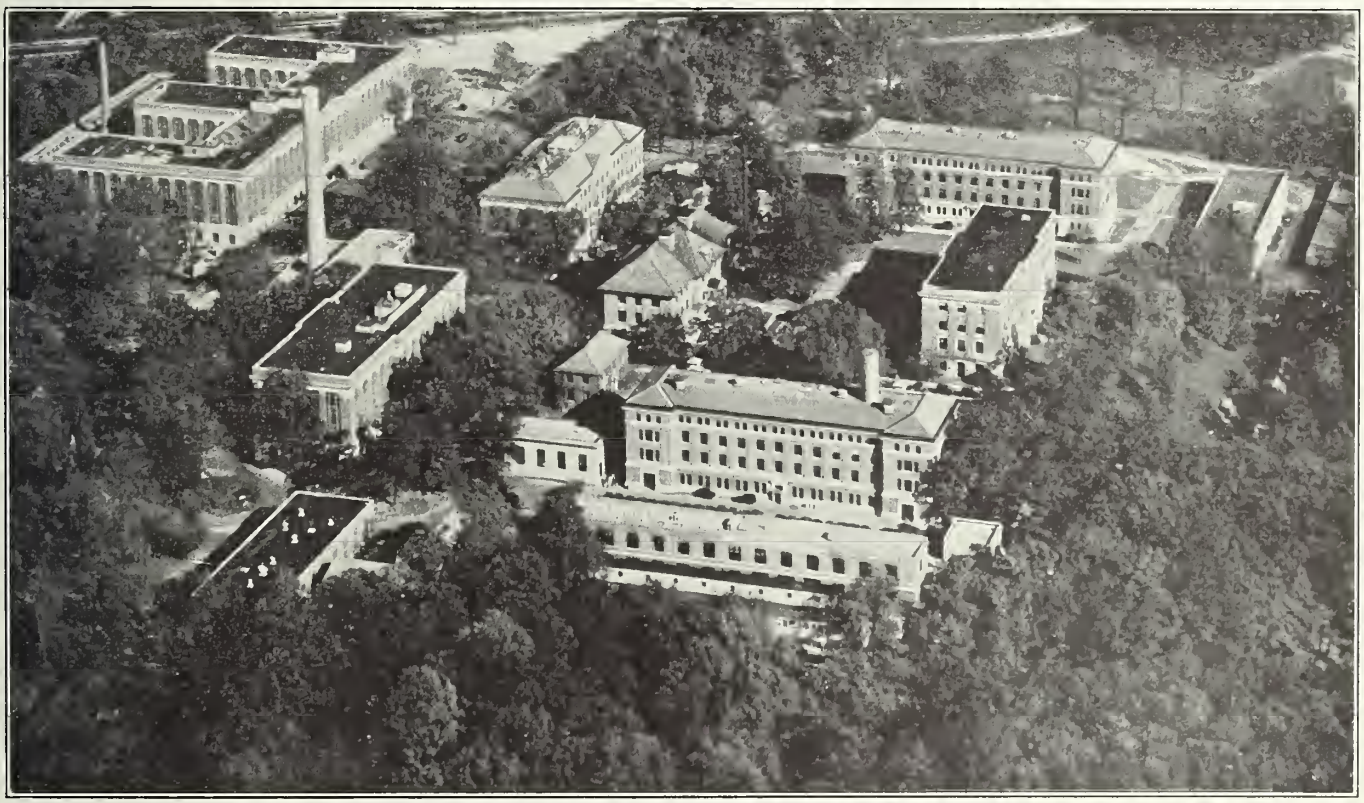
COMMERCIAL STANDARDS MONTHLY

A Review of Progress in Commercial Standardization and Simplification



AIRPLANE VIEW OF NATIONAL BUREAU OF STANDARDS

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

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U. S. DEPARTMENT OF COMMERCE
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NATIONAL BUREAU OF STANDARDS
GEORGE K. BURGESS, Director

COMMERCIAL STANDARDS MONTHLY
S. F. TILLMAN, Editor

DIVISIONS OF THE COMMERCIAL STANDARDIZATION GROUP

DIVISION OF SIMPLIFIED PRACTICE, EDWIN W. ELY.

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

BUILDING AND HOUSING DIVISION, J. S. TAYLOR.

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

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

DIVISION OF SPECIFICATIONS, A. S. MCALLISTER.

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

DIVISION OF TRADE STANDARDS, I. J. FAIRCHILD.

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

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

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CONTENTS

AN INVITATION TO VISIT THE BUREAU OF STANDARDS

An interesting fact in the growth of the bureau is the steady increase in the number of visitors. From all over the world experts come to see the work in progress in many specialties. Not alone the experts but in growing numbers many of our people visit the bureau from a public-spirited desire to acquaint themselves with its research work. All visitors, from the newspapermen, who have called the bureau a "house of wonders," to the specialists, who use its services, are welcome, for it is their bureau in a very real sense. They are the owners of the business and its beneficiaries. The annual per capita cost of 2 cents which the average citizen pays toward the operation of the bureau yields returns sometimes a hundredfold or a thousandfold. How science turns wastes into profits, increases the useful life of materials, adds new efficiencies to industry, advances new arts, such as aviation and radio, by research and discovery—these are to be seen first hand in the scientific and technical laboratories of the bureau.

A cordial invitation is extended to all citizens interested in scientific progress to visit the laboratories of the Bureau of Standards when in Washington. A personally conducted trip is organized at 2.15 p. m. daily except on holidays. Special trips for groups may be arranged at other times by writing to the bureau in advance. The bureau's illustrated Visitor's Manual may be had for the asking. This lists the work in progress and gives an airplane view of the ensemble and a brief statement of typical discoveries and inventions which have been notable, basic contributions to radio, aviation, and other modern arts and industries.

GEORGE K. BURGESS, *Director.*

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BUILDING "GOOD WILL" *in* BUSINESS

Commercial Standards Clarify Relationship Between Buyer and Seller

CONTACTS of the National Bureau of Standards with industry in the development of more than 100 simplified practice recommendations, revealed a very definite demand for a means whereby special nomenclature, definitions, grading rules, specifications, and other commercial standards for the quality or service characteristics of a commodity might be established and recorded as a basis for everyday trade, in order to clarify the understanding between buyer and seller, and to repair for entire industries the foundations of "good will" which had suffered from neglect as well as from undercutting of quality to meet a price.

In order to satisfy this demand, the Bureau of Standards, in October, 1927, arranged a procedure whereby industries might establish commercial standards as a basis for everyday trade. The procedure is very similar to that of simplified practice, cooperation of the bureau being available only upon written request in order that there may be no possibility of Government interference with business.

The function of the Bureau of Standards in such work is fourfold; first, to act as a referee to secure adequate consideration of the needs of all interests; second, to supply such assistance and advice in the development of the program as past experience with similar programs may suggest; third, to solicit and record the extent of adoption and adherence to the standard; and fourth, to add all possible prestige to the standard by publication and promulgation after it is adopted and accepted by all elements directly concerned.

"Good will" is recognized everywhere as a most important business asset. It requires a long time, earnest and steadfast effort to build, but is easily destroyed. It is bought and sold and yet is given freely to those whose policies of honesty and fair dealing are plainly evident. A constantly increasing number of industries, recognizing the new competition in which whole industries vie with one another for a share of the consumer's dollar, are building foundations for greater good will for themselves as a group by the establishment of commercial standards.

STANDARDIZATION IN SPORT

Recent Standardization Activities Relate to Growing Uniformity of Practice and to Exact Measurement of the Aspects and Factors in Sport; Amateur Athletic Union and Olympic Games Committee Sponsor Standard Practices of Many Sports

By Henry D. Hubbard, *National Bureau of Standards*

Modern sport is a standardized activity based on supreme efficiencies of the human machine. To it we are now adding power mechanisms with unlimited outlook for ever new speeds, skill, and daring. Standardization in sport began with the aim to secure a smooth conduct of play for the players and a worthy display of skill for spectators.

Such standardization in sport is not new. In many sports oral tradition still passes along the standard practice to the next generation. Recent standardization relates to progress toward world-wide uniformity of practice and to exact measurement of all aspects and factors in sport player, play, tools of play, equipment, facilities, grounds, rules, measurement and scoring, schedules, records, and awards.

Keen interest in sport standardization through measurement is shown by the rich technical literature in this field of research. A. V. Hill's Muscular Movement, Thooris's La Vie par le Stade, and Schulte's Eignungs und Leistungsprufung in Sport show new trends toward scientific measurement of athletes, classification into motor ability and aptitude groups, and the measurement of achievement, reactions, and the physical and chemical processes of the athlete during action and recovery.

Brace's Measuring Motor Ability presents a practical technique for rating in schools. Sargent's Physical Tests of a Man; Hetherington's Decathlon Tests; McCall's How to Measure in Education; and Schwegler and Engelhart's A Test of Physical Efficiency are typical of published researches. Wood and Cassidy's New Physical Education presents the strong case for natural movement and freer play.

Sport and its standardization.

Sport is performance. The bodily machine is the performer. Standardized sport means standard play by qualified players selected, trained, standardized under measured control, using standard rules, equipment, and facilities. The performance depends upon the effectiveness of the bodily machine.

