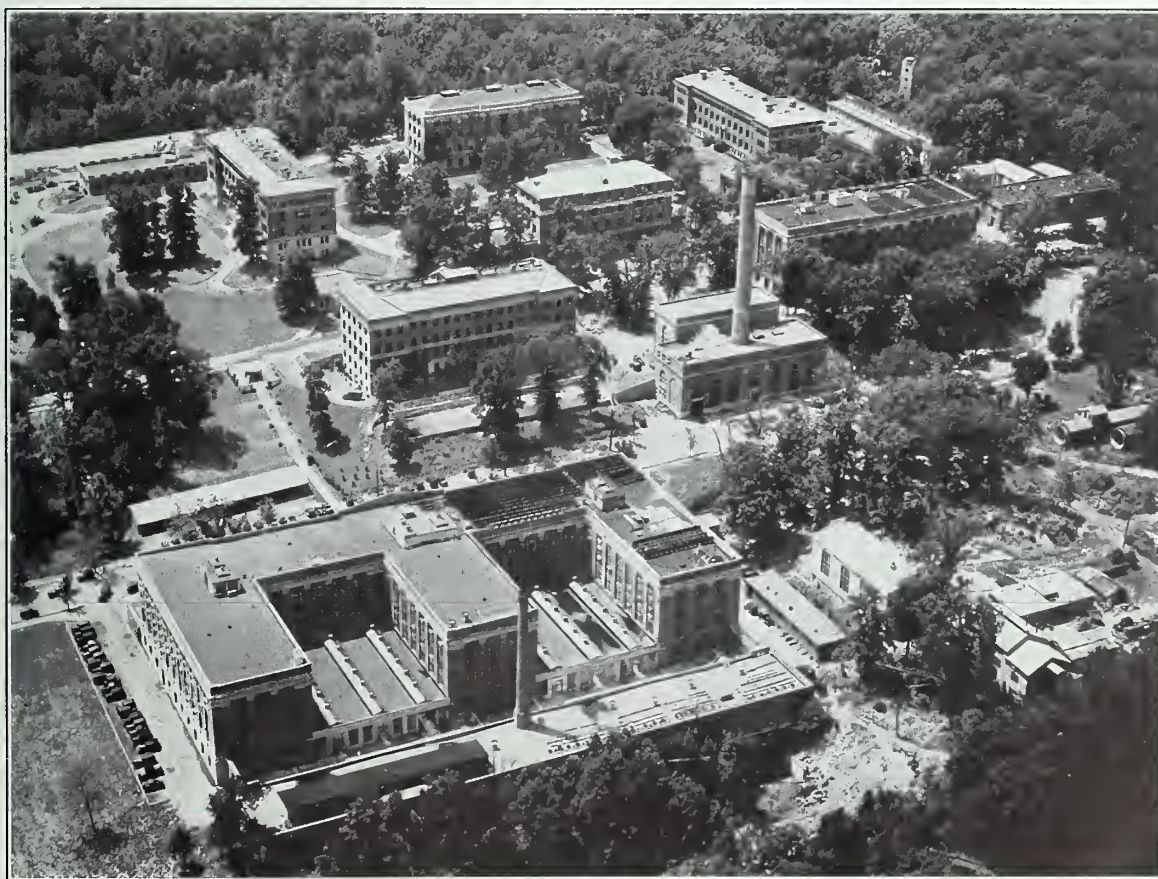


Bureau of Standards
OCT 19 1932

COMMERCIAL STANDARDS MONTHLY



*A Review of Progress in
Commercial Standardization and Simplification*



Photographed by Army Air Corps

AIRPLANE VIEW OF BUREAU OF STANDARDS (LOOKING SOUTH)

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

Vol. 9, No. 4



OCTOBER, 1932

For sale by the Superintendent of Documents, Washington, D. C.

The Commercial Standardization Group

A. S. McALLISTER, Assistant Director

DIVISION OF SIMPLIFIED PRACTICE

Edwin W. Ely

The division of simplified practice cooperates with industrial and commercial groups to reduce waste, usually through eliminating unnecessary variety of product, method, or practice. Its function is to bring together all parties interested in a project of this character, and to coordinate their work in developing a simplified practice recommendation. Such work includes surveys of current practice, formulation of a simplified practice program, and presentation of that program for action by a general conference representing all interests. The division then transmits to all concerned a full report of the general conference, with a request for written acceptance of the action taken. When the volume of acceptances is sufficient to indicate initial success, the Department of Commerce indorses the program and publishes the recommendation. The division thereafter cooperates with a standing committee appointed by the industry concerned, in conducting periodic surveys to determine the degree of adherence, to maintain and extend support of the recommendation, and to secure data for reaffirmation or revision. Simplified practice may be applied to any commodity or activity in which it will reduce waste. The division stands ready to render service in developing and making effective any application of simplified practice which will reduce waste, stabilize business, or extend commerce.

BUILDING AND HOUSING DIVISION

J. S. Taylor

The division of building and housing, formed in 1921, cooperates with business, technical, and professional groups in furthering construction activities. It works to modernize building codes and to encourage improved standards for the quality of building construction, and the practical application of the latest development in design and use of building materials.

It encourages home ownership through the development of an enlarged, steadier, more intelligent, and more discriminating demand for dwellings—the largest single class of buildings which the construction industries provide.

The division also cooperates with other governmental agencies and with many private 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 the broad objective of making buildings more useful through proper location with respect to other structures, stabilizing of land values and property uses, well coordinated thoroughfare systems, and well laid out public works.

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. It ascertains the standardization and specifications promoting activities of the associations and societies, and brings to their attention the work being done by the commercial standardization group. It brings the Federal specifications and commercial standards to the attention of the maximum number of producers and users of commodities complying with these standards and specifications. It compiles and distributes lists of sources of supply of materials guaranteed to comply with the standards and specifications. It shows both buyers and sellers the benefits from handling nationally specified, certified, and labeled commodities. The division prepares directories of governmental and nongovernmental testing laboratories and the Directory of Specifications, and is working on an encyclopedia of specifications, the first two volumes of which have been issued, namely, "Standards and Specifications in the Wood-Using Industries" and "Standards and Specifications for Non-metallic Minerals and their Products." It also aids in preparing the Standards Yearbook.

STANDARDIZATION
.. IS ..
A CONTINUING PROCESS
~*~
ITS AIM IS NOT FIXITY
OR STAGNATION
.. BUT ..
TO ADD SERVICEABILITY
AS OFTEN AS THE
POTENTIAL GAIN
MAKES IT WORTH WHILE

DIVISION OF TRADE STANDARDS

I. J. Fairchild

The division of trade standards, on request, assists industrial and commercial groups in the voluntary establishment of standards covering grades, quality, dimensional interchangeability, or other acceptance criteria as a national basis for marketing manufactured commodities.

The detail criteria are selected or determined voluntarily by interested buyers or sellers, without any Government dictation or domination, and adjusted at a general conference of producers, distributors, and users so as to represent the composite views of all branches. The division functions chiefly as a neutral agency to see that all interested elements are given full opportunity to be heard and satisfied; to solicit and record acceptances; and to publish and promulgate the standard when a satisfactory majority of acceptances is obtained and provided there is no active opposition.

Industries are encouraged to apply self-certifying labels to products meeting the commercial standard requirements, as a means of protecting the consumer and the scrupulous seller from misrepresentation or unfair methods of marketing.

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.

Address BUREAU OF STANDARDS, Washington, D. C., for further information

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AN INVITATION TO VISIT THE BUREAU OF STANDARDS

A cordial invitation is extended to all 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.

Meeting to Standardize Specifications for Road Oil

THE outstanding problem confronting the second annual Road Oil Congress, which is meeting October 13 and 14, at Tulsa, Okla., is the matter of standardizing road oil specifications. This problem will head the discussion at the meeting and will be of considerable importance to the refining and marketing branches of the oil industry.

The specification committee of the congress is expected to recommend a tentative standardized schedule which will provide for all possible simplifications that may be made in the present confused road oil specification set-up.

Considering the fact that there are more than 700 different specifications for road oil in the country, it is readily appreciated what standardization will mean to the refiners. The latter are said to be handicapped in not being able to manufacture and store any quantity of a given road oil but are forced by the ridiculously wide variation in demand, to make up comparatively small orders for almost every individual case. The result is that the price of the product is said to be higher than it need be. If the various States and the minor subdivisions could agree on standard specifications for given conditions, it is believed that the total number could be reduced to a round half dozen. Such a program would undoubtedly put more refiners in the business, bring healthy competition and manufacturing economies leading to lowered prices for the road builders.

SCIENCE AND THE HOME

Bureau of Standards Aid Home Planning and Construction

By HENRY D. HUBBARD, *Bureau of Standards*

Science and the power machine are exalting home life. To-day motors trap house dust in a vacuum, take the toil out of sewing, clean our clothes and dishes, cool our food, and make breezes to refresh us. Science is behind many such services. At a motion of the hand a vibrant world of melody, speech, and knowledge enters our living room. Seated at ease we may converse across continents, over oceans, with people in 40 nations. We turn night into day with a tungsten thread. These and scores of Aladdin-like miracles we perform. With new science and technics we may make our own home environment what we will, giving the household optimum conditions for perfect living.

That our standard yard, pound, and gallon comes from our national Bureau of Standards is well known. It is not so well known that scores of other newer kinds of measurement require many new types of standards or instruments. We rate electrical power in watts; electrical pressure in volts; light in candle-power; food energy and heat in calories; and radium in curies. For these and many similar measures the bureau must to-day have standards, units, instruments, and scientific methods of measurement.

Measurements are everywhere needed to locate the home and to design, build, equip, and maintain it. This brings us many contacts on fundamentals. The use of such measures calls for researches and tests. Ideal standards of quality, performance, and practice are measured ideals, for in the home technologies of to-day guesswork should no longer enter. Service must be built into the machines and structures to give predictable results.

"How to Own Your Home" and "Present Home Financing Methods," widely circulated manuals for the prospective home maker, were prepared by the division of building and housing of the Bureau of Standards. The practical problems of the householder in keeping his home in good condition are treated in the pamphlet "Care and Repair of the House," including minor improvements. Cooperation is given to the "Better Homes in America" movement, under whose auspices demonstration homes are exhibited each year in hundreds of places to stimulate and educate popular interest.

Staff assistance was rendered to most of the committees of the President's Conference on Home Building and Home Ownership, held in December, 1931, and the housing division is taking part in the continuing activities that have been instituted as a result of the conference. Technical phases of home building are given in publications dealing with plumbing requirements for dwellings, masonry walls, floor load requirements, and so on. These were prepared by the Building Code Committee appointed by the Secretary of Commerce, and are based upon data acquired by expert experience and embody results also of bureau's researches and tests, as well as those of other laboratories.

This article tells with more detail some ways in which the Bureau of Standards aids the activities and welfare of the home.

The division of building and housing serves cities and towns with valuable technical information essential to city planning and to the efficient regulation of housing and building in the public interest. Its "Zoning Primer" describes the modern policy of establishing special districts restricted to certain types of construction and occupancy. This protects home neighborhoods from unwarranted and uneconomic intrusion of commercial or other uses of property that are undesirable as neighbors to houses. It protects the homeowner's equity in his property and gives stability to the city plan, a subject described in "A City Planning Primer."

The bureau's work affects the household through tests and researches upon structural materials, building construction, and the utilities which serve the home. Nearly every division has work in progress of direct interest to the household. The division of building and housing was specially organized by the Secretary of Commerce to gather data useful in cheapening, improving, and encouraging the building of homes and other structures.

The bureau's experimental research on plumbing—so vital to household health—is credited as being a most scientific treatment of the subject. The published results aid home builders in providing adequate, safe, economical plumbing facilities. Many bureau researches and tests help to improve home-building materials through quality and service studies on cement, brick, tile, lime and lime plaster, stucco, paint, roofing, tiling, lightning rods, fabric, wall boards, and the like. The practice of plastering, stucco application, painting, and the installation of plumbing, gas service, electric service, and house construction have received careful experimental study.

To aid the household to protect the home from wear, weather, fire, lightning, noise, and other things, many researches and investigations have been undertaken by the bureau. A popular 127-page publication on "Safety for the Household" deals with safety precautions to protect the home from electrical, lightning, gas, and fire hazards, and the dangers from chemicals and accidents. It was "designed to present the subject to adults and thus aid the growing movement for safeguarding life and property from avoidable accidents."

The bureau's publication "Protection of Life and Property Against Lightning" describes the history and technique of adequate protection against lightning, which causes many fires, especially of farm buildings. The damage to such property by lightning exceeds \$20,000,000 annually. The Bureau of Standards points out how such losses can largely be prevented by the use of lightning rods properly installed, but that rods improperly mounted or without suitable ground connections are useless. The value of such protection for farm buildings having typical

exposure was emphasized. One interesting discovery was published on the proper grounding of wire fences to reduce the losses of livestock in open fields.

To safeguard the home from fire, the bureau's researches on fire hazard contribute new data on the nature, causes, and avoidance of fires in homes. Actual fires are studied for various purposes. The bureau has a furnace in which can be burnt to destruction specimen house walls of most varied design and material—to perfect our knowledge of how to build homes with minimum fire hazards.

A special brick building is used at the bureau to test the destructive effects of fire on various kinds of equipment. In Washington, a large brick building and a smaller one next door were about to be dismantled to allow Government building operations. The bureau, under close observation and measurement of temperatures throughout, burned them to complete destruction. Resulting data on the failure of the tin roof, brick walls, and floors enter into building practice to help perfect the design of houses. A construction, such as a wall, is rated on its ability to satisfactorily hold back fire and prevent ignition of combustible materials in contact with the side away from the fire. The length of time the wall affords this protection is determined in a standard furnace test.