Diverse individual characteristics of bodily mechanisms determine specific aptitudes. Each sport calls for a definite group of aptitudes, each aptitude in turn resting upon certain human characteristics—speed, skill, endurance, agility, strength, coordination, strategy, and other measurable factors in varying proportion. Collocations of sport of widening constituency bring variant usages face to face and standardization assimilates the best details.

The Amateur Athletic Union and the Olympic Games Committees sponsor standard practice of many sports and broaden the scope of sport standardization, while specialized groups intensively standardize details of their respective sports. Assimilation of local experience into national and international standardization makes for smooth procedure at the great events in turn, such standardization or synthesis of local experience flows back to local usage to the gain of sport everywhere, perfecting its details, making it a flawless display of skill with a minimum of dispute.

Standard terminology.

Each sport has its standard vocabulary, unique at the center, fading imperceptibly into the vernacular. Failure to use it accurately marks the novice. Fluent use of this technical vocabulary of the sport is a matter of pride and ends in habituation to a language unknown to the uninitiated.

The colloquial abounds in apt and picturesque words and idioms, standard for some sports, often unknown to the dictionary. These unique terms feed in from local groups and usages. As a class they are in principle like other special vocabularies. So far as they enter into sport practice they are subject to strict definition in the rules or standards of practice. Flawless definition devolves upon expert sportsmen, for experience and intimate knowledge of the sport are essential in standardizing its terminology. The terms then invade the dictionaries.

Sport abounds also in standard emblems, symbols, team initials, pennants, club devices, medals, cups, in endless variety. In yachting, for example, the color and shape of pennants are used as signals and to identify the club or the owner, to tell whether a flag officer is aboard and his rank. Events have standardized indications by flag or pennant. At night lights indicate the rank. Another convention is the standard system of "bells" used in nautical practice to indicate time.

Standard schedules.

Sports are seasonal. Their seasonal grouping provides a standard sequence of sports, each in turn a focus of interest. Many sport schedules are adjusted to meet weather conditions—winter sports call for ice and snow, tennis and canoeing being mild weather sports. Highly developed sport schedules are found in professional baseball leagues and similar sport organizations. In some tournaments handicaps allotted to players by a standard system are designed to give every player, with a given increment of extra effort, an even chance to win even against highly skilled players. Local schedules in some sports serve to pick winners for a graduated series of matches up to the big national and international tournaments.

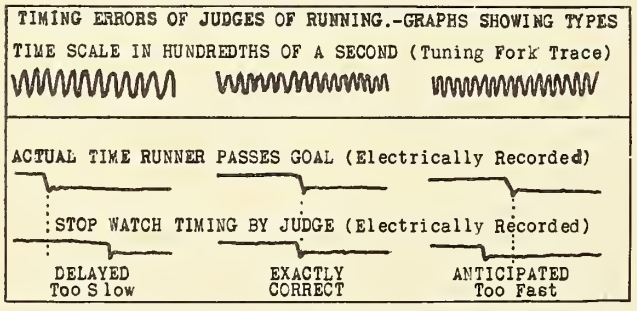
Measuring sport achievement.

While achievement is measured in sport, the results measure the players themselves, permitting them to gage themselves to find out what each lacks of a fair degree of ability in a variety of sports selected as criteria of well-rounded development. Systems of scoring, measurements, championships, and records are maintained, standardized in many cases, diverse in others. Scores or ratings are promptly announced and

transferred to score boards on the field and broadcast everywhere. Great interest centers in breaking existing records, and the new records become sport history.

Prescribed officials or judges control ratings. Standard measuring equipment and methods are used to measure performance. Some of these are elaborate. The varying accuracy of judges' decisions is itself studied by comparisons with electrical autographic records. (See fig. 1.) A glance shows the variance of different judges on the same events. Automatic recording devices are now standard and their autographic records add precision to sport decisions. The accuracy of such recording instruments is assured and standardized scientifically as one example will show. The homologation of altitude flights by aviators is based upon international rules of practice. The elastic and temperature characteristics of barographs cause them to read high in climbing up past a given level and to read low coming down past the same level.

The "standard atmosphere" adopted for aeronautical purposes is based upon the relation between altitude, air pressure, and temperature, and affords the standard basis for homologation of air-flight records. True altitudes in such flights are now determined with



Errors of judges timing a race, electrically recorded in comparison with true time

great care at the National Bureau of Standards by tests, under controlled laboratory conditions, causing them to repeat the time-pressure-temperature history of the flight.

Standard fields of play.

The design and layout of the modern stadium, and the surfacing and marking of baseball and football fields and tennis courts are examples of standardization of fields of play, in prescribing dimensional units of measure. Analogous to these are the standard design and construction of billiard tables, bowling alleys, and chess boards.

In boxing for a world championship, the roped ring or arena may be less than 24 feet square, while the spectators may exceed 140,000, raising the factor of the distance from which a sport may be viewed acceptably. A football field inclosed on all sides with tiers of seats extends far from actual play, but the size of the ball and length of punts and runs make it attractive as a spectacle even at such a distance.

Many sport fields have standard dimensions; others call for merely standard patterns. The standard limits of play may function in the play. The cushions in billiards, the wall in handball, furnish rebound as part of the play. Added limitations within the standard boundaries increase the demand on skill and enhance the interest, as, for example, the use of balk lines and anchor spaces in billiards.

Some sports do not permit standardizing the course. Balloon races for distance or altitude can have no standard course. "Hare and hounds" has no standard course, the hare's track being found by confetti dropped on his way as "scent" for the hounds, suggestive of the fox hunt. No standard course can be fixed for cross-country ski races as wind and traverse change the ski course hourly. Every ski race course is unique, new, never twice alike.

Standards of practice.

Standardization is effective in the rules of action or play. Rules for sport are standards of practice based upon experience and expert judgment. They are revised in the light of service experience. Rules promote fair play (the essence of good sportsmanship) and efficiency in the conduct of play. Some of them are provocative of an interesting variety of action, the "forward pass," for example, and thus evoke a maximum of the skill or prowess characteristic of the sport. They thus improve it for player and spectator and reduce hazard. Baseball shows few fatalities, but deaths in football, 37 of which were reported for 1928, call for safety measures.

Rules assign standard functions to the players and govern the play. Some rules provide rotation of function as in baseball batting, or tennis service, which alternates in singles. In some games, handball and others, a definite number of points concludes the game. In races and some games standard goals must be reached. Decisions on points to be scored and method of scoring are equally standardized, a maximum wins certain games, such as polo, a minimum winning in others, such as golf.

Standard costumes.

Standard sport costumes are evolved from choice to meet conditions encountered in sport. From a minimum in water sports to electrically heated garments in altitude record breaking, each sport has more or less standard attire. To the demand for efficiency is often added a desire for style or color, to lend gaiety to a sport. The jockey's bright colors of the entrant owner aid the eye to indentify horses in a race.

Fox chase costume is fixed by custom of long standing, while the popularity of golf rescues it from stylistic fixity. Fashion seeks novelty, tradition seeks fixity, but good taste, based upon service as well as stylistic grounds, is most effective in standardizing sport costume.

Standard tools of play.

Sport experts fix the dimension, weight, quality, and design of the basic tools of their respective sports. To permit useful variation it is usual to fix only the essential or more noteworthy details. Equipment is standardized to improve the quality of play, to protect, or to identify the players. Apart from standard bats, balls, racquets, skis, skates, and the like needed for the play itself, masks, shoes, gloves, and other protective devices are standardized for safety, as are emblems and costumes for distinguishing the players and team. Altogether thousands of articles are well

standardized while others might well be simplified by eliminating the less effective varieties.

The design and production of the vast variety of sport equipment form a diversified group of industries. Each sport calls for the best equipment obtainable so that designers and makers vie for the reputation of high quality. Precise methods and mass production prevail in making sport equipment. Provision for sport facilities and equipment is to-day among the more profitable groups of industries. Its output is entertainment for the spectator and it ranks even higher as a health giving and stimulating activity for the participants. The equipment of sport offers the same opportunity and gains in standardization, as do any other commercial products.

Standardization of equipment, however, has other than economic advantages, since players gain a basis of greater fairness and skill if equipment is standard. From the expert sportman's point of view, the welfare of the sport and its display of skill have a better chance with standard tools and equipment well designed and constructed. The tennis ball, football, and other balls in great variety are thus standardized sometimes to the point of precision.

The design and balance of a golf ball or club are as effectively standardized by specification and test as the parts of a motor car. The ball must be in true balance. The billiard ball is an accurate sphere, of perfect balance, with no preferential tendency to roll in a given direction on a flat surface. This standard balance is required by the highly developed skill of expert billiardists, whose best plays are impossible without such high accuracy.

Arrows rated by weight.

In archery, arrows are rated by weight (in shillings) which must be constant and uniform, with feathers (fletching) oriented to rotate the arrow in flight like a rifle ball. Weight standardization is necessary so that a standard pull on the bow string gives the arrow a definite momentum. With fairly standard bows, and arrows of uniform weight and balanced structure, the recent revival of the ancient sport of archery on a new basis of skill is made possible by precise methods in the factory.