The fire resistance of building materials and construction is determined by subjecting them to a test fire, the intensity of which is regulated so that given temperatures in the furnace obtain at stated times after the fire is started. Even the garage—now often built in or attached to the house itself—was not overlooked, and the standard of “1-hour fire resistance” was suggested by the Bureau of Standards to assure adequate safety.

Compiled data on seasonal variations in fires, on fire resistance in dwellings, and on the fire hazard from discarded cigarettes, cigars, and matches were published with suggestions for reducing such hazards. Many researches are conducted which sooner or later are reflected in technical details of home construction. In the experimental fires, for example, the bureau has studied the hazard of shingles, how roofing fails, how embers are formed and carried by the wind, the temperatures of fires, and a score of subjects vital to home safety and economy. Such data find their way through building codes into practice, or through the designers of equipment, or the architects of dwellings.

On the roof of the bureau's chemistry laboratory sheets of various colors are exposed to natural weather day by day, month by month. Paints are having their fortunes told, for some will live or die commercially by these tests. Inside the same laboratory “accelerated tests” of similar paints are in progress. Weather affects coated surfaces—a vital problem in the life of structures. Among materials tried out as protective coatings are oil paints, enamel paints, lacquers, bituminous saturated felts, and bituminous roofing materials. The accelerated weathering test is similar to and more rapid than actual weather exposure. Artificial rainfalls on the specimens, followed by artificial sunlight rich in ultra-violet, simulate the destructive forces of weather and play in repeated sequence on the painted specimens. Outdoor exposure tests and indoor accelerated tests thus tell pertinent factors as to how paints hold up under weathering. Such new facts for the paint industry eventually help the house-

hold more effectively and durably to save the surface and thus add longer life to the home.

The bureau has studied means for cleaning marble, and determined how to minimize disfigurement of the exterior of the house. Soluble salts in masonry materials often disfigure walls by efflorescence. Efflorescence is often attended by disintegration of material, particularly mortar. It was found that moisture in the wall is the immediate cause, and that moisture penetration can be lessened by proper design, construction, and maintenance. It may appear and disappear for a few seasons, but with each successive appearance gradually diminishes in extent until finally it never again becomes noticeable.

Quiet—the laudable goal of modern antinoise crusades—is essential to restful home life. The bureau has helped fundamentally by measuring the sound transmission properties of some 26 kinds of wall and floor of various materials and internal design. This research gave new light on how to minimize the invasion of noise through walls and floors of rooms. Ways are now known for making practically sound-proof walls and floors, and home and apartment house designers are furnished data needed for building quiet into the structure as effectively as we build strength. Further research will add new data on this subject.

In the course of the experiments silver tarnish, identified as silver sulphide, was made in quantity, made up into wire and found to possess interesting electrical properties. The bureau later has jointly with other agencies, help to produce a tarnish-resistant silver—a practical step toward a nontarnishing silver. Again the bureau, upon request, aided the makers of enameled-metal kitchen ware by finding the cause and cure for the chipping or flaking which marred the ware and actually threatened the industry. Research on the relative expansion of the metal and the enamel disclosed that unequal expansion caused the “fish-scaling” as it was called. New technique in cleaning and applying the enamel and a new formula for the enamel were developed in experiments in which 40,000 specimens were produced and studied. The housewife using enamel-metal ware will be interested to recall that science and technics at the Bureau of Standards helped perfect the art of making such ware.

The household draws to its service many arts and sciences, and such services will multiply as we use intelligently all means now so available and so potent for human well-being. The era of artificial refrigeration actively began coincidentally with the completion of the bureau's precise determination of the properties of refrigeration materials—data essential to and underlying scientific refrigeration, and the design and construction and operation of refrigerating devices. To-day, with 2,000 new refrigerating devices each day entering American homes, machine-made cold has become a household product.

It is now possible to install in the home scientifically designed power-driven cold-producing machines. The Bureau of Standards' series of classic researches on the refrigerating properties of materials has contributed in no small measure to this end. Active years of research yielded accurate technical data unsurpassed elsewhere by any similar research in other branches of engineering.

As early as 1904, the bureau controlled the humidity of some of its electrical laboratories, blowing the air

against radiators cooled below the freezing point of water by calcium chloride brine. This froze the water out of the air, thus drying it. Many inquiries were answered concerning this bureau provision of air-moisture control—then a laboratory necessity, now an industrial service, and aid to health and comfort in our great theaters, and slowly coming into the home, to add comfort for the family.

Perhaps dust-free air, of optimum temperature, humidity, and motion, may eventually be supplied as everyday practice in the home for the sake of the household, as is already done in scores of industrial operations for the sake of the material products. In the control of air conditions for research in many lines; for example, in its paper testing and textile testing laboratory, altitude chamber for simulating high altitude condition, and elsewhere, the bureau has helped show that air control is feasible. Controlled climate indoors will doubtless become as much an object of home technology as house heating in winter.

Again, if roofs were white outside and aluminum painted inside, attics would be cooler in summer and warmer in winter. This was discovered by the Bureau of Standards from measurements of the radiative and reflective properties of materials. Attics cool in summer and warm in winter may add a fifth to the habitable space of the home. If suitable heat insulation is applied under the roof, many livable attics could be attained more easily.

The walls of the home are built to keep out wind, rain, and snow. Summer heat and winter cold still force their way in, bearing bodily discomfort and ills. The bureau is helping toward a more ideal indoor weather by measuring accurately the heat transmissive quality of various materials. A useful letter-circular giving the results has been distributed by thousands to aid home makers and house designers to build temperate conditions into the home. With these data artificial heat can be kept indoors and summer heat kept outdoors more effectively. Economy is the welcome partner of comfort from heat-insulating walls since coal bills may often be cut down one-third if recommended precautions are taken.

All households in America are daily buyers of industrial products. They are America's largest buying group, but they lack expert knowledge of what they buy and of how to buy wisely. The national Government is one of the next largest buying units. The 74 technical committees of its Federal Specifications Board formulate quality-describing specifications to govern Federal purchases. Its 748 Government master specifications cover some 4,000 items, hundreds of which are of direct interest to the buying household. The bureau has put successfully into effect its beneficial "certification plan" to aid household buying. Under this plan the bureau publishes a "willing-to-certify" list of firms willing, when requested, to deliver goods certified to conform to the United States Government specifications. More than 8,000 firms have registered for this list. This gives the benefit of the Government's specifications to all who wish to use specifications. To this plan is added the system of "self-identifying quality-guaranteeing labels" under which the products and their sale are brought within the purview of the agencies which safeguard the buying public from misbranding and mislabeling commodities.

Full weight and measure in marketing concerns every householder. Accurate deliveries over the counter depend on the Bureau of Standards along four principal lines: First, through its standardization of the shop standards by which trade measures are made; second, through its standardization of the State standards with which local "sealer's" standards are inspected and verified; third, through annual conferences of State and national officials, encouraging the adoption of the model State law, standard tolerances, and adequate local inspection; and fourth, by information to the household and the inspectors. These four activities since 1901 steadily have developed what is now a nation-wide interest in full weight and measure in the markets in the interest of the buyer.

As aids, the bureau has published and widely distributed for the use of the household: "Buying Commodities by Weight and Measure," "Measurements for the Household," and a kitchen card. The first helps the household in methods of buying with special regard to quantity measurements. The bureau's kitchen card for the household gives tables of weights and measures, equivalents of the units of measurement used in cooking, standard heights and weights of children at each age, and other facts. The bureau's handbook for sealers is the reference work for the local inspectors throughout the country.

Practically everything used by the household calls for measurements, and accuracy is essential to fair dealing, and oftentimes to utility. All of us as buyers pay the last cent due in a purchase, so equally the last ounce due should be assured to the purchaser. Large buyers check the weight and measure of all deliveries. Households rarely do so, but rely on the sealer and tradesman for correct measure over the counter. The bureau's nation-wide campaign for honest weight and measure is saving buyers millions of dollars formerly lost through short measure. State laws and local inspection services are now general and the household is freer from preventable injustice.

The bureau's simplified practice division aids the household by stimulating the industries to simplify sizes and varieties of many household articles—beds, springs, mattresses, sheets, bed blankets, table china-ware, and others. Here the more acceptable sizes (as reflected in the sales) were retained on the manufacturers' schedules. A notable success was in simplifying and standardizing builders' hardware, latches, bolts, locks and keys, knobs, sash pulleys, brackets, umbrella holders, chest handles, and so on. Through the efforts of the simplified practice unit of the bureau, the industry has reduced the sizes and varieties of face brick from 33 to 1 in the nation-wide elimination of waste activity of the Department of Commerce. Simplification has been attained even in such details as the milk and cream bottles (now reduced to four kinds) and bottle caps (now of one size).

Clay products from bricks to chinaware, from terra cotta drain pipes to the beautiful tile of the bathroom, are of concern to the household. White glazed tile and unglazed ceramic mosaic were simplified, terms defined, and a form of certification was agreed upon. Sets of chinaware for hospital and hotel use have been selected so as to give a simplified set of general service utility. Weights, widths, and lengths of bedsteads and bed linen have been concurrently simplified

to promote economy in production and sale. In all, 120 commodities are now simplified as to size, grade, and variety. Such simplifications effect many economies, facilitate replacement, and assure benefits such as come from even partial standardization.

The bureau has designed and built an apparatus to simulate the wear of carpet in service. Two leather-faced abrading wheels give the stress and a vacuum-cleaner picks up the abraded material, the amount of which measures the wear.

The code of gas practice has given basic data to local Governments for effective and safe control of gas service. The bureau has made experimental and field studies of gas hazards and the efficiency of gas appliances. The consumers and the manufacturers have shown interest in this work and felt the stimulus to design more efficient appliances. In household practice the bureau's circular on "How to Get Better Service with Less Natural Gas in Domestic Gas Appliances" showed that two-thirds of the natural gas then used in the home could be saved by using the type of burner devised and recommended by the bureau for the purpose. The burner was found to have an efficiency several times that of the type in common use. The saving made possible (at replacement value) was estimated at \$250,000 a day, if the bureau's suggestions were fully adopted. The effects of changes in the heating value of gas furnished to the home were described in another published paper. Optimum conditions for efficiency, capacity, and safety of burners were designed for the domestic use

of two of the newer fuels known as propane and butane. A study was also made of the efficiency and safety of acetylene burners. At one of the national conventions of the American Gas Association, the bureau exhibited methods of utilizing natural gas and the best types of burners in use. The serious hazard from the presence of carbon monoxide in the air was made the basis of extended experiments and data for municipal regulations concerning the inspection and safety of gas appliances in the home.

Engineers of State utility commissions have met at the bureau to discuss problems of residential use of gas and electricity. The bureau's service of standardization for water, gas, and electric meters has brought uniformity and helped to maintain accuracy in the measured service of electricity, gas, and water—satisfying both to the household and to those who furnish such service—minimizing disputes, complaints, and promoting good will in the assurance of full measure to the home. The bureau's work on meters for electricity, gas, and water is chiefly in certifying the standards or standard instruments used to control the accuracy of manufacture and adjustment.

We have completed our survey and seen some of the ways in which the Bureau of Standards aids the home. Its 60 or more specialized lines of research of interest to the household could not be fully told here. The examples described may give an idea of what the 2 cents per capita spent for our Bureau of Standards is doing for the American home—one, not the least, of the many beneficiaries of its research.

STANDARD GRADING RULES FOR DOUGLAS FIR PLYWOOD

With a few minor changes the commercial standard grading rules for Douglas fir plywood were approved and recommended for acceptance by a general conference of the industry on August 17, 1932, in Tacoma, Wash. The conference was attended by manufacturers whose combined production represented approximately 80 per cent of the total.

Douglas fir plywood is a built-up or laminated board which usually consists of three or five plies of veneer with the grain of each contiguous layer running at right angles to the one next to it. The pieces of veneer are covered with a waterproof glue and united under heavy pressure into the finished product.

The sheets of veneer are cut from large choice logs of Douglas fir that have previously been steamed to facilitate their cutting. The log is mounted in a massive lathe which is revolved against a large cutting edge that is so tilted against the log that a continuous sheet of wood of predetermined thickness is cut. The long sheets are clipped to the desired size and thoroughly seasoned in mechanical driers.

The sheets are then covered with a water-resistant glue and united usually in a three or five ply construction under heavy pressure. Sometimes a larger number of plies are employed where greater thickness is desired, but they are always of an odd number.

Since each alternating layer extends at right angles to the adjacent one, the tendency of shrinking and

swelling is largely eliminated because the greatest shrinkage of wood occurs in a tangential direction or, in other words, across the face of the regular flat sawn board. In plywood, however, this tendency is checked by the adjacent layers of wood running in the opposite direction. The tendency is further reduced by the thorough drying of the component layers in the finished plywood.

The glue joints are as strong as the wood itself and because of the alternate grain direction the product is highly resistant to splitting and is nearly as strong in both directions.

Because of its strength characteristics and large panel sizes it has a wide field of usefulness, including the building field, where it is employed for interior paneling, partitions, sheathing, subflooring, shelving, concrete forms, etc. It is also used for window displays, cabinets, and other furniture items; in automobile bodies and a wide range of other industrial applications.