During the astonishing modern development of baseball as a leading national sport, the ball and bat, its basic tools, have for half a century been acceptably standardized. The standard baseball specification to-day is in the exact language given in the original playing rules of the National League adopted February 2, 1876. As therein specified, the standard baseball must weigh at least 5 ounces avoirdupois, but not more than 5¼ ounces and must measure in circumference not less than 9 nor more than 9¼ inches, and it must also be "the best ball that can be manufactured." Scope for improvement was thus permissible and the "best ball" has been greatly improved in resiliency, doubtless by higher standards in the factory, including make-up and construction acceptable to the national association.

The need is the matrix for the specification. An example of experimental development is found in the shaping of sport tool handles or grips by first grasping a plastic material to obtain the impression of the inside of the closed hands. Such experiments are used in designing grip handles for sport tools, such as bats, racquets, polo sticks, and similar methods are being tested for designing shoes or other foot equipment for sport.

Some sports easily standardized.

Some sports are easily standardized as to equipment. Basket ball, fencing, swimming, and races are possible with simple equipment. Nevertheless, scientific researches have been, and are being made, on almost every basic tool of sport, the boomerang, golf ball, billiard ball, top, arrows, and diabolo.

Moore's recent study of "scientifically designed golf clubs" is a good example, his "centerline clubs" being so designed that, for example, as Moore states, "with the improved brassie the ball is struck with the face of the club at a point where the axis of the shaft crosses the center of the club face, thus realizing the greatest possible efficiency from the stroke."

STANDARD SIZES OF FOLDING BOXES FOR COFFEE ESTABLISHED

There have been in use more than 100 combinations of dimensions for 1-pound folding boxes for coffee; there are now only 2. This summarizes the action of a general conference of representatives of coffee roasters, coffee packers, manufacturers of folding boxes, producers of filling machines, grocers' organizations, and allied groups, convening in New York, N. Y., on March 28. The meeting took place under the auspices of the division of simplified practice of the National Bureau of Standards, upon the specific joint request of the National Coffee Roasters' Association and Paperboard Industries Association.

The two recommended sizes, measuring 4⅜ by 2¾ by 6 inches and 4⅜ by 2¾ by 6½ inches, respectively, will adequately care for differences in bulk. If approved by the industry, this recommendation will be effective as of May 1, 1930.

REVISION OF RAILWAY-CONTROL STANDARDS

A revision of American Institute of Electrical Engineers standard No. 16, Railway Control and Mine Locomotive Control Apparatus, has been approved by the A. I. E. E. standards committee, and is shortly to be issued in report form in order to permit industry to familiarize itself with the suggested changes, according to the Journal of the A. I. E. E. The present standard, No. 16, will remain in force until revisions are finally accepted. Incidentally, standard No. 16 has been split into two parts, as follows: Railway Control Apparatus, and Mine Locomotive Control Apparatus. A section committee, under the joint sponsorship of the American Mining Congress, National Electrical Manufacturers Association, and the American Institute of Electrical Engineers, is to be formed to develop an American standard for mine locomotive control apparatus.

THERMAL INSULATION OF HOMES

Location and Fuel Cost Are Factors in Determining the Proper Insulation a House Should Have

By J. L. Finck, *National Bureau of Standards*

When fuel was cheap and insulating materials were expensive or not readily obtainable, the incentive for using insulation was almost lacking, but under present conditions the fuel saving resulting from use of insulation may be made to pay a substantial return on the increased investment. In addition to materials which have been produced primarily as insulators, such as cork, a large variety of materials formerly considered as waste, such as corn stalks, straw, wood waste, flax straw, and sugar-cane fiber, are being utilized in the manufacture of insulating and building materials.

Understanding of terms.

Before considering the question of insulation in detail, it may be well to clear up a common misunderstanding with regard to terms. One is frequently asked with regard to the "heat and cold" insulating properties of a material. In general, there is no distinction. The material is always used to reduce the flow of heat from a warmer to a colder space. It is sometimes desired to control the temperature of the warmer space, and sometimes that of the colder. The insulation of a house illustrates the former condition in winter, and the latter in summer. In winter the insulation reduces the amount of heat which must be supplied by burning fuel to keep the house warm. In summer the insulation keeps the temperature inside the house from going as high as it otherwise would during the day, or, if the building is to be kept cool with a refrigerating machine, reduces the amount of power used by the machine.

Any wall, no matter what kind, has some insulating value. This is most commonly seen in the fact that windows are effective in helping to keep a house warm. The glass in a window is effective for two reasons: first, because it prevents the cold outer air from entering; and second, because heat is transferred rather slowly from the inside air to the glass, and again from the glass to the outside air. A large proportion of the insulating value of a pane of glass is due to these so-called surface resistances, which are essentially the same regardless of the thickness of the material. For this reason two panes of glass, one twice as thick as the other, have nearly the same insulating value. The influence of surface resistance is also utilized by introducing air spaces; for example, by the use of furring strips, or by double windows.

Value of weather-stripping.

The importance of preventing excessive leakage of cold air into a house through cracks and crevices may be seen from the comparatively large improvement resulting from the use of weather-stripping and building paper. The building paper is so thin that its value as an insulator is negligible, but by preventing inward leakage of cold air, it adds greatly to one's comfort and to the ease of heating a house.

Most of the houses in this country depend, for their protection against heat losses, upon the prevention of air leakage, upon surface resistance, air spaces, and such insulating value as the structural materials may possess. The insulating value of the walls of such houses is comparable with that of a 1-inch thickness of any of the good insulating materials. In other words, the insulating value of a wall would be doubled, or the heat loss through the wall cut in half, by including in the wall a 1-inch thickness of a good insulating material. The total amount of heat required to keep the house warm would not be cut in half by this means, since the loss through windows and doors would not be affected.

With substantial advances in the cost of fuel, the average home owner may well consider the advantages of heat insulation. Not only has it been found economical to insulate the house, but one obtains more home comfort both in winter and summer.

There are numerous insulating materials on the market which may be used, each in its particular way. The fuel saving will depend on the kind of material used, its thickness, and the manner of installation.

The roof should ordinarily require first consideration for insulation, for without insulation much heat is lost through the roof in winter, and in summer the sun's radiation will warm up the upper floors excessively.

Comparison of insulating values.

All materials which are ordinarily used in building-wall construction have some heat-insulating value, but in some cases this value is so small as to be insignificant. The heat-insulating value of a layer of material depends on two things: (1) The character of the material, and (2) the thickness of the layer. The ability of a material to transfer heat, or its conductivity, is inversely proportional to its insulating value. In other words, the materials of lowest conductivity are the best insulators. However, when purchasing insulation, one is interested not only in the conductivity of the material but in its thickness. If you want to measure the insulating value of a material, divide the conductivity by its thickness and you get what is called "conductance." This is the measure of insulating value. The better insulator has the lower conductance.

Consider the following example of two materials A and B.

	A	B
Conductivity	0.30	0.40
Thickness, inch	½	1
Conductance	$\frac{0.30}{\frac{1}{2}} = 0.60$	$\frac{0.40}{1} = 0.40$

On the basis of conductivity it appears that A is a better insulator than B. Taking account of the difference in thickness, however, we find that actually B has more insulating value than A. No matter what the salesman has to say about conductivity, he is not telling the whole story until he states how thick a material he is selling or what its conductance is. Comparison of the insulating value of sheets or boards of insulating material is properly made on the basis of their heat conductance, as in the example above, without regard to their surface resistances. But because of the factor of surface resistance, the user will be the gainer if he can use the board in such a way as to introduce an additional air space.

The question of how much insulation a house should have will depend on its location and the cost of fuel. Where the winters are severe, and the cost of fuel is high, it is economical to add more insulation than in warm climates where one naturally needs but little insulation. Some parts of the house may need more insulation than others. For example, if the northern exposure is subject to severe, cold winds, it will be wise to add an extra layer of insulation to that wall. In ordinary construction, it is safe to say that more heat flows through the roof during winter than through any single wall. In the summer more heat enters the house through the roof than through the walls. It is therefore advisable and highly economical to add extra insulation underneath the roof.

Estimate of savings.

As estimate of the probable saving in fuel resulting from insulating or weather-stripping an ordinary dwelling house is given in the following table, which is taken from Bureau of Standards Circular No. 376. The first part of the table gives the fuel saving expressed in percentage of fuel which would have been required for a similar house without insulation or weather-stripping. In the second part of the table the savings are expressed in percentage of fuel required for a house without insulation but with weather-stripped windows. In calculating these values, an average insulating material is assumed, but no commercial fibrous or cellular insulating material departs far enough from this average value to make a significant difference in the approximate figures in the table. Whenever insulation is involved, it is assumed that the insulation is applied to both walls and roof, and that the insulation is not substituted for some other member which is present in the uninsulated construction.

Approximate fuel savings in dwellings.

The savings are expressed in percentage of fuel which would have been required for similar houses without insulation or weather-stripping.

	Savings (per cent)
No insulation, weather-stripped	15 to 20
Same, with double (storm) windows	25 to 30
½-inch insulation, not weather-stripped	20 to 30
½-inch insulation, weather-stripped	about 40
½-inch insulation, with double windows	about 50
1-inch insulation, not weather-stripped	30 to 40
1-inch insulation, weather-stripped	about 50
1-inch insulation, with double windows	about 60

Savings expressed in percentage of fuel which would have been required for similar houses without insulation, but with weather stripping.

	Savings (per cent)
With double windows, no insulation	10–15
½-inch insulation only	25–35
½-inch insulation, with double windows	40–45
1-inch insulation only	35–45
1-inch insulation with double windows	50–55

Air space filled with loose material.

Insulation value is gained by filling an air space with loose material. Many loose materials are being sold for this purpose, and such materials can sometimes be installed in finished houses. Several things have to be guarded against. Material should not be added which will constitute a fire hazard or serve as a nest for rodents or vermin. One should make sure that the material will not settle, for otherwise, after a year or so, the spaces will be partially empty. In buildings of frame construction it is absolutely necessary to prevent moisture penetrating walls filled with loose material, since the retention of the moisture by the material and the lack of ventilation within the wall would promote rotting of timbers, and incidentally kill the insulating value.

According to a chart given in Bureau of Standards Circular No. 376, the following all have approximately the same insulating value:

1. A 1-inch thickness of loose or quilted fibrous materials.
2. A 1¼-inch thickness of fibrous insulating boards.
3. A 2-inch thickness of compressed composition board.
4. A 3-inch thickness of softwood.
5. A 5-inch thickness of hardwood.
6. A 10 to 20 inch thickness of masonry.

Within each class there are no great differences in insulating value between insulators made of various materials. The materials offered may differ greatly in other characteristics, such as strength, durability, cost, finish, etc., which the purchaser is fairly well prepared to judge for himself, but, as regards insulating value, which is more difficult to judge, one may be guided by the statement above.

STANDARD METHOD FOR DETERMINING VAPOR PRESSURE OF GASOLINE

The technical committee on fuel oils of the American Petroleum Institute has agreed to recommend to the society for adoption as a tentative standard the Reid method for the determination of the vapor pressure of natural gasoline and a new method of test for the dilution of crank-case oil. The Reid method also has been adopted by the Interstate Commerce Commission as the official method to be used in determining the classification of gasolines for purposes of transportation.

ESTABLISHING STANDARDS FOR MASONRY OPENINGS

Bureau of Standards Cooperates with Construction Industry in Developing Plan for Standard Masonry Opening Sizes

By P. H. H. Dunn, *National Bureau of Standards*

Standardization is progressing. Not only is its application becoming more universal but it is growing within itself. There is a new and broader conception of the true meaning of the term. We might call this comparatively recent conception "creative coordination." It is the coordination of standards for related materials so that each has a very direct relation to the other, and the creation of such standards where none now exist.

In the past standards have been developed either on the basis of production and sales or from a technical study of the material with a view to arriving at the ideally perfect product. In a great many cases both methods have proven eminently satisfactory. Considering the first of these from the point of view of the manufacturer, the selection of the size or style which enjoys the greatest demand as standard has a direct value which takes the form of dollars and cents added to his net profits. The distributor profits through smaller inventory and greater turnover, while the ultimate consumer usually gets a better article and sometimes at a better price. This method of arriving at standards is substantially that used by the division of simplified practice of the National Bureau of Standards in cooperating with American industry, and has resulted in savings estimated by the industries concerned at hundreds of millions of dollars.

Standardization simplifies purchasing.

Standardization based on technical or scientific research has saved countless other millions of dollars. It has simplified purchasing and improved the quality of products. It assumes the ultimate user of standard material that he is getting an article which comes up to a standard based on careful study of the properties and characteristics of the materials going into the article, as well as the use of which it is to be put.

However, this new area in standardization looks a step further. It has in mind the use of the finished product, as well as the standards for other materials used with the product in question. There is to-day underway in the construction industries a project which has for its aim the creative coordination of standards for masonry materials, as well as those materials used in masonry openings.

Early in 1929 several manufacturers of building materials discussed with representatives of the National Bureau of Standards the possibilities of arriving at a standard list of masonry opening sizes based on definite increments in height and width. It was felt by these manufacturers that the development of standard sizes of windows would never be of maximum benefit until the standards for related materials going in and around openings could be coordinated. Subsequent to these discussions a representative of the Bureau of Standards talked with a number of architects and other interested parties and found a decided trend of thought in favor of standard openings. Should a standard list of opening sizes be promulgated, such fixtures as awnings, shades, etc., could also be standardized with the knowledge that they would fit standard openings.

The first difficulty, however, lay in the fact that there were no existing standards for many masonry materials, and that where standards had been adopted they did not in all cases have regard for related materials. It seemed that the coordination of existing standards on a common unit of dimension would do much to eliminate waste in masonry construction and make possible the development of standards which do not now exist.

Held preliminary conference.

Accordingly, on June 12, 1929, a preliminary conference of industries interested in masonry construction and masonry openings was held at the Bureau of Standards. After considerable discussion a resolution was passed authorizing the chairman of the meeting to appoint a committee composed of one representative of each of the various interested industries to go into the entire matter and to make a recommendation.

This committee was appointed, and held its first meeting on October 8, 1929. The members presented the points of view of their several industries and decided that if the coordination which they hoped for was to be achieved there would have to be developed some unit of dimension which could be applied to all masonry materials, the size of each product going into a wall to be an even multiple or divisor of this unit. The conferees further felt that the brick was the key unit in a wall, and that as such was the logical starting point for the considerations. The use of a unit of measure or module equal to the length of a brick plus a joint was considered as logical.

Taking the present brick size of 8 inches and the average mortar joint of one-half inch, this produced a module of 8½ inches, or halving this, 4¼ inches. The architects' representative pointed out that if a standard was promulgated and the architect was expected to use it, that it would be very desirable to have the dimension an even inch. As an illustration of what was meant, he showed how by using an 8½-inch length of brick with a ½-inch joint, a unit of 9 inches could be achieved. A 2½-inch thickness, with a ½-inch joint, would produce a 3-inch vertical module which could be very handily used, while a 4-inch width of brick and a ½-inch joint gave 4½ inches or one-half of the 9-inch horizontal dimension. In other words, he proposed as a brick which appeared to meet the requirements one 8½ by 4 by 2½. In designing both walls and openings the architect could then lay off his vertical dimension in increments of 3 inches and his horizontal in increments of 9. Should he desire to go in between any 9-inch dimension, the

4½ might be used. It was pointed out that the 4½ inch is a much more familiar dimension to the architect than 4¼.

Were this 9-inch modular dimension used with a thinner joint, the brick would be slightly larger, as in the case of a pressed or enameled brick, the brick then being 8¾ and the joint one-fourth, always sticking to the 9-inch unit of dimension. There appears to be a tendency at the present time toward a slightly larger brick and the size suggested by the architect might well come into use within the next few years whether adopted as a standard at the present time or not.

With this thought in mind, it was suggested that the entire proposition of a possible increase in brick size and coordination of standards for masonry materials be presented to the various brick associations at their conventions. Representatives of the committee on masonry opening sizes attended the annual meeting of the American Face Brick Association in New Orleans on December 10.

Two sets of plans drawn up.

Prior to that time, however, two sets of plans for a section of masonry wall were drawn up, the first plan being based on the use of the 9-inch module, with the new brick size and the ½-inch mortar joint, while the second used the present brick size. Figuring the price of face brick at $30 a thousand delivered on the job, these two plans were submitted to contractors in five different sections of the country, with the request that they furnish as accurate an estimate as possible as to the comparative costs of laying the face brick work on each of the walls. The average estimate for plan No. 1, using the proposed size, was $78.39. The average estimate for plan No. 2, using the present size, was $95.16, or a difference of $16.77. This indicated that there was an actual saving of nearly $17 in the laying of 1,200 face brick, and that even though a somewhat larger brick might cost as much as 50 per cent more than the present size, there would be a considerable saving due to reduced labor cost in connection with the construction of the wall backing, etc., as well as with the use of standard windows, trim, etc., which would be possible should a standard list of opening sizes be adopted.

Attention is further directed to the range in estimates on each of the two plans. Plan No. 1 ranged from $63.51 to $98.62, while plan No. 2 ranged from $75.76 to $125.93, although these estimates were based on identical specific data. The information supplied the contractors was more complete than any contractor would receive in actual practice, every brick to be clipped being marked and all joints which it was necessary to thicken being so indicated. It would seem as though it might be concluded that contractors figure brick work loosely and that they include in their estimates a relatively large amount for cutting and fitting, regardless of whether or not there would be any.

Subsequent to the presentation of this information to the American Face Brick Association, a similar report was made for the Common Brick Manufacturers Association, the Filled Lime Brick Association, and the American Ceramic Society. All these groups have appointed committees to go into the matter and it is expected that they will report the latter part of May with their recommendation to the committee on masonry opening sizes.

Opportunity for elimination of waste.

This entire effort on the part of manufacturers of building materials is based on a realization that there lies in the field of construction an opportunity for the elimination of waste. The introduction of substitute and competitive materials in many of the building lines have made it necessary for the manufacturers of material affected to scour their field of operations for means of eliminating avoidable wastes and thus cutting down their costs. During this coming year construction expects to receive more attention than it has ever had in the past. Federal, State, and municipal governments, as well as private corporations, are pushing their building activities as a means of stabilizing the economic situation in the country. It is the logical time for branches of this industry to undertake such projects as this, and it is believed that the example set by manufacturers of masonry materials, as well as windows and trim, will be followed by other elements of the construction industry.