To meet the requirements of these varied uses the industry recommended the acceptance of definite grade rules as the universal basis of understanding in the trade. Architects, engineers, contractors, and industrial users will thus be able definitely to specify their needs from recognized grades and eliminate the misunderstanding that is ever possible between buyer and seller in the absence of grade specifications.

The recommended standard has been sent out for the formal acceptance of the entire industry and is available gratis to anyone interested, upon application to the Division of Trade Standards, Bureau of Standards, Washington, D. C.

STANDARDIZATION WORK OF THE INGERSOLL-RAND CO.

By ARTHUR HUNTRESS, *Standards Department, Ingersoll-Rand Co.*

About three years ago the management of the plant with which the writer is connected decided that the time had come for revamping its company standards. The following brief article tells something of the experiences and the methods developed since that time.

The product of the plant is of considerable variety; the main lines are air compressors, air rock drills, turbines, condensers, pumps, and oil engines. The expansion of plant activities, in past years, into new lines of product has been such that the several main divisions have, to some extent, been fairly independent of one another in the establishment of their own standards. Some standards were in common use in more than one division, but there was considerable duplication of effort, lack of cooperation (due largely to lack of complete dissemination of available knowledge on a subject among divisions), some disregard of commercial and national standards and other similar conditions.

A general realization that a more complete and comprehensive system was needed to handle this work, in a better way than it had been in the past, led us to study; first, our own actual conditions at the time; second, basic ideas of modern plans already in operation; and third, methods of application to our own individual case. As a result of this, we have adopted a basic plan which we believe is such that anything which comes within the field of standardization, such as any article of stores, a practice or a function, will easily and logically fit into the scheme. The method of development of an Ingersoll-Rand standard is, briefly, as follows:

A standards committee has been formed, composed of representatives from each of the main divisions and departments. The chairman of the committee is the assistant chief engineer. The secretary is a full-time man. The main business of the secretary is to investigate the subject of a proposed standard and to prepare a draft for the consideration of the committee. If the subject is of such nature that a special subcommittee is deemed advisable, such a committee is appointed to assist in the work, but this committee is considered temporary.

When a proposed standard has the approval of the main standards committee, it must finally be approved for publication by the general superintendent. In theory, only a two-thirds majority of the standards committee is required to be in favor of a proposal to secure committee approval. In practice, we have always had a very much higher percentage of the committee in favor of a proposal before final approval. A standard may be revised at any time, and the procedure is practically the same as for the original development. A new standard or a revision is never promulgated until all interested parties have had opportunity to study and criticize a proposal. In short, this method is both representative of all interests and centralized, thus making available, for all parts of the plant, these articles of stores and accepted practices which appear to the committee to be in the best interest of all. In operation this method

of standards development nearly always brings out the fact that some division or department has a distinctly better method of handling a particular subject than the other divisions. Thus a practice which has distinct merit, but which has previously been confined to one division perhaps, becomes standard for the plant.

A proposal to standardize any particular subject may come from any division or department, but so far the committee has had plenty of work ahead of it in the subjects that were known to be in need of attention from the beginning. The plan which we have adopted, divides the whole possible field of standardization, within the company, into several main divisions or groups, with each group designated by a letter.

When it is decided to standardize any particular subject, whether it is an article of stores, a practice, or a function, the group and class must first be selected. The group into which a subject naturally falls should generally be easy to select. The class which covers the general subject (as, for instance, bolts and screws) may have already been started, in which case it is only necessary to add further sheets to cover new varieties or specifications. If the general subject has not been previously started, it is necessary to begin a new class. The general subject of each class is then subdivided (if required), and each subdivision is assigned a sheet number to cover the specification for a single subdivision of a subject only.

In the system adopted for sheet numbering, the group letter and class number are preceded by the sheet number. This automatically separates numbers for sheet and class, without a hyphen or other means, and works in with the method of developing part symbols, for articles of stores, for the same reason. It should also be stated that the sheet number bears no relation to any other number or symbol whatever, being assigned in the index solely as a sheet to cover the information pertaining to a particular subject.

A system for part symbols, to be used wherever possible, has been developed in connection with the sheet numbering system. This part symbol is intended for general use on drawings, in storerooms, in correspondence, and wherever it is necessary to identify an article of stores. It should be pointed out that a sheet number completely identifies the general character of an article as for instance: Sheet 20 A2-American Std. Hex. Head NC-2 Semi-Fin. Machine Bolts. This does not identify the material and size, however, and these are taken care of by the following method:

On each sheet where this part-symbol system is used, a list of I-R material specification numbers is given covering materials from which the articles may be ordered. Each material specification number appearing on that list is assigned a material symbol letter which must be understood to identify the particular material specification number for that one sheet only. This point is particularly important as the same material symbol (for instance the letter C) may refer,

on different sheets, to the same general material (carbon steel) but to different material specification numbers, on various sheets. This is illustrated by the case of carbon-steel bolts and carbon-steel hex. cap screws. The material symbol in both cases is the letter C but the material specification referred to is No. 175 in the case of bolts and No. 307 in the case of hex. cap screws.

The size of an article is identified by a plain number in a part-number list. For instance, No. 335 is a $\frac{5}{8}$ by 4 inch bolt on all American standard and United States standard regular bolts. For a $\frac{5}{8}$ by 4 inch hex. cap screw, however, the number is 192. This illustrates the point that, as in the case of material symbols, the part number is used as a means of identification only in connection with the sheet from which it is taken. These three factors are then combined to give a part symbol which completely identifies the article and is easy to locate in the standards without reference to any index. The part symbol is made up as follows:

- First, sheet number; which gives general character.
- Second, material symbol; which gives I-R material specification number.
- Third, part number; which gives size (or some other third characteristic).

For instance, part symbol 20 A2 C335, in which 20 A2 means American standard hex. head NC-2, semi-finish machine bolt, C means I-R material specification No. 175, carbon steel, and 335 means $\frac{5}{8}$ -inch diameter by 4 inches long.

Two distinct advantages of this part symbol system are: First, that it does not require the assignment of large blocks of part numbers from a master part number list; and second, the ability to make quick and complete identification of parts. Some of the work has been covered, but much remains to be done. There is not time to go into such questions as methods of enforcement, reduction in inventory, etc., but we believe that the plan we are working to has the prime

virtues of flexibility, unified directing force, and real plant team work. This does not mean, of course, that we have not met with difficulties and objections, but it is also true that the general degree of cooperative spirit shown has been high. Any commercial standard is a compromise, almost without exception, involving sacrifice of personal preference in some cases. The objector frequently honestly believes that a standard tends to suppress initiative and progress. Obviously this is not true if a standard is kept up to date and the limits of its usefulness are thoroughly recognized and agreed to. Certainly a standard is not intended to limit experience and change in their proper fields, but only to act as an established authority for present practice and to repress any unnecessary individuality.

Although the standardization idea is far from new, it has undoubtedly received much greater general attention in the years since the World War than before. It has enemies as well as friends, and by some people it is viewed as an ominous bogey. It seems probable, however, that this viewpoint is largely the result of the same handicap which was once offered, by a celebrated Englishman as an explanation of his well-known antipathy for a certain contemporary. When asked if he was personally acquainted with the object of his dislike, he replied, "Of course I don't know him or I could not hate him as I do."

No system or plan will run itself and will never be any better than the people who try to operate according to it. In a small plant there is obviously no necessity for much of the formal procedure that is required in a large and diversified products plant. In the large and complicated organization, however, there are a thousand unobtrusive ways of losing money constantly which a real standard system will largely reduce. This has been so thoroughly demonstrated that it is beyond argument. Every commercial organization exists principally to produce profit for someone and standardization has proven one of the most useful agencies for that purpose to-day.

FAST SELVAGE TERRY TOWELS

The majority of manufacturers who have accepted simplified practice recommendation R119-31, covering fast selvage terry towels (turkish towels) have expressed their intention to identify the simplified lines in new catalogues and trade lists, according to information received by the division of simplified practice, Bureau of Standards.

This simplification program, which was proposed and developed by the industry, provides a simplified list of six stock sizes of terry towels. Formerly 74 sizes were in use. The recommendation does not apply to special sizes made against particular orders for purposes other than stock, nor to sizes smaller than 16 by 30 inches or larger than 24 by 28 inches.

It is expected that identification of the simplified lines in trade literature will assist this industry in maintaining close adherence to the waste elimination program, and that the cooperation of all interests in the industry will greatly increase the benefits and economies possible through simplified practice. Several national associations representing users of simpli-

fied commodities have for some time strongly urged that this policy be adopted by manufacturers who have accepted the various simplified practice recommendations. When the simplified items are so identified in trade literature their selection can be made without difficulty and often much waste now incurred in checking files and auxiliary records for this data is eliminated.

SOLDERS AND SOLDERING

In order to facilitate answering many inquiries on this subject, the Bureau of Standards has just issued an 8-page mimeographed letter circular, LC343, Solders and Soldering.

Three classes of solders are described, namely, soft solders, hard solders (silver and brazing), and aluminum solders. The composition and properties of each are outlined together with the methods of application and fluxes to be used, and a short bibliography follows. Copies of this letter circular may be obtained upon request to the Bureau of Standards.

USE OF SPECIFICATIONS IN PURCHASING

County Official Reviews Value of Check Testing in Making Bulk Purchases and Certification in Minimizing Expense of Testing

By W. R. CORTRIGHT¹

The recognition of purchasing as a business function is the result of a slow and steady development which started in the old industrial shops, where the foreman or superintendent was also the buyer. Increased volume in latter years made it increasingly more difficult for one individual to handle efficiently both operating and management questions. The monetary values involved, and the contradictory fact that procurement of materials was formerly looked upon as an unimportant incidental duty of those who were to use the materials often led to transactions which were not to the interest of the purchasing principal, due to lack of care on the part of the buyer or to various forms of commercial bribery.

Evils in this field grew to such proportions as to attract Federal regulation, and the situation was such as to establish an unpleasant aroma in the popular mind whenever purchasing was mentioned, especially governmental purchasing. Peculiarly, this attitude did not exist in regard to the complementary transaction of selling. There were some sincere and well qualified buyers, but even they were handicapped by the nonexistence of generally used specifications, by restricted distribution, by limited advertising, and by a scarcity of trade and technical publications.

For some time past there has been a steady trend toward a more efficient handling of purchasing. The formation of various groups of governmental and industrial buyers into associations has been important, and the formation of the National Association of Purchase Agents in 1915 was an outstanding expression of this movement. All include in their purposes the elevation of the moral and ethical standards of those engaged in purchasing and the improvement of the mode of operation.

Simultaneously the use of specifications has taken on a greatly added importance. For example, an order calling for "good" coffee could be filled with a multitude of products and each product would find somebody who thought it good. On the other hand, a specification calling for a certain percentage of stated kinds of coffee berries of a certain size can give but one result. Such a specification recently permitted a buyer to enter claim and receive settlement in the amount of several hundred dollars where the coffee was "good" and was used, but was afterwards found to be not equal to the detailed specification. In other words, the specification was a definite statement of what the seller had agreed to furnish and what the buyer expected from the seller. With such a statement clearly formulated and expressed before starting the transaction and strictly adhered to in the completion of the transaction, there is little possibility of chicanery or misunderstanding.

The problem now commonly arises of preparing proper specifications or the selection of the right ones

from the large and diversified list already available to those who are interested. The Federal Specifications Board and the Bureau of Standards have a very complete list. There are numerous societies and trade bodies which have established other such specifications applying to certain lines of commodities, such as the American Society for Testing Materials, the American Petroleum Institute, the various engineering societies, canning associations, etc. In addition, there are many State specifications and State laws which serve as specifications. Whether any of these established specifications are used or new ones are prepared by the purchaser for his particular use, there are two limits which must be observed: (1) They must be adequate. Vendors may intentionally or unintentionally leave out essential qualities of a product if such qualities are not specified. They can not be criticized for this as they are compelled to meet competition and may be justified in assuming that a vendor who uses the specification has included all elements required. (2) They must not be too comprehensive by including points which are not needed or which can not be checked. Such an excess of specifications will either be a source of unnecessary additional expense or will lead to disregard by certain bidders of the points which can not be checked, and possibly some of the essential points.

The scope and detail of a specification should be settled upon after consideration of the market in which the purchase will be made and the volume involved. An occasional purchase of two barrels of laundry soap would probably be made from a local dealer's stock and it would be necessary to buy from among the brands available locally, whereas a monthly purchase of two carloads of soap for the same purpose would justify a chemical specification and would attract quotations from manufacturers. The cost of checking delivery by analysis would be the same in either case and would be entirely out of question in the case of two barrels, but would be only an incidental expense of inconsequential percentage when applied to the larger purchase.

Whatever specification is adopted, it must be backed by means for checking as to compliance by the vendor. Specifications giving only the required performance are the simplest and the easiest to check; for example, hack-saw blades, or carbon paper, or any commodities which can be used and results determined at once. Other commodities do not lend themselves to this method and must be covered by physical tests for qualities which will be indicative of their ability to meet the required service. It is impossible to define accurately and impractical to check accurately performance in service of a piece of cotton sheeting, but a comparatively simple matter to state the thread count, weight per square yard, and tensile strength required. These characteristics will give a good indication of the service which can be expected.

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An item regarding fiber of cotton used in the sheeting could be introduced but would add nothing to the practical results and would possibly increase the cost. Other commodities lend themselves only to a chemical specification while many others require a combination of physical and chemical. A large tonnage of chute steel or of steel piling would justify an inclusion of both physical and chemical requirements and even the inclusion of additional tests, depending upon usage conditions, and not found in the standard specifications as issued by the Government or other organizations.

In making use of and checking merchandise against specifications, each buyer has four God-given allies in his senses of sight, feeling, taste, and smell. Valuable assistance can be obtained by the use of a yardstick, a micrometer, a magnifying glass, and a set of ordinary scales reasonably accurate in weighing up to about 20 pounds. The frequent use of these tools coupled with an extensive curiosity which is inherently part of the nature of a good buyer will assure the obtaining of good values. A connection should be made with a reputable commercial laboratory or with some available educational laboratory for handling

chemical tests and the more complicated physical and performance tests.

For the buyer who does not wish to handle the checking of shipments against specifications there have been established by the Bureau of Standards lists of "willing-to-certify" manufacturers. The use of this method in purchasing permits the buyer to take advantage of these established specifications without the inconvenience or expense of testing, and is, of course, dependent upon the reliability of the manufacturer giving the certification. However, the advantages and benefits to be gained by this method of procedure are considerable and thoroughly justify its use wherever applicable.

In this era of acute competition, there are many vendors who are not as scrupulous as they should be or who may even make unintentional mistakes. Frequently merchandise is offered which looks like a full dollar-for-dollar transaction and is sufficiently discounted to prove of interest to the buyer, whereas the actual value may be only a few cents. The old saying that "All that glitters is not gold" was never more true; and adequate specifications and their use to their full extent will assure all buyers of receiving maximum values for each taxpayer's dollar spent.

CLINICAL THERMOMETERS

The printed revision of the Commercial Standard for Clinical Thermometers is now available and for sale by the Superintendent of Documents, Washington, D. C., at 5 cents per copy. The standard has been entirely rewritten by the industry with a view toward clearer statement of methods of testing and more definite requirements.

This revision is designated CS1-32 and became effective June 1, 1932.

FEDERAL SPECIFICATIONS

Fifteen specifications were acted on by the Federal Specifications Board during the month of September. Of this number, six proposed specifications and nine revisions have been sent out for official comment and criticism. Copies of these specifications are available in mimeographed form and further information can be obtained from the Federal Specifications Board, Bureau of Standards, Washington, D. C.

New designation	Specifications proposed	Old F. S. B. No.
	Aluminum bars, rods, shapes, and wire.....	
	Aluminum-alloy; bars, rods, shapes, and wire (aluminum-manganese).....	
	Cement; Keene's.....	
	Feathers.....	
	Fire-alarm systems; electric, hand-operated, shunt-type.....	
	Screw drivers.....	
	SPECIFICATIONS TO BE REVISED	
C-L-351.....	Ligatures, catgut, boilable.....	357
N-P-101a.....	Paste, office, and paste-brushes.....	
T-C-571.....	Cord, sash, cotton, braided.....	528
T-R-601.....	Rope, Manila.....	61b
T-T-881a.....	Twine, cotton, seine.....	
MM-L-751.....	Lumber and timber, softwood.....	533a
GGG-B-671.....	Braces, ratchet.....	416
GGG-G-521.....	Goggles, rubber-frame.....	542
GGG-H-131.....	Hatchets.....	433

REVISED PAMPHLET ON METRIC SYSTEM ISSUED

A revision of a miscellaneous publication of the Bureau of Standards, entitled, "The International Metric System of Weights and Measures," has just been issued. This publication, containing 13 pages, presents a brief description of the international metric system of weights and measures. The purpose of this publication is to give such information as will adequately answer some of the more simple questions addressed to the Bureau of Standards on this subject, particularly those coming from educational institutions.

The pamphlet sets forth a working knowledge of the metric system, gives a brief account of its origin, information concerning the International Bureau of Weights and Measures at Sevres, near Paris, France; the international standards kept there, and the national prototype standards of the United States, which are kept at the Bureau of Standards.

A synopsis of the metric system is given which shows the derivation of the primary units, their interrelation one with another, the method of forming the multiples and submultiples, the abbreviations used, comparisons of the units with those of our customary system of weights and measures, and tables of equivalents. The status of the metric system in the United States is shown by citations of congressional enactments and departmental orders.

This publication (M135) is a revision of Miscellaneous Publication No. 2, entitled "The International Metric System of Weights and Measures." It may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy. Circular No. 47, Units of Weight and Measure, contains more extensive tables and may be purchased from the Superintendent of Documents, for 20 cents per copy.

UTILITY AND DURABILITY TESTS FOR TEXTILES

Fundamental Studies of Chemical and Physical Behavior of Fabrics Conducted at Bureau of Standards

By R. K. WORNER, *Bureau of Standards*

Textile studies at the Bureau of Standards are concerned with a variety of problems of interest to the consumer and to the manufacturer. They range from studies of the ultimate nature of the fibers themselves, through investigations of the relation of the yarn and fabric construction and finish to the properties of the finished fabric, and include studies of utilization, storage, and maintenance. The development of standard test methods for measuring the quality and predicting the utility of yarns and fabrics for particular purposes is an essential part of this work.

This series of articles deals briefly with some of the studies in progress on the development of fabrics for specific uses and the resulting accomplishments.

Adequate test methods are prerequisite to fundamental studies of the chemical and physical behavior of textile fibers, yarns, and fabrics, and to the evaluation of their utility or durability. The development of new and better test methods is one of the most important functions of the textile section of the Bureau of Standards.

In the past, textile testing was usually limited to tests for breaking strength, number of threads per inch, weight per square yard, and the like. To-day, however, it is generally recognized that although these characteristics are a criterion of quality of cloth for some purposes, they may be only remotely, if at all, related to the value of cloth for other purposes. Accordingly, attention is directed first to a study of the conditions to be met by the cloth in service, then to an analysis of the characteristics which it is desirable to measure, and finally to the development of quantitative tests for these characteristics.

For example, the suitability of cloth for many purposes is dependent upon its feel or "handle." We are so accustomed to referring glibly to this characteristic that its evaluation at first thought appears a simple matter. A critical examination, however, shows that "handle" depends upon several physical properties, among them compressibility, stiffness, resilience, smoothness, thickness, and weight. Until recently, there were no adequate methods for measuring all of these properties. As a result of work at the Bureau of Standards, methods are now available for measuring all of the characteristics of cloth that contribute to its "handle."

A very sensitive "flexometer" has been developed for the evaluation of stiffness and resilience of even the finest silk fabrics. The resulting data can be interpreted in terms of wrinkleability of the cloth. Since stiffness, resilience, and weight are the properties of a cloth that contribute to its ability to drape

well, this instrument offers a means for evaluating the draping quality of different fabrics.

A simple method for specifying the slipperiness or smoothness of a fabric has also been devised. A block covered with the fabric to be tested is simply placed on an inclined plane covered with a portion of the fabric, and the coefficient of friction between the two fabrics is determined. Slipperiness is desirable in linings used in coat sleeves and in shoes. It is not desirable in the backing of rugs.

An ordinary thickness gage for measuring textile fabrics consists essentially of a fixed horizontal plate called the anvil, and a movable upper plate called the presser foot. The fabric to be measured is placed on the anvil and the presser foot lowered until it rests on the fabric. The thickness is then read directly from a dial. The thickness of a fabric depends upon its elastic properties, and the size, shape, and weight of the presser foot. Since the presser feet in different

This is the first of several articles describing the activities of the textile section of the Bureau of Standards. In these several articles the author will describe the work of the textile section and its relationship to the producing, distributing, and consuming elements of the industry. This month's article explains the utility and durability tests for textiles, in which is pointed out the benefits derived from such tests by the ultimate consumer. The second article will appear in the November issue of *Commercial Standards Monthly*.

instruments vary widely in these characteristics, it is obvious that thickness measurements of soft fabrics, such as blankets, velvets, and carpets, made with different instruments are not comparable. Furthermore, the rate of change of thickness of textiles with change in load is not known, so that readings on one instrument can not be converted to those of another. A new gage has been constructed at the Bureau of Standards to measure the thickness of fabrics under varying loads. With it both the thickness and the pressure are read directly. It furnishes a means also for evaluating the "softness," "hardness," and "compressive elasticity" of fabrics.

The air permeability is a vital characteristic of parachute cloth and must be held within a fairly definite and narrow range. If the cloth is impermeable, it will not be able to resist the air pressure when the parachute opens and will rupture. If the cloth is too permeable, the descent will be too fast for comfort and safety. An apparatus has been developed which measures the amount of air passing through a definite area of cloth in definite times at definite pressures. This apparatus is also useful for determining the permeability of clothing fabrics, which has an important bearing on the selection of clothing from the point of view of comfort and hygiene.

Warmth or the ability of fabrics either to retain or to transmit heat is another characteristic of interest from the standpoint of the health and comfort of the individual. An apparatus has been built to measure the amount of heat passing through fabrics under definite controlled conditions. This appara-

tus is being used in the study of underwear fabrics, blankets, and outer clothing materials.

The average diameter of wool fibers is the characteristic on which is based the present system of classification into commercial grades. It is the characteristic that largely determines the value of the fibers for manufacturing purposes. Commercial grading is done by men of long experience in the industry who merely observe and handle the wool. Until recently there was no satisfactory mechanical method for grading wool accurately without making a large number of individual diameter determinations on separate fibers. A simple optical instrument based on the laws of diffraction has been designed which makes it possible to measure the average diameter of a bundle of fibers directly and rapidly. The instrument, which is called an "erimeter," is small and portable and should find wide application in both the field and the laboratory.

To predict the utility of certain fibers, accelerated aging tests that simulate as nearly as possible the conditions that will be met by the fabric in service are necessary. A number of such tests have been developed at the Bureau of Standards. It has been found that by exposing silk to the radiation from a carbon-arc lamp for a few hours, results which are in substantial agreement with those obtained by natural aging for several months are obtained. This makes it possible to predict the comparative life of different silk fabrics. A cycle of treatments including light exposure, wetting and drying, and mechanical crumpling has been worked out for the laboratory testing of waterproofed fabrics.

To test the endurance of sash cord, a machine has been constructed which subjects the cord to the same action that it would receive if a window were repeatedly raised and lowered until the cord broke. A comparison of the breaking strength and endurance of a large number of samples of sash cord showed that the breaking strength is not a criterion of endurance. The strongest cord will not necessarily last the longest in service. The machine has been used

in a study of the relation between the type of construction and the kind of finishing materials on the cord and its endurance.

A carpet wear testing machine has been designed to simulate the effect of walking on carpets. Tests of carpets made with the machine show good agreement with the known serviceability of the carpets. This machine is being used for studies of the durability of carpets as related to the height of pile, the quality of wool used for the pile, and the pile density. The results should assist the manufacturer in making the most serviceable rug for a given price, and the consumer in the selection of serviceable carpets and rugs.

One of the questions often arising in connection with a fabric of unknown history or one submitted for conformance to a certain Federal specification is "Of what is it made?" Generally, it is not sufficient to give the fiber composition qualitatively, which a microscopist can do readily. The quantity of each fiber, the amount and nature of the finishing materials, and the quality of the fiber are required. Attention is being given to the quantitative analysis of fabrics containing several kinds of fibers. This involves the refinement of methods for determining the amount of sizing materials and methods for the quantitative chemical separation of each different fiber from the mixture.

Many silk fabrics contain tin and other metal salts which have been added to them in the processing in order to increase the weight and modify the feel or draping quality. Methods have been worked out for identifying the weighting material and determining the amount present.

In general, it may be said that the Bureau of Standards is striving not only to improve existing methods, but to devise methods of test for those characteristics of textiles which are of the greatest importance to the user but which have not heretofore been evaluated quantitatively and to apply these tests to the improvement and development of yarns and fabrics for particular purposes. From this brief outline it is evident that substantial progress has been made.

COMMERCIAL LAUNDRY EXTRACTORS, TUMBLERS, AND WASHERS

The required degree of support by the industry has been accorded simplified practice recommendations R139-32, R140-32, R141-32, and R142-32, covering commercial laundry extractors, ironers, tumblers, and washers, respectively. These recommendations, which were proposed and developed by the industry under the auspices of the Bureau of Standards, will be considered effective as of October 1, 1932.

The simplified schedules for washers and tumblers are concerned with the size, the type of drive, the number of compartments, the number of cylinder doors, and the number of vertical and horizontal partitions. The tumbler program also provides for the method of heating. Types and diameters are considered in the extractor recommendation, and sizes, types, drive, and method of heating are contained in the flatwork ironer program.

GRINDING WHEELS AND COATED ABRASIVE PRODUCTS

The proposed revisions of simplified practice recommendations R45-32, and R89-32, covering grinding wheels and coated abrasive products, respectively, have been accorded the required degree of support by the industry.

In the latest revision of the grinding wheel recommendation, the third since the recommendation was formulated and developed by the industry in 1925, the tables listing standard wheels of various types are rearranged to facilitate the selection of any particular wheel. New wheel sizes also have been added.

The present changes made in the coated abrasive products recommendation as well as those made in the grinding wheel recommendation were necessary to meet current needs of the consumer. Both of these revised schedules are to be effective as of October 1, 1932.

TONS AND TONNAGE

Modern Usage Traced to Medieval "Tun" of Wine

Many people may wonder what is meant when they read that the *Leviathan*, the greatest ship under the American flag, a ship which at one time had the greatest tonnage of any ship in the world, has a rating of "more than 59,000 tons." Does this mean the weight of the vessel, either empty or fully loaded? Or is there some special significance to this expression, only indirectly, perhaps, associated with weight? Or, turning to a different field, it may be a surprise to many to know that in certain places in the United States a legal ton of coal represents 12 per cent more than it does in most places and that this oversized ton is likewise the basis for the collection of certain important Federal revenues.