STANDARDS FOR COMPRESSED-AIR MACHINERY

The fourth edition of Trade Standards, a publication of the Compressed Air Society, has been announced. This pamphlet embodies the result of extended study and research on the part of the executives and engineers associated with the companies that are members of the Compressed Air Society. It embraces the accepted nomenclature and terminology relating to air compressors and their operation, with appropriate definitions; a history of the development of speeds of air compressors; an explanation of capacities and pressures; a description of the low-pressure nozzle test recommended by the society; instructions for the installation and care of air compressors, suitably illustrated, and recommendations for their lubrication; illustrations of the standard A. S. M. E. air receivers and a list of standard sizes of air receivers; pneumatic tool standards; numerous tables that will be of assistance in the treatment of various compressor problems; and a partial list of applications of compressed air. Copies of the pamphlet may be secured through the office of the secretary, the Compressed Air Society, 90 West Street, New York, N. Y.

STANDARD WEIGHT MALLEABLE-IRON UNIONS

The printed pamphlet entitled "Standard Weight Malleable Iron or Steel Screwed Unions," Commercial Standard CS7–29, has been released. It covers dimensions, tensile strength, leakage tests, galvanizing, and marking of standard weight brass-seated unions for use with standard-weight pipe.

The commercial standard was effective for new production on November 1, 1929, and for clearance of existing stocks on May 1, 1930. Copies of the pamphlet may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents per copy.

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NONGOVERNMENTAL SUPPORT FOR CANADIAN STANDARDIZATION

Electrical Code Most Important Publication Issued by the Canadian Engineering Association

By B. Stuart McKenzie, *M. E. I. C., Secretary*

The Canadian Engineering Standards Association is the national standardizing body for the Dominion of Canada. It was incorporated in 1919 at the suggestion of the British Engineering Standards Association and the British Board of Trade, negotiations having been started in 1917. The organization of the Canadian Engineering Standards Association follows very closely that adopted by the British Engineering Standards Association in that the work is carried on under the direction of a main committee composed of representatives of technical, educational, and industrial bodies. Under this main committee there are sectional committees, to each of which is assigned one branch of engineering. The actual work is carried on by voluntary working committees, who prepare the reports on the particular projects which are up for consideration. When these reports have been completed they are submitted for approval to the appropriate sectional committee and thereafter to the main committee for final approval and authority to publish. All committee members give their services without remuneration, the detailed work being handled by a paid secretary and staff at Ottawa.

Financial support.

The Canadian Engineering Standards Association is not a department of the Dominion Government, although it does receive financial support indirectly from that source. Its specifications are not mandatory in themselves. When the association commenced operations practically all the working funds were supplied by direct grant from the Department of Trade and Commerce, a certain amount having been received from technical organizations and leading business firms. In 1925 this Government grant was discontinued, and at the suggestion of the National Research Council arrangements were made to continue the work by constituting the main committee of the association, the Associate Committee on Engineering Standards of the Research Council. Financial support was guaranteed by the research council on the condition that a reasonable amount be also obtained direct from industry. Since 1927 the association has been operating on this basis, a campaign for financial support having been inaugurated early in that year. The business firms who have subscribed to the budget have been listed as sustaining members without any fixed fee for membership. In the fall of 1929, however, it was decided to put sustaining memberships on a more permanent basis and a financial committee, composed of five leading business executives, was appointed to direct operations. The fee for sustaining membership has now been set at a fixed sum per annum.

Publications issued.

The work is carried on, as above stated, by committees on which representatives are appointed by both manufacturers and users, and, where necessary, technical advisers are included. The Canadian Engineering Standards Association is in a peculiarly favorable position to obtain satisfactory results, in that it deals directly with the business firms or organizations and not through sponsor bodies. For this reason the contact with business interests is unusually intimate, it being possible to establish the most cordial relations and, in many cases, save much valuable time in the completion of the various projects. That industry appreciates this relation is clearly shown by the generous financial support which has been forthcoming and the favorable reception accorded the specifications which the association has thus far issued. These specifications have been widely adopted, and, in most cases, are officially approved for use in the different Government departments. In some cases firms have placed a standing order for all publications as they are issued. Many of the leading technical and public libraries in the United States have asked for complete sets of the Canadian Engineering Standards Association specifications for their files.

Since its incorporation in 1919 the association has issued 28 specifications. These cover steel railway, highway and movable bridges, steel buildings, Portland cement, concrete and reinforced concrete, reinforcing materials for concrete, wire rope, wire strand, stove bolts, machine screws, incandescent lamps, distribution transformers, watt-hour meters, cedar and reinforced concrete poles, control cable, electrical code, galvanized wire, railway fencing, check analysis of steel, forging steel, commercial bar steel, steel castings, etc., and a report on gasoline and lubricating oils.

Canadian Electrical Code.

Perhaps the most important publication thus far issued by the association has been the Canadian Electrical Code, the first edition of which was published in September, 1927, and the second in January, 1930. This code possesses features which are somewhat unique, the most important being the combination of rules providing for protection from both fire and electrical shock. It follows very much on the lines of the National Electrical Code and the National Electrical Safety Code, but much material has been taken from the rules of the Hydro-Electric Power Commission of Ontario and various Provinces and municipalities throughout Canada. The code has been prepared by an all Canada committee, which includes representatives of the different power commissions, power companies, manufacturers of electrical apparatus, city and provincial inspection departments, fire underwriters' associations, labor organizations, and technical men. Working committees have been established in eight Provinces and these are under the direction of the Code Committee which considers the code as a whole. This differs from the system used in the preparation of the National Electrical Code whereby a committee is assigned to each article of the code. The Canadian Electrical Code has now been officially adopted by six out of the nine Provinces, and is being administered under special provincial acts.

Yearbook and quarterly bulletin.

The association uses every effort to keep its members, and the industrial firms with whom it is associated, well informed on the work which it is doing, and to that end publishes a yearbook and quarterly bulletin, the first issues of which appeared in 1927. The yearbook constitutes an annual report on the year's operations, showing the status of the various projects under consideration, list of cooperating bodies, description of standards issued during the year, financial statements and lists of sustaining members. It also covers the history, organization, and working methods of the association. The bulletin serves the purpose of a progress report, covering each quarter. This includes meetings of working committees, announcements of new publications, Canadian code news, general items dealing with standardization, lists of specifications received, and acknowledgment of any publicity in the press. It has been found that this bulletin fulfills a most useful purpose as is evinced by the steadily growing mailing list.

Work is being done at present on specifications for cast iron, pipe, power transformers, transformer and switch oil, and wood piling. A start was made in 1929 on a new type of publication under the general title of Established Lists of Dimensional Standards. The first list covered machine screws and effected a reduction in variety from 43 to 21. The list provides for 11 sizes and, with one exception, a two-thread series throughout, giving a range which should fill every practical requirement. Similar lists covering cap and set screws, stud bolts, carriage and machine bolts, plough bolts, etc., are now being prepared. They will be issued in pamphlet form for insertion in a binder specially prepared for the purpose.

Wide field of service.

The Canadian Engineering Standards Association has now been in existence a little over 10 years, 3 or 4 years of which were taken up in initiating the work or were unproductive owing to lack of funds, so that the work is comparatively in its infancy. In the light of the present situation there is every reason to believe that the association is now firmly established and in a position to be of practical service to the industries of Canada. The field is opening up in a most encouraging way, and the industries have plainly indicated their indorsement by taking out sustaining memberships and providing a great part of the funds necessary for prosecuting the work.

MOP STICKS

June Conference of Industry to Consider Proposed Commercial Standard

At a meeting in Cleveland, Ohio, April 3, the leading manufacturers of mop sticks requested the assistance and cooperation of the National Bureau of Standards in establishing a commercial standard specification for their product.

Tentative specifications were formulated for the three most popular styles covering both the handle and the metal fixtures constituting a mop stick. Among the points covered are the width of the bale or portion in which the mop is inserted, size and quality of the various metal parts, and the finish that is to be applied to the metal parts and the handles.

A general conference for the complete discussion of this proposed standard was tentatively fixed for early June.

FULL DISK BUFFING WHEELS

Recommendation Has Been Adopted by Industry

Sufficient acceptances have been received for the simplification of full disk buffing wheels to warrant the promulgation of the simplified-practice recommendation 115–30, the industry's standing committee has advised the division of simplified practice. The recommendation was approved at a general conference of manufacturers and users held on October 7, 1929, and became effective January 2, 1930.

The action of the conference resulted in a reduction from 17 diameters to 11, and from 2 plies to 1. It is expected that this constructive simplification program will result in savings to all concerned, by reducing wasteful cutting of the sheeting out of which buffs are made. The standing committee was authorized by the industry to give consideration to question of kinds of cloth and sewing, and also to such other items as arbor holes and pieced buffs, with a view to working out standards for all types of buffing and polishing wheels—that is, wheels of cloth, leather, and felt.

The savings and advantages which have already accrued through the simplification of grinding wheels, and the savings which are expected to result from the buffing wheel simplification program, have prompted the industry to request the cooperation of the division of simplified practice in developing a simplification program for abrasive grain sizes.