An understanding of the numerous meanings of the expressions "ton" and "tonnage" is essential for an intelligent interpretation of commercial statistics or the conduct of large-scale commercial transactions, particularly when these involve ships and water shipments. It is unfortunate that there exists a considerable diversity in the specialized meaning of these terms, yet many of the usages are so well established that there appears to be little basis for the hope that any substantial simplification can be effected.

As a unit of weight, the ton is the modern counterpart of the large weight units which have had currency from time to time in various countries throughout the world. Many of these units have been considerably greater than present-day tons, and some have been less. For example, expressing their approximate equivalents in terms of our "short" ton of 2,000 pounds, it is found that the Persian "Kara" equaled 6.2 tons; the "garsali" of Southern India, 5.1 tons; the "sau man" of Northern India, 4.1 tons; the Danish "last," 2.9 tons; the Swedish "last," 2.7 tons; the "Livorno last" of Italy, 2.1 tons; the Norwegian "last" of butter, 1.5 tons; the "ton" of Pernambuco, Portugal, 1.1 ton; both the Prussian "ton" and the Spanish "ton," 1 ton; and the "shipping ton" of Portugal 0.9 ton.

In the United States our tons, like our other customary units of weight and measure, are a heritage from England. During the reign of Edward I of England (1272-1307) the ton of 2,000 pounds, consisting of 20 "hundredweights" of 100 pounds each, was in use. The relation of 20 hundredweights to the ton seems generally to have been maintained, but the value of the hundredweight has not been constant. A century ago a ton of 2,400 pounds—20 hundredweights of 120 pounds each—was recognized in the canal trade of England, and was known as "long weight." The ton of 2,240 pounds is now very generally used in Great Britain; this consists of twenty 112-pound hundredweights, each of which represents eight "stones" or units of 14 pounds. There is also the Cornish mining ton of 2,352 pounds which comprises 21 hundredweights of 112 pounds each; this has only a restricted use, however.

In the United States the 2,240-pound ton and the 2,000-pound ton have been in use from early Colonial days, although it was not until early in the nineteenth

century that the latter began to come into general use; since that time, however, this "short" or "net" ton has gradually displaced the long ton and is now very generally used. It is of interest to note that the 2,000-pound ton is now also finding favor in various portions of the British Empire, being legal in Canada, the Union of South Africa, and Australia.

The long ton of 2,240 pounds, also known as the "gross" or "shippers" ton, is used in this country by the Federal Government in the assessment of import duties and in the purchase of coal for Government use in the District of Columbia. This ton has likewise been specifically legalized, or specified for particular uses, by several of the States, although recently some of these statutes have been repealed; it is still required in Delaware and the District of Columbia that when coal is sold by the ton it be sold by the long ton.

The "metric" ton, consisting of 1,000 kilograms and equivalent to 2,204.6 pounds, is of very considerable importance, being regularly used in countries employing the metric system of weights and measures. Before leaving the subject of the ton as exclusively a weight unit, mention may be made of the very special "assay" ton, a unit of 29 $\frac{1}{6}$ grams, which contains the same number of milligrams as there are troy ounces in a 2,000-pound ton; the number of milligrams of precious metal recovered in assaying a sample of one assay ton of ore represents the richness of the ore in troy ounces per short ton.

In connection with ships and ship cargoes we find that both the long ton (2,240 pounds) and the metric ton (1,000 kilograms, or 2,204.6 pounds) are used, but the use is usually in connection with some form of "tonnage" which is expressed in terms of the units mentioned. At the same time there are other varieties of tonnage expressed in terms of "tons" which are exclusively units of cubic measure.

The history of ship tonnage goes back to the Middle Ages. It was pointed out in a recent article on this subject by Commissioner Arthur J. Tyrer, of the Bureau of Navigation of the Department of Commerce, that the necessities of King Henry V of England (1416-1423) in connection with the collection of taxes were perhaps the incentive which finally resulted in the establishment of a fixed method by which the carrying capacity of vessels was to be reckoned. Henry V had fixed the standard size of a "tun" of wine at 252 wine gallons; these casks (tuns) occupied a space of about 42 cubic feet and weighed approximately 2,240 pounds. It was decreed that the number of tuns which a vessel could carry should be her "tunnage," from which, by a change of spelling, we arrive at the "tonnage" of to-day. Commissioner Tyrer pointed out the interesting fact in this connection that King Henry established his tax rate as 1 tun for each 10 tuns of wine carried by a vessel.

The relation of 42 cubic feet per ton of 2,240 pounds varied from time to time after its establishment, but in principle this was adhered to up to the development in 1835, of the "new measurement rules" upon which the tonnage of the British Navy was based. Nineteen

years later the "register" ton of 100 cubic feet became the standard for merchant vessels, as noted below.

Modern usage in relation to ships recognizes several varieties of tonnage. For merchant vessels these may be classified as follows:

1. "Gross tonnage," or "gross register tonnage," is the total cubical capacity of a ship expressed in "register" tons of 100 cubic feet (2.83 cubic meters), less such space as hatchways, bakeries, galleys, etc., as are exempted from measurement by different governments. The mathematical formulas by which leading maritime nations have agreed to compute the gross tonnage were devised by George Moorsom, of England, in 1852, at which time the English Government revised its method of measuring and registering vessels. These rules were incorporated in the English shipping laws in 1854 and were subsequently adopted by other nations. There is some lack of uniformity in the gross tonnages as given by different nations on account of lack of agreement on the spaces that are to be exempted.

The exemptions result in a gross tonnage short of the real gross capacity. In 1873 an International Tonnage Commission formulated a special set of rules for the Suez Canal in order to secure figures that approximated more closely the real capacity. Another special set of rules made necessary by the present variations in ship construction was put into local effect when the Panama Canal was opened.

2. The "net tonnage," or "net register tonnage," is the gross tonnage less certain additional spaces specified by maritime nations in their measurement rules and laws. The spaces that are so deducted are those totally unavailable for carrying cargo, such as the engine room, coal bunkers, crew's quarters, chart and instrument room, etc.

The net tonnage is the basis for tonnage dues, wharf charges, and other commercial charges. Statistics of entrances and clearances to ports are likewise in terms of the net tonnage.

3. The "register under-deck tonnage" is the cubical capacity of a ship under her tonnage deck expressed in register tons.

4. The "displacement tonnage," or "light displacement tonnage," is the weight, expressed in long or in metric tons, of a vessel with crew and supplies on board, but before any fuel, cargo, or passengers have been taken on. "Loaded displacement tonnage" is the weight of a vessel when she is loaded to her maximum draft line; that is, to the safety line of loading; "actual displacement tonnage" is her weight as she is equipped and loaded at any particular time. Displacement tonnage may also be considered in terms of the volume of water displaced by a vessel. A vessel will displace a ton of water for each ton of her weight; 2,240 pounds of sea water has a volume of approximately 35 cubic feet, while the corresponding figure for fresh water is 36 cubic feet. Displacement tonnage is computed from the dimensions and the shape of the submerged portion of a vessel's hull, using the proper conversion factor for the weight per cubic foot of the water so "pushed aside" by the floating ship. Displacement tonnage as such is of only secondary importance with respect to merchant vessels.

5. The "dead weight tonnage" is the difference between the "loaded" and "light" displacement tonnages of a vessel. It is expressed in terms of the long ton or of the metric ton, and is the weight of fuel, passengers, and cargo that a vessel can carry when loaded to her maximum draft. The term is applied to ore vessels and vessel load lots of commodities, and knowledge of the dead weight tonnage of a vessel enables owner or charterer to determine, within certain limits, the quantity of any particular commodity which the vessel can carry. The term is of rare application to express steamers, or vessels operated in a general freight service.

6. The term "measurement ton" refers to cargo space in a vessel, and is a unit of 40 cubic feet. Much ocean freight is shipped as measurement cargo. Ocean freight rates are based on this unit; if a commodity requires more than 40 cubic feet for a long ton, the freight is paid according to the space occupied; if the commodity has such a density that less than 40 cubic feet are required for a long ton, the freight is charged according to the actual weight.

The "tonnage" of a merchant vessel, as the term is ordinarily used, means tonnage in terms of register tons of 100 cubic feet, because earning capacity is a characteristic of prime importance for merchant ships. When it is learned, therefore, that the "tonnage" of the *Leviathan* is in excess of 59,000, it is meant, not that she weighs a certain amount, but that her cubical capacity is nearly 6,000,000 cubic feet.

With respect to war vessels the factor of importance is their displacement tonnage, and this expression is almost exclusively used in connection with such vessels. "Loaded" and "actual" displacement tonnage mean the same in the case of a war vessel as in the case of a merchant vessel, but another term, "normal displacement tonnage," which is never applied to a merchant vessel, has the special meaning with respect to war vessels of displacement tonnage when the ship is fully equipped and manned. When the term "displacement" is used without qualification with respect to a war vessel, "normal displacement" is meant. This rating differs in different countries because of varying allowances for stores, etc.

"The accurate measurement of a merchant vessel is very important," said Commissioner Tyrer in the article previously mentioned. "On these measurements are based canal tolls, tonnage taxes, dry dockage, and port charges of all kinds both in our own ports and in those of foreign countries. For this reason, it can be seen that an accurate and fair determination of tonnage is important in the profitable operation of a merchant vessel.

"It is sometimes difficult to determine the cubical content of a vessel because it can not be ascertained simply by multiplying her length, breadth, and depth. A ship has numerous curves and variations of all kinds and an accurate determination of her cubical contents can be ascertained only through geometric calculations based on parabolic curves. This very highly technical work, as far as the American merchant marine is concerned, is under the supervision of the Bureau of Navigation. In the measurements division of the bureau, a large number of technical men are working at various points throughout the country."

STANDARD QUALITIES OF PETROLEUM PRODUCTS

Preparation of Specifications for Lubricants and Other Oils from Results of Tests by the Bureau of Standards

By H. C. DICKINSON, *Bureau of Standards*

Among the many commodities with which the research and testing work of the Bureau of Standards is concerned are petroleum and its products.

The mining and refining of petroleum oil are covered by the Bureau of Mines, while the properties and utilization of its products are within the field of the Bureau of Standards. Among the various projects which relate to petroleum the following may be of interest.

Petroleum oils are recovered from the earth in a crude form containing various percentages of a great many individual substances known as hydrocarbons. These are made up, as their name implies, of varying chemical combinations of hydrogen and carbon. They vary in composition and in physical properties all the way from methane or marsh gas, the simplest of them, to the very complex heavy substances which make up gear transmission oils, paraffin wax, and petroleum. For several years the Bureau of Standards has been making a very careful analysis of the various pure hydrocarbons which constitute petroleum. For this purpose, the pure compounds must be separated one by one from the crude oil by methods which are the last word in accuracy and ingenuity. Of the many thousands of these compounds only 24 have yet been obtained in a pure state, but these are among the most important.

Among all the products of petroleum, gasoline or motor fuel is probably familiar to the greatest number of people. Some 30,000,000 people purchase supplies of it at frequent intervals. About 10 years ago the Bureau of Standards, in cooperation with the petroleum refiners and the builders of motor vehicles, undertook a continuous research to maintain the most economic relation between the qualities of motor fuels and the current requirements of motor vehicles. Various questions have arisen during this time. First, it was found, contrary to expectation, that the heaviest or "poorest" gasoline which could be used was the most economical, and for several years this knowledge resulted in important savings to the public. Dilution of oil in the crank case by unvaporized fuel, however, placed a limit on the fuels which could be used. A study of this problem furnished information on the basis of which engines were so designed to avoid this trouble, which now has practically disappeared.

The starting of engines in cold weather has always been a problem. The research project covered this point and showed exactly what qualities in the gasoline were necessary to start an engine at any particular temperature. With this information at hand the refiners have been able to supply fuels in winter and in summer from Florida to Montana, which are so well adjusted to the particular weather conditions where they are used that starting troubles are no longer serious except under very extreme conditions.

But gasoline which starts easily may be so volatile as to give trouble by boiling in the fuel line in very

hot weather. A study of this subject has shown what sort of gasoline to use at any particular temperature in a given motor car, and also how the fuel lines of the car can be so designed as to minimize trouble from "vapor lock," which is the term used for bad engine performance resulting from overheated fuel.

The latest problem, still in progress, with the assistance of many laboratories of the oil and automobile companies, has to do with fuel knock. High compression engines require special fuels and it has been necessary to find a means of testing and evaluating such fuels. A suitable test method has been devised and is in general use, but it is as yet not fully perfected.

Lubricants for most purposes are produced from petroleum. The Bureau of Standards has been called upon by other Government departments to assist in preparing suitable specifications for petroleum lubricants for many uses.

The Bureau of Standards has been studying the various properties of lubricating oils for the past 10 years or more and has only begun to find out a few of the important facts about them. Recently a new set of specifications for automobile crank case oils has been proposed which may further assist the purchaser. Such reliable information as is available may be had in the form of letter circulars. Such other petroleum products as fuel oils, kerosene, greases, and cleaning fluids are tested by the Bureau of Standards for purchase on Federal specifications by other departments. These tests, however, are mainly of a routine nature and are performed only on request of Government departments with the following exceptions:

One of the important problems in the testing of petroleum products is the maintenance of uniformity among all the various laboratories concerned. This is required in order that the refiner supplying material on contract may know with certainty from his own tests whether the material will meet the Government tests. To assist in maintaining this uniformity, the Bureau of Standards makes check tests of petroleum products submitted by other testing laboratories for purposes of comparison. In case of disagreement between laboratories the Bureau of Standards may make referee tests on the request of both parties to the controversy.

Another service which is important to the petroleum industry is the maintenance of standards of viscosity and the testing of commercial viscosimeters for use in other laboratories. The bureau also certifies and distributes samples of oil of known viscosity which are designed for the standardization of viscosimeters, or if desired tests a small sample from a larger batch retained by another laboratory as a viscosity standard.

Motor fuels, lubricating oils, and other petroleum products are usually bought and sold on the basis of measured volume. It is important, therefore, that accurate information and equipment be available for

determining volume with satisfactory commercial accuracy. Because of the fact that the volume of petroleum products changes with temperature it is necessary, especially where large volumes are involved, to reduce measured volumes to a standard temperature, and in order for this to be done correctly, accurate knowledge of the rate of expansion of various petroleum products is required. In order to obtain this necessary information extensive investigations were carried out by the Bureau of Standards and from the results obtained volume correction tables were prepared which have been widely accepted by the petroleum oil industry.

Through its testing laboratories and through the activities of the National Conference on Weights and Measures, the Bureau of Standards has also taken an active part in the testing and certifying of correct measuring equipment, and in the development of adequate specifications and tolerances for such equipment. Through cooperation with the American Petroleum Institute the bureau has assisted in the development of an extensive series of standards for use in oil production equipment. These standards include threaded connections for well casing, drill pipe, sucker rods, and other necessary equipment. Master gages have been prepared for these standardized threaded connections, and by reference to these, complete interchangeability of parts is brought about, and much of the former confusion and nonassembly of parts have been overcome.

There have been compiled by the division of specifications of the Bureau of Standards, lists of sources of supply of Stoddard solvent and domestic and industrial fuel oils guaranteed to comply with the requirements of commercial standards Nos. 3-28 and 12-29. These lists, which now contain the names of 37 and 51 willing-to-certify firms, are sent to Federal, State, county, and municipal purchasing agents and given the widest possible distribution, use being made of every available channel for such distribution.

There have also been compiled by the division of specifications, an index with brief outline of all nationally recognized specifications, including those for petroleum and petroleum products, which index has been given publicity as the National Directory of Commodity Specifications, the second edition of which has just come off the presses of the Government Printing Office. In the volume of the Encyclopedia of Nonmetallic Minerals and Their Products, which was issued by the Bureau of Standards in 1930, were reproduced the substance of every nationally recognized specification then available for petroleum and petroleum products.

NEW CANADIAN STANDARD ANNOUNCED

An established list covering cap screws (hexagon, flat, oval, fillister, and button heads), set screws and studs, and common and semifinished, slotted and castellated hexagon nuts, has just been announced by the Canadian Engineering Standards Association. These lists cover (1) milled from the bar or cold-headed products, with rolled or cut threads, and with slotted or unslotted heads; and (2) hexagon nuts.

These lists are primarily for the guidance of designing engineers, draftsmen, purchasing agents and

The bureau's division of trade standards has played a conspicuous part in bringing the petroleum industry together for the establishment of definite nationally-recognized specifications for two of its products. Several years ago the cleaning and dyeing industry was experiencing difficulty in obtaining uniform dry-cleaning petroleum naphthas and their problem was presented to the Bureau of Standards. Through the regular procedure of the division of trade standards, conferences were arranged which included the refiners and users of this product and which finally led to the adoption and acceptance of a commercial standard specification for dry-cleaning naphtha generally referred to as Stoddard solvent, commercial standard CS 3-28. This specification includes flash point, corrosion properties, distillation range, and other important characteristics of this material, together with definite test methods.

This definite specification enables the dry cleaner to purchase a solvent of limited fire hazard with the proper drying characteristics and other attributes that he requires and by the same token the producer can furnish a product the satisfaction of which he can thoroughly guarantee.

With the increase in the use of oil as a domestic fuel, the manufacturers of oil-burning equipment became confronted with the complaints which quite frequently resulted from the use of oil unsuited to the burner on hand. Accordingly the manufacturers of oil burners, through their trade association, drafted a preliminary specification for several grades of fuel oil that were adapted to the several types of burners on the market.

Under the auspices of the division of trade standards, the oil-burner manufacturers were brought into conference with the fuel-oil refiners, distributors, and users and there adopted a specification known as "Domestic and Industrial Fuel Oils, Commercial Standard CS12-29." This standard sets definite limitations on the flash point, water and sediment, pour point, distillation range, and viscosity of three grades of domestic and three grades of industrial fuel oils. The commercial standard oils are numbered from 1 to 6 and in this manner the oil-burner manufacturers can definitely recommend one particular grade of oil with assurance that it will give satisfactory results. The consumer can purchase the desired oil merely by reference to the number and without reference to specific gravity, color, and other extended details.

Confusion is eliminated between the distributor and the refiner of fuel oils, and the industry as a whole benefits by a better understanding of each other and their mutual problems.

the industry generally, and give a range which should be sufficient for all practical purposes.

The preparation of this standard was under the direction of a special committee of the association, under a subcommittee organized in January, 1930, to deal specifically with cap and set screws, studs and hexagon nuts. In the preparation of the standard the report of the National Screw Thread Commission of 1928 (United States) and the standards of the Society of Automotive Engineers for 1931 (United States) were carefully considered.

CANADIAN ENGINEERING STANDARDS ASSOCIATION

Secretary of Association Reviews Electrical Standardization in Canada

By B. STUART MCKENZIE¹

The value of standardization in the electrical field becomes more apparent as the work progresses and the Canadian Engineering Standards Association continues to exert efforts in this field.

The Canadian Electrical Code, Part I, the second edition of which was issued in January, 1930, is proving of great benefit in the standardization of electrical rules throughout Canada, and in assisting the different provincial and municipal electrical inspection departments to work on a uniform basis. The province of New Brunswick in 1931 passed legislation officially adopting the Canadian Electrical Code and it is expected that a provincial inspection department will be organized. It is interesting to report that electrical contractors and electrical workers have endorsed the action of the Government and have asked that this inspection department be established at the earliest possible date. The C. E. S. A. provincial code committee in this province has been very active in an educational campaign with particular reference to hazards involved in electrical installations and have put on special displays at local fall exhibitions. The code is now adopted in all Provinces in Canada except Manitoba. In Manitoba a provincial power commission has been organized on lines similar to those adopted by the Ontario Hydro-Electric Power Commission and it is hoped that before long this province will also adopt the code.

The electrical code committee of the C. E. S. A. held a meeting in September, 1931, in Toronto, to consider proposed revisions to the code, and it was at first suggested that a supplement to the present edition be issued in preference to an entire new edition. As a result of the discussion at the meeting, however, it was finally decided to postpone official action until 1933 when it is proposed to issue an entire new edition. In the meantime the revisions recommended at the meeting have been incorporated in the C. E. S. A. Bulletin for December 31, 1931. This was done for the benefit of inspection departments and it was understood that these were recommendations only and they have not been finally approved by the C. E. S. A. committee as official code revisions.

The work on Part II of the Canadian Electrical Code, covering approvals specifications for electrical apparatus, is being continued and draft specifications covering electric signs, electrical equipment for oil-burning apparatus, inclosed switches, service-entrance and branch circuit breakers, electric clocks and portable electrical displays and incandescent lamp signs, have been prepared. The specification for radio was published in March, 1932. Comments from many sources on the specifications for electric signs, electrical equipment for oil-burning apparatus, circuit breakers, and electric clocks have been received and a memorandum has been distributed to those interested. The drafting of these various specifications is under the direction of a special committee on specifications

and copies of the drafts are sent to interested manufacturers for their comment, every effort being made to cooperate as closely as possible with them.

In connection with Part III of the Canadian Electrical Code, covering outside wiring rules, the four sections covering overhead systems, underground systems, inductive coordination, and conductive coordination are making progress. Questions dealing with grounding under both outside and inside conditions are now being handled by the C. E. S. A. grounding committee. The chairman of this committee has been added to the correlating subcommittee, which is directly supervising this work.

In connection with overhead systems, discussion has been most active on the question of safety factors in construction. With reference to inductive coordination, general principles and practices are being studied and special consideration given to radio interference. It is probable that a conference may be called to discuss this particular question with different inspection departments and interested manufacturers. Data are being collected on the efficiency of grounding methods, and the committee is cooperating closely with water works interests with reference to the use of water piping systems for grounding purposes. In connection with conductive coordination the question of electrolysis is being studied.

A specification for power transformers is still under consideration, and it is hoped to have this issued in the near future. This will probably include information covering standardization of transformer bushings and up-to-date information on terminal clearances. For transformer and switch oils, a draft specification has now been prepared and is being considered by a special committee. The committee which was formed to consider specifications for lead-covered power cable has held its first meeting and has decided to enlarge the scope and consider insulated power cable in general. A special committee to draft a specification is now at work, and a report on paper-insulated, lead-covered cable has been prepared.

Revisions to the C. E. S. A. specifications for alternating-current watt-hour meters and a proposed new specification for demand meters has been under consideration during the year by the C. E. S. A. committee, also by the meter committee of the Canadian Electrical Association. A comprehensive summary of comments was sent out and meetings to consider final draft were held in Toronto in March and April. Additional interpretations of electrical code rules have been published during the year in the C. E. S. A. bulletin and have been reprinted in the technical press.

The relations of the C. E. S. A. with electrical manufacturers and contractors have continued to be most cordial, and the electrical industry in general has continued its generous support of the association by subscriptions to its budget. This has been all the more encouraging in the light of the industrial depression which has prevailed during the year.

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SIMPLIFIED PRACTICE IN CALIFORNIA

Dr. Julius Klein, Assistant Secretary of Commerce, in a recent address, made the following statement on the value of simplified practice:

Simplified practice is the policy of limiting varieties of any given manufactured article to such convenient minimum as will satisfy all normal and reasonable demands. Within 10 years it has attained a wide and beneficent application in American industry. Machinery has been set up for voluntary self-government in business on a large scale, designed to mobilize an effective attack on costly wastefulness—on the extravagance of variety in common utilitarian things, such as bricks, hardware, steel, lumber, and countless other products, but leaving unimpaired the desirable shifting of style, the free play of artistic novelty in matters of appearance, ornament, and individuality of taste. Simplification in industry does not mean in the least destruction of style.

Simplified practice offers one of the best means by which business can accomplish its necessary task of getting down costs of finished goods to levels that will place them within reach of temporarily reduced buying power.

Simplified practice is just a rational, appealing, carefully devised plan to save money and promote good business.

Since October, 1929, the California State Chamber of Commerce has cooperated with the United States Department of Commerce in promoting simplified practice in California. This work has had the active assistance of such representative trade organizations and groups as: Purchasing Agents Association, Pacific Coast Electrical Association, Foundry Associations, Clay Products Institute, Reinforcing Steel Institute, Structural Steel Institute, and the Industrial Accident Commission.

In a recent report the California State Chamber of Commerce discloses some of the results obtained in specific commodity fields.

Simplified invoice.—Investigations by the State chamber of commerce showed that as many as 30 different types and sizes of invoices were received in one day by individual concerns, and that considerable saving could be made by general use of the national simplified invoice. The State chamber, with the cooperation of the Purchasing Agents Association, recommended and sponsored adoption of this standard by California concerns, and 145 industries of the State have adopted this standard. Recent action by the railroads of the country requiring the use of the simplified invoice as a definite saving of time and expense has given considerable impetus to the adoption of this standard in California and elsewhere. The national groups who initiated this waste elimination measure have estimated that national savings should result which would exceed \$15,000,000 a year. Estimated on a comparative basis of value of manufactured products as reported in the 1929 census, this represents an annual saving to California business and industry of \$670,500.

Reinforcing steel.—California reinforcing steel dealers were handling 23 sizes of reinforcing steel, while in the East only 11 sizes were carried. The local industries were suffering from intense competition. The California State Chamber of Commerce brought all of these industries together and recommended adoption of the 11 national standard sizes, which was accepted unanimously and made effective in California on August 1, 1931, with the support of all 16 plants. This simplification has resulted in a substantial reduction in inventories of stocks carried, accompanied by an appreciable decrease in handling

charges, and, at the same time, satisfactorily meeting every requirement of the trade.

The committee, in reporting on the benefits of this standard, stated that this reduction in the number of sizes of reinforcing steel will mean that approximately \$300,000 less capital will be tied up in inventory per year as compared with the former practice involving 33 sizes and 3 grades of reinforcing steel. This does not include the saving to the steel mills in inventory or in operation.

Common brick.—California manufacturers of common brick were experiencing difficulty in marketing their product. It was found that 12 different sizes of common brick were made in this State. The State chamber recommended one size which has now been adopted by 29 out of 31 leading manufacturers. The committee reported that the adoption of this standard has lessened difficulties in present-day construction, increased the possibility of masonry design to the most practical value, and lowered costs of production and ultimate saving to the consumer.

Pole-line hardware and packages.—In response to an urgent request from local industries, the State chamber enlisted the active cooperation of the Pacific Coast Electrical Association to initiate the simplification of pole-line hardware and packages in California. As a result, California users have adopted as standards 17 items of pole-line hardware, representing approximately 60 per cent of the types used. Twelve items formerly used have been abandoned. A list of 85 items has been reduced to 53, or a reduction of 37.6 per cent. Fifty-six standard packages for various items of pole-line hardware have been adopted, which completes the major work on packages.