BUILDERS' TEMPLATE HARDWARE

Pamphlet on Commercial Standard Now Available

The printed pamphlet entitled "Builders' Template Hardware," Commercial Standard CS9–29, has been released. It covers all necessary dimensions and tolerances to provide complete interchangeability of template lock fronts and strikes, as well as the leading varieties of template butts, such as full mortise, half surface, full surface, and half mortise. It also includes standard template identification symbols and minimum clearances on butt hinges designed for painting. It will materially assist the hollow metal door manufacturers and building contractors in obtaining earlier delivery, complete interchangeability, and will facilitate replacement of these items regardless of source of manufacture.

The commercial standard was effective for new production September 18, 1929. Copies of the pamphlet may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents per copy.

STANDARDIZED SPECIFICATIONS AID VETERANS' BUREAU

Economy Promoted by the Standardization of 7,000 Medical and Hospital Supply Items

By Brig. Gen. Frank T. Hines, *Director United States Veterans' Bureau*

Up until the advent of the World War the Government services had given comparatively little attention to the important industrial practice of standardization of equipment as a means both of economy and facilitation of production. The Quartermaster's Department of the Army promptly resorted to the standardization of the various types of motor transportation necessary for the proper equipment and functions of the Army and maintained this standard for several years subsequent to the war. However, the practice generally prevalent throughout the Government in making purchases of equipment or general supplies was merely to ascertain what large commercial concerns or groups of concerns were using, and then, in so far as the law would permit, adopt similar articles for their own use.

Federal Specifications Board.

Subsequent to the appointment of Herbert Hoover as Secretary of Commerce on March 5, 1921, the principles of standardization and simplified practice were given special attention by his department and the Federal Specifications Board was created on October 10, 1921. The duties of this board were to compile and adopt standardized specifications for material and services and to bring the Government specifications into harmony with the best commercial practice wherever conditions permitted, bearing in mind the broadening of the field of supply.

It is believed that the mandatory power with which this board is clothed is in itself of inestimable value to the Government in carrying out, in so far as it is permitted to do so by law, the process of standardization. It eliminates individual opinions and desires which in any organization must be subservient to the needs of the organization.

Medical and hospital supplies standardized.

In October, 1924, the supply division of the Veterans' Bureau standardized on some 7,000 items of medical and hospital supplies and at the same time, in order to simplify the problem of distribution, authorized the field stations to requisition such items of these supplies as they needed from the supply depots direct. The result of this procedure was the elimination of thousands of requisitions a year which had formerly been sent to central office direct and thence to the supply depots for filling. This action also resulted in a considerable reduction in central office personnel and brought the service of supply to field stations up to a point of efficiency where to-day practically no complaints are being received.

In addition to the foregoing, the standardization of these items created a condition where supplies became interchangeable between stations; in other words, if a shortage of supplies existed at one station it could, in an emergency, be met by a transfer of similar supplies from another station and in the event of the closing of a station these standardized supplies could be distributed to other stations within the same area for their use.

This work of standardization is continually progressing. In the operation of 50 hospitals it is necessary to furnish a large number of items of proprietary drugs, etc., which are not commonly used, but in doing this a study is made of the use of these items and when it is found that their use is more or less continuous, the item is standardized and added to the standard list. Vice versa, when it is found that a standardized item has become obsolete and is no longer in common demand or use it is dropped from the list and in this manner the standard list is maintained current at all times.

Standardized specifications beneficial.

The principal benefit which is derived from the use of the standardized specifications prepared by the Federal Specifications Board in carrying out the function of procuring supplies is that it establishes a uniform standard which puts prospective bidders on notice as to the exact kind, character, and quality of goods the Government desires, and strict adherence to these standards eliminates to a certain extent the bidder who does not possess manufacturing facilities or is not a recognized distributor of an established manufacturing concern, thereby insuring to the Government the closest possible adherence to the specifications with the result that the Government gets 100 cents worth of goods for every dollar spent therefor.

The best evidence of the soundness and reliability of these specifications is found in the fact that wherever it has been necessary to reject material or supplies furnished by any contractor due to their not being in compliance with the specifications, subsequent tests by the National Bureau of Standards of the goods delivered, in comparison with the samples submitted, has in every case resulted in a substantiation of the reasons for rejection and confirmation of such action. Bidders and contractors are coming to realize this more and more as time goes on with a result that a slow but continuous improvement in purchasing operations is gradually taking place.

DIAMOND CORE DRILL FITTINGS

Standard, Now in Printed Form, Effective as of January 1, 1930

The printed pamphlet with the above title and designation as Commercial Standard CS17–30 has been released. This standard covers measurements and tolerances of diamond core drill fittings in order that this material may be interchangeable as to size and threaded connections as produced by the various manufacturers. It covers four regular sizes of casings, casing bits, casing couplings, core barrel bits, drill rods, and rod couplings.

The commercial standard was effective for new production on January 1, 1930, and the time limit for clearance of existing stocks was set at July 1, 1930. Copies of this pamphlet are available at the office of the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents per copy.

BRICK STANDARDS REDUCE PRODUCTION COST

Through Standardization Competitors are Put on an Equal Basis

J. F. McNeil, *National Bureau of Standards*

Brick is one of the oldest of building materials. Excavation of the ruins of ancient Chaldean and Egyptian cities has unearthed crumbled brick structures, together with inscriptions dating back more than 6,000 years. In America, the manufacture of brick commenced about the year 1650. The development of this industry was very slow, however, because the producers were dependent, almost entirely, upon hand labor and upon the location of clay deposits.

Mechanical equipment for the manufacture of brick and other clay products made its appearance in England about the middle of the nineteenth century. A short time later, it was introduced into the United States, where the increase in production of brick thereafter was commensurate with the expansion of building and construction operations. In the year 1922, when a simplified practice recommendation was initiated in this field, the Bureau of Census reported a production of more than 5,800,000,000 common brick, and more than 1,400,000,000 face brick. Large production, such as is shown in this instance, is generally accompanied by diversification in sizes and types. Such variation starts with the birth of an industry and oftentimes continues to increase over a long period of years.

Survey shows many varieties.

A survey of production, in the rough and smooth face brick and common brick industry, conducted in 1922, showed 39 sizes of rough face brick, ranging in length from 7¾ to 8⅝ inches, in thickness from 2⅛ to 2¾ inches, and in width from 3$\frac{3}{16}$ to 4½ inches. In the manufacture of smooth face brick there were found to be 36 variations in size. Forty-four sizes of common brick were also in existence at that time. The established recommendation reduced the variety of rough and smooth face brick from 75 sizes and types to 2; and of common brick from 44 to 1. A check, following the development of the recommendation, has revealed the fact that 93 per cent of the face brick and 85 per cent of the common brick is made in accordance with the simplified schedule.

After the recommendation had been in effect for several years the Bureau of Standards made a survey to evaluate the benefits derived by the acceptors through its operation. Letters were sent to all signed acceptors requesting that they give the bureau a statement of their experience with this simplification program. Excerpts from these replies, which follow, are indicative of the fact that much benefit is being derived from the application of this recommendation. The outstanding benefits cited are smaller inventories, lower production cost, necessity for less yard space, quicker turnover, and a more satisfactory condition regarding competition.

Excerpts of replies.

"Previous to this change," replied a manufacturer whose plant is located in Ohio, "our brick were one-eighth inch oversize over all, and their weight averaged 5 pounds. Now the weight averaged by the Interstate Shipping Bureau is 4.6 pounds, which means a saving in freight. Also more tonnage can be shipped per car. The savings in a standard-size common brick are as follows: Less clay, shorter time in drying, easier for the men to handle, kilns formerly holding 400,000 bricks will now average 460,000, less hours in burning brick which means less fuel."

Another manufacturer said: "We believe that our experience justifies us in saying that we have enjoyed a saving to ourselves or to the trade of 10 per cent."

"We find that it works to advantage in smaller inventories and in convenience of supplying brick for alterations and additions to buildings. As this practice is continued, it will result in more saving and convenience," wrote the manager of a large eastern brickyard.

"Simplified practice in the brick industry," said another executive, "has produced its objective. It gets its deserved praise when mentioned among brickmakers. In our own business, it has enabled us to concentrate on one style of product which has lowered our production cost, saved yard space, lowered inventory, and given us more time to continually improve our product."

"In our particular case," replied a Virginia brickmaker, "it has increased our cost as we are making a brick that was not up to the size recommended, but we are pleased to advise you that in changing to the standard size we find it is very satisfactory, since the majority of our competitors in this particular district are now manufacturing this standard size brick, and this naturally puts competition on an even basis and contractors know exactly what to expect in a brick so far as size is concerned."

Sales manager pleased.

"From our past experience," said the sales manager of a large manufactory, "we find that for our business it is to be a great advantage to standardize on the manufacture of one size of face brick, as this enables us to handle our markets more efficiently, and at the same time architects and contractors readily familiarize themselves with the size of the product manufactured by us. In addition to the benefits received from the handling of our markets, it enables us to do a large volume of business on a smaller inventory, which permits quicker turnovers of our stock and reduces the necessary capital that otherwise would be tied up in special machinery for manufacturing different size products."