The committee has reported the following benefits to the manufacturer, jobber, and consumer:

The adoption of standard packages results in easier handling, greater storing facilities, simplifying of inventories, less need for breaking standard packages to fill small mail orders as the standard packages now adopted contain a smaller quantity than some of the old types of packages.

It is estimated that this simplification of pole-line hardware and packages will result in an annual saving of \$700,000 to the electrical industry of California.

New projects under consideration.—A number of suggestions for new projects have recently been referred to special committees for careful study and recommendation on projects that would prove beneficial to California business and industry. These include the following: Manhole frames and covers; uniform markings on valves and fittings; purchase order form; valves and valve gages; standard size for bolts, nuts, and construction wrench openings as well as standard packages for set screws and cap screws.

During the past fiscal year the California State Chamber of Commerce accomplished 88 per cent of its objective in 10 projects of simplified practice.

Three hundred California concerns participated in the State chamber's program by acceptance and application of simplified practice recommendations beneficial to their respective industries.

Leading group representatives report that this application of simplified practice and elimination of waste will normally result in benefits to business and industry in California of approximately \$10,000,000 a year.

AMERICAN SOCIETY FOR TESTING MATERIALS

Elaborate Test Program Under Way on Corrosion of Nonferrous Metals and Alloys

The elaborate and comprehensive test program for studying corrosion of nonferrous metals and alloys which is being carried out by the American Society for Testing Materials, is supported by many of the leading companies of the country. It has been estimated that over the past five years during which extensive tests have been performed and preparations made for the unparalleled series of exposure tests now under way, these companies have contributed more than \$175,000 in the form of materials, special testing equipment, labor, and funds.

The active support of this work and the expense involved is indicative of its importance alike to consumers and producers of nonferrous metals. Annual losses from corrosion run into millions of dollars. As a result of the program new data on various metals and alloys will result to enable this loss to be materially reduced. About 23,000 test specimens are being used in various phases of the work. Of these, 13,000 are in the form of standard tension test specimens, each carefully machined and finished. The remaining 10,000 are in various forms depending on the type of test.

The most extensive program is that sponsored by the subcommittee on atmospheric corrosion. These exposure tests will extend over a period of 25 years and involve the use of the greater part of the 23,000 specimens. Twenty-four different metals and alloys are being tested. The amount of corrosion undergone by each metal and alloy is to be measured in two ways: (1) Determining the change in weight of plate specimens and (2) determining the loss in strength and ductility by means of tension tests.

An investigation of the films of corrosion products which form on the various metals and alloys will be conducted by the division of metallurgy of the Bureau of Standards. It is anticipated that this study will yield valuable information regarding the formation and character of protective and nonprotective films. The materials are exposed in the form of plates 9 by 12 inches, 0.035 inch thick and tension test specimens of the same materials machined to conform with the standard A. S. T. M. specimen for sheet materials. The surfaces of the plates and tension test specimens were left in the original condition as received from the rolling mills and given no special preparation other than to remove with benzine, ether, and alcohol all traces of the rolling mill lubricants. There are four plate specimens of each material exposed at each test location, two designated as "removable," two as "permanent." Thirty tension test specimens of each material under test are also exposed at each test location. In addition, an extra set of 30 tension test specimens of each material was prepared and placed in air-tight glass containers and stored at the Bureau of Standards.

At various times during the 25-year period the two "removable" plate specimens of each material will be taken from their racks and returned to the Bureau of Standards for inspection and weighing. The corroded plate specimens will be weighed just as they are received from the test racks without attempting to remove any surface deposits or films of corrosion

products. A set of six tension test specimens of each material will also be removed from the racks and tested to determine their tensile strength and elongation. At the same time six tension test specimens of each material will be removed from the set stored in the air-tight containers at the Bureau of Standards and their tensile properties determined coincidentally with the specimens which have been corroded in the atmosphere. These latter tests must be made in order to determine what changes may have taken place in the physical properties of the materials through simple aging so that allowances can be made for such changes in interpreting the tensile data secured from the corroded specimens.

After weighing and inspection, the "removable" plate specimens are to be returned to the various test locations for further exposure. In transporting the plate specimens back and forth from the test locations, they will be shipped in specially designed containers to insure minimum damage to the corrosion films formed on the surface of the specimens. To make sure of the exact identity of each plate and tensile specimen, a number was stamped on each one with steel dies. With the assistance of printed forms a record was made of the exact position of each specimen in the individual specimen racks which are identified by numbered brass tags attached to them.

Since the atmospheric corrosion tests may continue for 25 years, it was necessary to select a fairly permanent type of construction for the specimen racks and supporting structure. The individual specimen racks and the main framework on which they are mounted were therefore built of structural steel protected by a heavy coating of zinc applied by the hot-dip galvanizing process. All fittings, nuts, bolts, etc., used in assembling the test racks were likewise hot-dip galvanized. The vertical members of the main supporting framework were buried in the ground with substantial footings of concrete to afford a suitable foundation and earth anchorage. At seven of the nine test locations, the test racks are in inclosures protected from disturbance by high wire fences. The other two locations are roofs of industrial buildings in Altoona, Pa., and New York, N. Y.

In selecting locations for the exposure tests, an effort was made to secure a wide variety of atmospheric conditions which, at the same time, would be fairly representative of the atmospheres in which the metals and alloys included in these tests are used in large percentages. The types of atmosphere included in the nine test locations can be broadly classified as industrial, rural, and seacoast. There is considerable variation between the atmospheric conditions at the individual locations included in any one of the foregoing groups, and therefore these general classifications have only a broad significance. It is also appreciated that the severity of the atmospheric attack will vary considerably even within the immediate neighborhood of a test location. Differences in elevation, variations in exposure to prevailing air currents, and the amount of atmospheric pollution in the form of industrial gases can all be found to vary widely between two locations only half a mile apart.

SURFACE QUALITY STANDARDS IN MACHINED SURFACES

Research has Made Possible the Obtaining of More Satisfactory Surfaces by Machine-Tool Manufacturers

By R. E. W. HARRISON¹

The technique of lubrication engineering has progressed far during the last few years. With the aid of their research laboratories conducting expensive investigations along chemical and physical lines, and with the aid of their field tests and carefully recorded data secured over a number of years of experience, the producers of high-grade lubricants have been able to place at the disposal of industry satisfactory products especially suited to meet the needs of any specific application.

In the past, the properties of the lubricant have been largely the essential factor in insuring long life of parts of machinery moving relative to one another. Recently, however, there has been a marked trend toward higher speeds and higher loads made possible by the development of alloy steels of high tensile strength. This trend has not only made necessary the development of lubricants with higher load-carrying capacity, but it has also forcibly focused attention on the quality of the surfaces being separated by the lubricant. A quality of surface which would be satisfactory under light loads might be the cause for serious damage to the machine after a few hours of operation under heavy load. Serious consideration of the quality of moving surfaces in relation to the operating conditions of speed and load is economically desirable in view of the increased use of power driven machinery, practically all of which to-day involves a maintenance and replacement cost, which in the aggregate must reach an enormously high figure.

This cost probably rivals and possibly exceeds the enormous economic losses due to the wastage which is directly chargeable against the old bugbear of oxidation. It is a well-known fact that the war on oxidation has created a demand for large quantities of

stainless steels and irons, and that the tendency of all fabricators is to use the nonoxidizing materials whenever it is economically desirable to do so. Increased loads on power-transmitting and load-carrying devices had resulted in a somewhat analogous situation, and the answer to the problem from the design standpoint is to use as high a quality of finish as is economically feasible.

A considerable amount of attention has been given to this matter during the last few years, and a number of methods of obtaining more satisfactory surfaces have been made available by the machine-tool manufacturers. However, while continued research indicates that perfection is unattainable, the fact has been brought to light that a scheme of finish tolerances or standards analogous to the established theory on tolerances applying to size control is a desirable thing, and in fact a necessary element in the engineering control of the manufactured product.

The establishment of definite standards of finish, each standard indicating the tolerated deviation from the true plane, together with the broadcast publication of the methods involved in obtaining the different standards, as well as the establishment of a universally accepted method of calibration would have the following beneficial results:

1. Establish the at present undefined element in all manufacturing engineering contracts.
2. Provide the engineering profession with a common terminology.
3. Provide means whereby costly initial wear can be readily computed and compensated for in the design and tolerance specifications on dimensions.
4. Provide the production engineer with a proper basis on which to compute production costs.
5. Exercise an enormous economic influence in controlling, and in many cases halting the process of wear which eventually destroys most mechanical appliances.

¹ Engineering sales director, Cincinnati Milling Machine & Cincinnati Grinders (Inc.); chairman, Cincinnati section, A. S. M. E.; and secretary, Machine Shop Practice Division, A. S. M. E.

GRADES FOR CATTLE HIDES

The United States Department of Agriculture, through its Bureau of Agricultural Economics, has announced tentative standards for market classes and grades of butcher and country green salted cattle hides. These grade descriptions are the result of careful study by the Bureau of Agricultural Economics, and have been indorsed by representatives of the Hide Bureau of the Tanners' Council of America, and to the Inspection Bureau of the New York Hide Exchange.

The preparation and issuance of tentative standards for this class of hides is a part of a general conservation program undertaken jointly by the hide and leather industries and the United States Department of Agriculture to improve the take off, quality, and condition of domestic hides and skins for the purpose of enhancing their usability and value. Any improvement in the quality of domestic hides will increase their value to the producer, since they may be used for the production of better grades of leather.

SULPHONATED OILS (SULPHATED) SAPONIFIABLE TYPES

General approval of the commercial standard for the standard grading of sulphonated oils has been indicated in its acceptance by a very large percentage of the manufacturers and users of these oils. Accordingly, an announcement of its adoption by the industry was made in a circular letter sent out from the office of the division of trade standards, on September 7, 1932.

This commercial standard covers the standard grading of the saponifiable types of sulphonated (sulphated) oils, and includes nomenclature, definition, and a rule for expressing strength or concentration, together with methods of analysis for determining the percentage of weight of the various ingredients.

Mimeographed copies of the standard may be obtained by addressing the Division of Trade Standards, Bureau of Standards, Washington, D. C.

PAPER AND PAPER PRODUCTS

Simplified Practice, as Applied to Paper Industries, Has Aided in Reducing Waste

By EDWIN W. ELY, *Bureau of Standards*

At the request of the standing committee in charge of simplified practice recommendation No. 22, the division of simplified practice of the Bureau of Standards recently mailed a questionnaire to approximately 8,000 representative manufacturers, converters, and users of paper products. The purpose of this survey is to secure constructive suggestions on the desirability of revising the present schedule, which became effective on July 1, 1924. The recommendation presents a simplified list of stock sizes of paper for general printing and publishing, bond, ledger, writing, and book publishing.

At a recent meeting of the standing committee the following groups were represented: American Paper and Pulp Association, National Industrial Advertisers Association, National Paper Trade Association, Lithographers National Association, National Publishers Association, National Association of Purchasing Agents, Association of National Advertisers, United Typothetae of America, Direct Mail Advertising Association, Associated Business Papers (Inc.), and the American Association of Advertising Agencies.

At that time the committee decided to send out the questionnaire. The chairman, in commenting on the proposed revision, said: "The revisions and additions to recommendation No. 22 should effect real economies for printers, advertisers, and paper manufacturers and distributors, and we urge everyone who receives the questionnaire to fill it in and return it promptly." In the questionnaire, the committee requests expression of opinion on changing one of the stock sizes of paper used for general printing and publishing and adding new sizes to the schedule for bond, ledger, and writing paper. The committee also recommends the addition of stock sizes of cover paper and index bristol, new items in the program. It is expected that the standing committee will meet in September to consider the report.

Simplified practice recommendation No. 22 is one of several recommendations developed by various industries concerned with paper products. The annual volume of these in the United States is such that the principle of mass production can be applied profitably so as to insure adequate output at minimum cost.

Simplified practice is an important aid to this industry in obtaining the maximum benefits of production, distribution, and use of its products. By simplified practice is meant cooperative action of all elements of an industry in selecting for stock purposes the minimum number of varieties and sizes of products necessary to meet the normal requirements of those concerned.

A typical simplification program in the paper industry is the one for paper bags used in grocery stores. Prior to the development of the recommendation which was made voluntarily by the industry, with the cooperation of the Bureau of Standards, there existed 6,280 varieties of bags, considering size and other features. This variety was reduced to 4,700 thus effecting an elimination of 25 per cent. Bags made to conform to the sizes selected for regular stock purposes by the industry bear the familiar symbol SS in an oval, on the side of the bag, as the producers' guarantee to the trade, of standard sizes.

The business world has recognized the value of simplification as applied to bank checks, notes, drafts, and similar instruments; and to commercial forms, such as invoices, inquiry, and purchase-order forms. The adoption by industry of uniform sizes and printing for these business forms results not only in economy in production, but in convenience of handling and filing. Since the simplified practice recommendation covering bank checks became effective,

* * * * At the time, we needed some special forms. The last such forms had been bought in another city and had cost us \$4.50 per hundred. When the local man saw the samples he asked if we could not use a standard form, and we found that it would do just as well. On the standard form we saved \$3.50 per hundred. * * *

C. D. Garretson, president, Electric Hose and Rubber Co., in *Nation's Business* (August, 1932).

a survey made by the American Bankers' Association showed that 85 per cent of the check business in the country is being done with simplified sizes carrying uniform placement of essential data. A similar survey in connection with invoice forms shows that the simplified invoice form is gaining in use and favor.

Simplification has also been applied to special papers. An example of this is found in photographic paper, used by amateur and professional photographers for portraiture and commercial purposes. The simplified-practice recommendation in this field was based upon a factual survey made by the industry. Consideration of the current demand for various sizes of photographic paper showed that of 73 per cent, representing 97 per cent of the total production, 14 sizes satisfied 79.2 per cent of the demand.

The condition as regards variety which was found in this industry is observable in other industries. It is typical to discover that 80 per cent of an industry's business is transacted with 20 per cent of the total variety offered. The remaining 20 per cent of the business is scattered over 80 per cent of that variety. When this condition is found, an opportunity is offered for industry-wide simplification, the effects of which hold benefits for all concerned.

The simplified practice recommendations aforementioned are for paper products which have been manufactured or converted from paper of one kind or another. Paper used in the printing industry has also been simplified, and under this program there have been selected stock sizes of paper for general printing and publishing, for book publication, and for

forms and letterheads. In simplified practice recommendation No. 22, on paper, are shown the sizes of paper and their doubles, which are basic for economical cutting.

Other simplified-practice recommendations for paper products in everyday use include tissue paper, paper boxes for coffee, binder's board used in book-binding, composition books for schools, the familiar paper shipping tag, glassine bags used in the candy and confectionery business, No. 1 kraft paper sealing tape used for sealing cartons and the like, waxed tissue paper, ice-cream cups, restaurant guest checks, and

paper boxes and bags used in department and specialty stores. Surveys by industries in connection with other paper commodities are in process as bases for other simplified-practice recommendations.

Simplified practice is a commercial rather than a technical procedure. The purpose of industry in each application of simplification is to discover those varieties, sizes, etc., which satisfy the normal requirements of the trade, and to adhere to that list as a guide for stock purposes. The resultant benefits to all interested are in direct proportion to the adherence accorded the simplification programs.

AMERICAN STANDARDS ASSOCIATION

Current developments of the following standardization projects under the auspices and procedures of the American Standards Association have been reported by that association.

Inch-millimeter conversion.—A general conference under the auspices of the American Standards Association will be held in New York on October 21 to give American industry an opportunity to discuss a request made by the Ford Motor Co. to the ASA that the value 25.4 be adopted as the American standard ratio between the inch and the millimeter in so far as industrial measurements are concerned.

In the United States the official ratio between the inch and the millimeter is based on the relationship between the meter and the inch as laid down by law in 1866, namely, 1 meter equals 39.37 inches. This gives the following approximate relationship between the inch and the millimeter; 1 inch equals 25.40005 mm. The difference between this figure and the value 25.4, only 2 parts in 1,000,000, is negligible in all cases except those where the highest accuracy of measurement is required. It is of a smaller order of magnitude than the degree of accuracy required even in manufacturing industries working with the greatest precision in the sizing of parts except gages and precision measuring instruments. For this reason it has been common practice for years to use the ratio 25.4 in many lines of manufacturing. However, different figures, such as the official ratio 25.40005 and the rounded figure 25.4001, are also given; for example, in engineering handbooks, with consequent dissimilarity in the conversion tables based on these respective figures.

In Great Britain, where the official ratio also differs from the figures 25.4, industry has already approved a national standard based on the ratio 25.4 and giving corresponding conversion tables. It seems probable that if the same ratio is adopted for practical use by American industry, this figure will become a world standard and all confusion that may arise from variety in conversion practice will be removed.

The decision of this conference will be an important one, particularly to all manufacturing industries that use limit gaging practice. While the answer to the Ford Motor Co.'s request depends mainly on the approval of the ratio 25.4, matters of secondary importance can probably also be easily decided in principle at the conference, such as the general set-up of the conversion tables based on this ratio, which probably will be deemed necessary for practical purposes.

Copper wire bars.—As the result of recent action by the A. S. A. standards council, the following two specifications for copper wire bars have been added to the list of American standards:

Standard specifications for lake copper wire bars, cakes, slabs, billets, ingots, and ingot bars. Standard specifications for electrolytic copper wire bars, cakes, slabs, billets, ingots, and ingot bars.

The American Society for Testing Materials has been granted proprietary sponsorship to care for future revisions of these specifications. These standards, which are revisions of earlier A. S. T. M. specifications for copper wire bars, were developed by a committee of the A. S. T. M. in order to harmonize minor differences in the provisions of available specifications covering these materials. Both standards are widely used, and are, in fact, generally recognized for all copper transactions in the United States. They are also used as a basis for practically all copper transactions abroad, through the use of French and German translations prepared by the Copper Exporters Association.

Wood foundry patterns.—A new American recommended practice for foundry patterns of wood has been approved by the American Standards Association. The standard was submitted to A. S. A. by the American Foundrymen's Association, which had an important part in its development and which offered to be sponsor for the standard or joint sponsor with the American Society of Mechanical Engineers if the A. S. M. E. so desired. Since this suggestion was approved by the A. S. M. E., the two organizations have been appointed joint sponsors. The standard color markings provide the molder with correct information regarding location of cores, the surfaces to be machined, the portions to be filled, where stop-off construction is to be used, and also insure preparation of the mold in the proper manner. The standard was issued in 1930 by the Bureau of Standards as Commercial Standard CS19.

Electrical definitions.—A report on proposed American standard electrical definitions has been prepared by the sectional committee on definitions of electrical terms. For more than three years the sectional committee, under the sponsorship of the American Institute of Electrical Engineers, has been working on the preparation of this report. The scope of the committee's work is defined as "Definitions of technical terms

used in electrical engineering, including correlation of definitions and terms in existing standards." In many cases, a number of synonymous terms are now in use where but one term would be far more desirable; in other cases, the same term is defined in several ways, although the application in each case is identical. The work of the committee has been to clear up such conditions, to coordinate the existing definitions, and to collate the definitions deemed desirable of inclusion in the report.

The report lists more than 3,000 definitions and terms. These range from the fundamental definitions on which the science of electricity is based (including a section on laws and effects, where this material is gathered together for the first time in convenient, accessible form) to definitions for practical applications, such as those for control equipment, generation, transmission and distribution, welding, illumination, wire and radio communication, electrobiology, and electrotherapeutics.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

Secretary of the A. I. E. E. Standards Committee Reviews Standardization Activities

By H. E. FARRER¹

The chief point of interest during the past year in standardization work in the electrical field has been in what might be termed a new phase of development; a phase in which it is hoped definitely planned and organized cooperation covering the entire electrical field will be the keynote.

Ever since the establishment of the American Standards Association, or, as it was originally known, the American Engineering Standards Committee, it was evident to those anxious to expedite standardization work that further steps must be taken to insure more effective operation of the machinery provided under the procedure laid down for the American Standards Association. With this in mind, and on the recommendation of the A. I. E. E. Standards Committee, the board of directors of the institute, in January, 1930, approved, in principle, the proposition calling for the formation of an electrical standards committee. In October, 1931, the Electrical Standards Committee came into being, in a meeting at which it superseded the Electrical Advisory Committee of the A. S. A. The Electrical Standards Committee, which is so constituted with its membership of 17 official representatives from 11 major electrical organizations and groups, that it can speak authoritatively for the electrical industry, has three distinct functions: It is the standards committee of the electrical industry; the electrical advisory committee of the A. S. A.; and, with certain additions to its personnel, the United States national committee of the International Electrotechnical Commission.

In the standardization work which the institute has been carrying on, under the procedure of the A. S. A., sole sponsorship or joint sponsorship has been acquired for some 25 sectional committees.² Of these 25 projects, 12 are held jointly, principally with the National Electrical Manufacturers Association. Representation is also held upon some 30 sectional committees under other sponsorships.

With regard to the joint projects, it should be noted that there is now a very definite tendency to urge that such undertakings be placed under the sole spon-

sorship of the Electrical Standards Committee, and in a number of cases, the institute board of directors has approved such procedure. A closely related step is indicated in the consolidation of sectional committees whose scopes cover related types of apparatus, resulting in the formation of group sectional committees, bringing within the scope of each such individual group committee many types of apparatus. Among those suggested are rotating electrical machinery (already in operation), transformers, power switch gear, etc. These two movements (elimination of plural sponsorship and consolidation) should expedite the work which has been slow in developing, largely because of the complicated procedure involved in multiple sponsorships and will, at the same time, minimize the man hours required to carry on the work.

A number of sectional committees, under the sole sponsorship of the A. I. E. E. or joint sponsorship, have recently submitted reports for approval by A. S. A., notably, mercury arc rectifiers, abbreviations for scientific and engineering terms, graphical symbols used in radio, graphical symbols used in electric power and wiring, and graphical symbols used in electric traction, including railway signaling, and several subcommittee reports of the committee on insulated wires and cables.

Probably one of the most extensive projects under way and now nearing report stage and for which the A. I. E. E. is sole sponsor is the work on electrical definitions. This sectional committee, which had its inception in 1928, is made up of representatives from about 30 national engineering and scientific societies, trade associations, Government interests, communication interests, and miscellaneous groups. Its work has been divided among 17 subcommittees which, with their immediate personnel and that of cooperative groups, means active participation by close to 300 individuals, embracing experts and specialists in all divisions of the electrical and related fields. The first emission of the committee will constitute approximately 3,250 definitions of the total of from 5,000 to 6,000 estimated for the completed undertaking.

In the development of new prospects and in the revision of existing A. I. E. E. standards which now number 38, with 19 approved as American standard or tentative standard, the institute standards committee is now depending almost entirely on the various

¹ Secretary, Standards Committee American Institute of Electrical Engineers, New York, N. Y.

² A sectional committee is a committee made up, in accordance with certain rules of A. S. A. as to balance, of representatives designated by the various bodies concerned with the assigned project, and if necessary, additional specially qualified individuals. It is under the guidance of a sponsor organization and is in reality a miniature industrial legislature, organized to develop a standard or code.

A. I. E. E. technical committees; notably, the committees on electrical machinery, protective devices, instruments and measurements, and applications to the marine industry. The two most recent actual developments within the institute are the reports on proposed standards for relays and on electrical recording instruments.

Those who have made a close study of standardization feel that it is to such committees within the institute and other similar organizations, made up as they are of men closely in touch with the trends and the needs of particular fields, that the electrical industry can look most logically for suggestions on revisions of existing standards and codes, and drafts of new material. If the sectional committees which, in most cases, must eventually consummate the desired standards, and irrespective of those committees' personnel or sponsorship, can have before them, when they hold their first meetings, proposed reports or drafts of the work they are expected to accomplish, much time and expense can be saved. It is with such a practice in mind that the institute has been offering, through A. S. A. procedure, not only its accepted standards, but its reports on proposed standards, as conditions seem to warrant such action.

In order that the electrical industry might become fully cognizant of a new work undertaken by the

institute, there was published during the past year a report on a proposed test code for transformers which, it is expected, will be followed by test codes for other types of apparatus. It is the purpose of these test codes to provide in convenient reference form the more generally applicable and accepted methods of conducting and reporting tests of a commercial nature which apply to the fulfillment of performance guaranties and to acceptance tests, as specified in the A. I. E. E. standards. It is not intended that the codes shall cover all possible tests or those of a research nature.

In closing, and for the benefit of those who may have a considerable concern with electrical standardization results and yet who have not had the time to follow the intricacies and ramblings of its development over a period of years, further emphasis should be placed upon the conditions touched on in the opening paragraphs and the various instances of which are generally outlined in this article. So, to repeat, these conditions are indicative of standardization procedure now at a critical stage of transition; a transition which has great possibilities—possibilities in the reduction of man hours necessary heretofore to accomplish a desired result, and even greater and more desirable possibilities involved in the elimination of organization friction.

HOSPITAL RUBBER SHEETING

A printed pamphlet on Hospital Rubber Sheeting, Commercial Standard CS38-32, is now available and for sale by the Superintendent of Documents, Washington, D. C., at 5 cents per copy. The sheeting specified is made from a cotton fabric coated on one or both sides with a rubber compound containing not less than 30 per cent by weight of rubber. The standard as established voluntarily by the industry, covers chemical and physical requirements together with packing, marking, and certification to buyers.

The standard became effective June 1, 1932.

WROUGHT IRON AND WROUGHT IRON STEEL PIPE

The revised simplified practice recommendation (R57-32) covering wrought iron and wrought steel pipe, valves and fittings, has been accorded the required degree of support by the industry, and is to be effective as of October 1, 1932.

This revision eliminates from the original recommendation the 3½-inch nominal inside diameter pipe from Table 3, "double extra-strong" pipe. The recommendation applies only to new installations and production of pipe.

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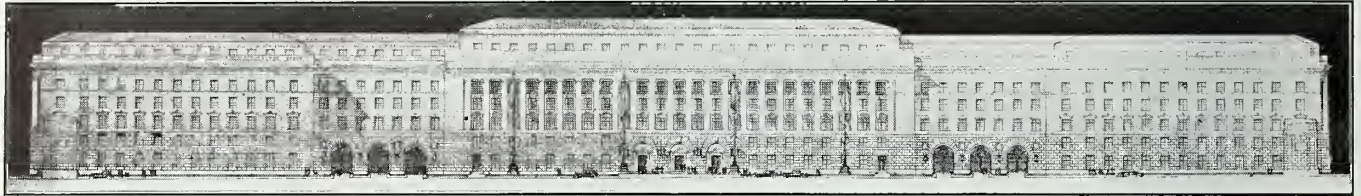
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