"We think we are perfectly conservative in saying that the adoption of uniform-size face brick effects an annual saving of at least $15,000 to $20,000, which, of course, would have to be passed on to the consumer with no gain from an architectural standpoint," wrote the president of a large brick manufacturing plant.

A member of a firm of consulting engineers, located in the northwest, said: "We think that it is a fine movement, and one which is sure to bring great results in years to come. You can count on our hearty cooperation."

CURRENT ACTIVITIES OF THE AMERICAN STANDARDS ASSOCIATION

Standards for Twist Drills, Bed Blankets, Ball Bearings, and Bursting Tests on Fittings

The technical committee on the standardization of twist-drill sizes, of the general A. S. A. committee on small-tools and machine-tool elements, has revised the proposed American standard for drill sizes and lengths, and these proposals are now being circulated for review and criticism.

The circulation of previous drafts elicited a number of suggestions, many of which are incorporated in the present draft. The sizes of drills covered in the draft are from 0.014 to 0.6875 ($\frac{11}{16}$) inches. The present total of 150 sizes is reduced to 107. In studying the present sizes listed in manufacturers' catalogues, the committee found, in a number of instances, two drills of different nominal diameters which produced, within close tolerances, the same size hold.

The drill sizes now submitted are arranged as to give progressive increases in diameter and require the use of but 15 additional sizes. The committee has also prepared a table indicating the necessary top-drill sizes required to produce the several specified N. S. T. C. full-thread percentages. A sheet comparing in detail the proposed and present sizes is included with the proposed American standard for ease in comparison with the present practices of industry.

Specifications for Blankets.

Evidence that the standardization of blankets has aroused in the textile trade the desire for labeling which will give definite information as to quality, has been found in a survey made by the New York Daily News Record, a textile trade paper. The News Record questioned a large number of retailers and wholesalers concerning the A. S. A. project for the establishment of standard specifications for blankets.

Typical of the trade comment was that of the department manager of a prominent Youngstown, Ohio, firm, who said: "I think the standard-size list would be suitable to almost every retailer. I have also had in mind for several months whether or not it would be possible to have the manufacturers put on their labels exactly how much wool there is in their blankets, as there are a lot of blankets on the market which are part wool, whether they contain 5, 10, 15, or 25 per cent. It seems to be a hard proposition to convince your customer just what percentage of wool is in the blankets. We know our customers have bought a certain blanket the same as we carry in stock, but purchased at another store, and represented to them as being a 15 to 25 per cent wool blanket.

"Therefore, we would like to make the suggestion as above, if the blankets could be labeled, telling the general public just exactly how much wool is in the blanket, it seems to me it would eliminate a lot of dissatisfaction among the consumers."

Bursting tests on fittings.

A third progress report on the cast-iron pipe investigation being conducted at the engineering experiment station at the University of Illinois, has been published and is available for review through the American Standards Association. The investigation is being carried on as part of the work of the A. S. A. technical committee on specifications for cast-iron pipe and special castings.

The A. S. M. E. fittings were tested with flanged joints, and no difficulty was encountered except in the case of the elbows. The first 12-inch elbow was tested without any attempt to hold the blind flanges except by the bolts in the flanges. The elbow failed at a low pressure (540 pounds per square inch) by pulling off one of the flanges. In testing the other two elbows an attempt was made to reduce the bending stresses by applying heavy thrusts against the center of the blind flanges. However, the failures, in each case, was by pulling off the flanges, although higher bursting strengths were developed (1,025 and 920 pounds per square inch).

It is evident that the weakness of the A. S. M. E. flanged elbow is in the junction of the flange and the body of the fitting. In the second series another group of 12-inch flanged elbows were tested in which a fillet had been added back of the flange. These elbows were tested without applying a thrust against the center of the blind flanges and the failure occurred by bursting along the inside of curve at pressures of 1,055, 1,010, and 960 pounds per square inch (specimens 82, 83, and 84). It is shown, therefore, that the addition of a very small amount of metal is surprisingly effective in increasing the strength of this fitting.

Use of Victaulic joints.

At the meeting in January a question was raised concerning the effect on the strength of the fitting of using Victaulic joints instead of bells or flanges. In order to answer the question, three 12 by 12 inch A. S. M. E. 125-pound flanged crosses were prepared for Victaulic joints by turning off the flanges (specimens 34, 35, and 36). These were burst at pressures of 360, 485, and 495 pounds per square inch. The first specimen was no doubt defective and should be thrown out, making the average bursting strength 490 pounds per square inch, as compared with an average bursting strength of 647 pounds per square inch for the same type of fitting with flanges (specimens 1, 2, and 3). It is evident, therefore, that the flange does add materially to the strength of the fitting, and it may be expected that bells would have the same effect to a lesser degree.

The short body fittings are shown to be a little stronger than the corresponding A. W. W. A. fittings. The A. W. W. A. fitting has long radius curves at all angles introducing flat areas which cause bending stresses to be added to the tensile stresses. The A. W. W. A. 12 by 12 inch curves in particular have large flat sizes which were blown apart nearly an inch before failure occurred.

Lateral the weakest 125-pound fitting.

The lateral was the weakest of the 12-inch A. S. M. E. 125-pound fittings. This is no doubt due to the relatively small area of metal at the crotch to resist the water pressure on the large tributary area. This fitting is a particularly difficult one to strengthen.

Ribs carried across the crotch would undoubtedly help. It may be possible that a thickening of the walls opposite the crotch would be effective and easier to cast, although more metal would be required.

Without intending to do so, information concerning the strength of blind flanges was secured, due to the failure of three blind flanges during the tests at pressures of 450, 490, and 500 pounds per square inch. The practice of putting the ribs on the outside of blind flanges is a mistake because the ribs are not effective in carrying tensile stress. The practice of dishing blind flanges outward is also wrong because this introduces tensile stresses. To be effective the ribs and the dish should be turned to the inside.

Standards for ball bearings.

The proposed American standard for annular ball bearings of the single row type, light, medium, and heavy series, and the proposed American recommended practice for ball and roller bearings of the wide type have been submitted for the approval of the American Standards Association.

The standards were approved by the A. S. A. technical committee on ball bearings and by the sponsors of the committee, the American Society of Mechanical Engineers and the Society of Automotive Engineers. In the preparation of the standard the committee cooperated with foreign standardizing bodies in an effort to achieve as great as possible a degree of international unity. To this end international conferences were held in Zurich, Switzerland, in 1923 and in New York in 1926. As a result of these conferences differences between foreign and American practices were practically eliminated. The work of this committee began in 1919 and was based on the existing ball bearing standards of the Society of Automotive Engineers.

COMPUTING CHART FOR HELIX ANGLES OF SCREW THREADS

Covers Diameters from 0.05 to 10 Inches and 1 to 100 threads Per Inch

A chart issued by the National Bureau of Standards during the past month shows graphically the relationships among diameters, leads, and helix angles of screw threads or other helical surfaces. This chart should prove of great value to mechanical engineers, since it furnishes a means for readily determining the helix angle at the major, pitch, or minor diameters for any of the standard pitches of the American National coarse, fine, hose coupling, pipe, and Acme threads as given in the 1928 Report of the National Screw Thread Commission. Usually, however, it is the helix angle corresponding to the pitch diameter which it is desirable to know.

Diameters and leads.

The range of the chart includes diameters from 0.05 to 10 inches and 1 to 100 threads per inch. Diameters are represented by a vertical logarithmic scale, designated on each side of the chart, and leads (or pitches of single-thread screws) on a horizontal logarithmic scale along the top. For convenient use of the chart, vertical lines are drawn corresponding to the threads per inch of the various standard systems, and these are designated along the bottom of the chart. The abscissa for a nonstandard pitch can be readily determined by interpolation on the lead scale and transferred to the diameter ordinate by means of a pair of dividers. The diagonal lines of the chart represent helix angles as designated.

Example.—To determine the helix angle at the pitch line of a ½″–20, 60° screw thread: The basic pitch diameter is 0.4675 inch. Reading opposite 0.468 on the diameter scale on the vertical line corresponding to 20 turns per inch, the diagonal line immediately below is 2° 0′ and interpolation gives the helix angle as 1° 57′.

There may be occasions, as in designing power transmission or conveying screws, when the helix angle would first be selected and a suitable corresponding combination of diameter and lead or pitch determined. Interesting comparisons of various standard screw-thread systems can also be made by plotting them on the chart.

Copies of this chart, known as Miscellaneous Publication No. 109 of the Bureau of Standards, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents per copy.

TEXTILE SAFETY CODE

United States Bureau of Labor Statistics Publishes Safety Code for the Textile Industries

Among the industrial safety codes prepared under the procedure of the American Standards Association is the Textile Safety Code, which was completed last year and is now available as Bulletin No. 509 of the United States Bureau of Labor Statistics. The sponsor for this code was the National Safety Council, which organized a representative sectional committee headed by President Charles H. Eames, of the Lowell Textile Institute, as chairman.

It included representatives of the textile manufacturers and workers, State industrial authorities, insurance underwriters, and technical experts. The National Bureau of Standards was represented by C. W. Schoffstall, who was at that time the chief of its textile section.

This code gives detailed requirements for the safeguarding of pickers, cards, spinning mules, slashers, looms, kiers, calendars, cutters, slitters, extractors, ironers, and folding, sewing, and washing machines. Precautions are given for the handling of chemicals, for the removal of dust, for the handling of tanks and vats, and other operations used in the handling of textile materials. This code will serve as a guide to factory managers and textile engineers in planning equipment, as well as for State and insurance inspectors in judging whether existing installations are properly safeguarded.

VALUE OF STANDARDS TO THE WAR DEPARTMENT

In Preparing Its Specifications Department Follows Commercial Practices Wherever Possible

By Maj. Henry L. Rice, *Ordnance Department*

Our people fervently hope they will never again be forced to decide any dispute by force of arms, but if war does come to us, we naturally desire to carry it through successfully. Victory in warfare has from time immemorial depended upon three elements—leadership, man power, and supply power, and with the constantly growing complexity of the supplies required by fighting forces and the enormous increase in the amounts consumed, the essential element of supply power, the efficient procurement, accumulation, and distribution of munitions of war, has obtained an importance so vital to success that no underlying factor may safely be neglected.

The standardization movement in the United States, with its great influence on quantity production, is such a factor, the importance of which is so well realized in the War Department that hundreds of officers and civilian employees are constantly engaged in studying and perfecting standardization within the department itself, and in cooperating with the related agencies of industry.

Necessarily, a considerable portion of this work is concerned with special and technical items peculiar to war, and as there is no large munition industry in the United States, the War Department must necessarily look to the personnel of its own special training and to its own arsenals, proving grounds, and laboratories for those special elements of research and development with which the commercial world has little familiarity.

> "The War Department is a staunch backer of the standardization movement, which has been enthusiastically participated in by many governmental and civil agencies since the World War," said Maj. Beverly C. Dunn, United States Army, in his article, Status of Industrial Mobilization Plans, which appeared in the March–April issue of The Military Engineer. He also stated that rapid progress has been made in specification writing and commercial standards have been followed wherever possible.

Department welcomes ideas.

Within this localized and clearly defined field of work, however, all ideas are gladly welcomed and from whatever sources received, whether civilian or official, from enlisted men or officers, through military attachés from foreign sources, from special boards or from the enjoined yearly survey of military equipment, they are at once submitted to the careful consideration of a technical group especially organized and particularly qualified to render an opinion as to their possible feasibility and merit; and in these varied ideas, constantly flowing in, together with the research work carried on in the branches charged with the supply of the Army, are found the necessary progressive impulse toward the gradual improvement of the basic military equipment.

With a favorable opinion that any suggestion is feasible, a development project is formulated, sent to the laboratory, followed carefully by the technical group concerned through all of its stages of development, and, if successful, finally emerges as a new standard of equipment. The goal to be reached, and already in sight, is an existing standard for every important item of military supply, a standard finally reflected in a carefully written specification, back of which is a fully developed plan for the procurement in quantity of the item.

In the course of this development every effort is made to commercialize the manufacture as fully as possible. The views of industry are constantly solicited in this respect and responsible business leaders, with no thought of personal inconvenience or expense, have patriotically responded and contributed the benefit of their valuable experience.

War Department standard.

A War Department standard is exactly what the name implies, a fully perfected item with drawings and specifications ready for use; the most desirable known type of the item and the type which it is hoped to produce in sufficient quantity in event of war. In addition to the standard, less desirable but entirely useful variations of the standard type, are kept upon the books of standards, as substitute standards, also available for manufacture in case of any deficit in the manufacture of the standard. Thus certain field pieces which were successfully used in the World War and which are still efficient in action are carried as substitute standards for manufacture, although there is an improved standard on which it is deemed more desirable to concentrate.

An item may, therefore, be said to progress downward from standard to substitute standard, as research and development result in improvement and finally may pass to limited standard under which classification stocks may be retained for use until exhausted, but with new manufacture no longer contemplated. So much for special and technical military articles.

Forecasting use of items.

The War Department must, however, also forecast the use of vast quantities of strictly commercial items to the improvement and standardization of which American industry is contributing a magnificent effort and, recognizing that as an agency of the people cooperation in this work is not only natural and proper, but that in event of war the benefits to the War Department and to the people at large will be far reaching in their effects, the Secretary of War has instructed the department to definitely ally itself with this general standardization movement and con-

tribute the services of its personnel whenever and wherever such services may be desired.

In the furtherance of this movement, the National Government has itself set up certain general agencies in which the War Department endeavors to do its share and the work of the Federal Specifications Board in formulating standards for general governmental procurement, of the division of simplified practice of the National Bureau of Standards in assisting industry to carry through programs for the elimination of waste in manufacture, distribution, and consumption, similar to those which were begun so successfully under the conservation division of the War Industries Board during the World War, and of the Bureau of Standards in its constant assistance to industry in technical problems are too well known to need description.

In the business world the War Department is associated in the standardization work of many of the larger engineering and trade associations, and is particularly represented in the coordination of their work by direct membership on the standards council of the American Standards Association, assisting through the sectional committee procedure of this association in many of its standardization projects. In special fields of work, it is represented on the United States Screw Threads Commission, and on many other special national and international boards and committees is affording the public the benefit of the technical knowledge at its command.

Standardization pays dividends. The War Department believes in this movement, practices its precepts and teaches them in its schools and expects to continue and extend its own efforts and its cooperation with national and civilian effort in every way possible.

TYPES OF DIE SETS REDUCED

Standardization of Die Sets Has Reduced Types and Improved Material

Standardization of die sets for stamping, piercing, cupping, or other forming operations, is a relatively new practice, states a news item in the magazine, American Machinist, in discussing typical standard die sets, but one that has not been lost sight of by farsighted, analytical manufacturers. The result has been a reduction in the types of sets available and the development of new types of sets only where conditions warrant.

Another advance has been the change in the materials from which die sets are made. Originally cast from gray iron, sets are now cast from semisteel mixtures, one manufacturer going so far as to add chromium and nickel. This mixture, though more expensive, is much stronger, reduces blowholes and shrinkage dangers, and, consequently, makes up for the slight increase in first cost of the die sets by giving much longer service.

Forgings are now being recommended for die sets, being claimed to have more uniform structure and greater strength. In addition, delays encountered in obtaining special die-set castings are eliminated by the purchase of standard forged sets. Special die sets may be forged in any thickness. The die sets are held to extreme limits of accuracy, variations on the pins being held to 0.0001 inch, in squareness 0.005 inch in 6 inches and in parallelism 0.002 inch in 12 inches.

ACCOUNTANTS SUPPORT SIMPLIFIED PRACTICE

Requests for Information Received from All Over the World

As a result of sending informational data to the members of the accountant profession, the division of simplified practice received more than 2,000 inquiries for supplemental material. In addition to those from the United States, inquiries were received from 21 foreign countries. This display of interest shows that the accountants are keenly aware of the benefits of simplified practice and its close relation to their work.

The support of consumers is essential to the ultimate success of simplified practice programs. For this reason, it is interesting to note that between October 1, 1929, and January 1, 1930, consumers have requested more than 5,000 copies of various simplified practice recommendations, and as a result 1,500 new consumer acceptances have been received.

The spread of interest in simplified practice in foreign countries is illustrated by a steady flow of inquiries from abroad. These average about 15 a month and come from all parts of the world. Foreign inquiries recently received came from Ireland, Cuba, Italy, South America, Australia, Porto Rico, Africa, India, France, Siam, Holland, England, and Scotland.

VALUE OF SPECIFICATIONS FOR PAVING MATERIALS AND MACHINERY

Standardization of Specifications Should Prove Valuable in Reducing Waste and Decreasing Production Costs

Dudley T. Corning, chief of bureau of highways, Philadelphia, Pa., and chairman of a subcommittee of the city officials' division, American Road Builders' Association, said:

> We are living in a period of standardization and simplification. In every branch of industry commissions and committees are working on the standardizing of products and practices to reduce wastes and decrease production costs.
>
> Standardization and simplification of paving specifications should be of great benefit to the manufacturers and producers of paving materials and machinery. Why should producers of crushed stone or gravel have to make a dozen gradings when one or two would serve the paving industry, or why should the asphalt industry have to produce so many different materials to be used for the same purpose?
>
> Cities do not, as a rule, adopt any so-called model specifications as standard. The specifications of most cities are built up as a result of the paving practice of that city, modified by ideas gathered from the many "so-called" standard specifications which come in the daily mail of every city engineer. This is liable to lead to even greater confusion.
>
> Standard specifications can be written only after studying the requirements of many cities and the products of many manufacturers. Specifications to be standard must be universally asseptable.
>
> It is probably true that specifications for the materials of construction are being made gradually to conform to some model which is universally recognized as a standard throughout the country."

PRAGUE CONFERENCE ON STANDARDIZATION IN BUILDING INDUSTRY

More Intensive Standardization Urged in Building Industry; Program to Include Tools, Porcelain, and Timber

A national standardization conference, convened by the Czechoslovak National Committee for Scientific Management was recently held at the headquarters of the Czechoslovak Engineers Society at Prague.

The conference examined the present situation as regards standardization in various branches of industry and recommended that the program should be extended to include tools and machine tools, porcelain, and timber for sawing. A recommendation was also passed in favor of more intensive standardization in the building industry.

The Commercial High School requested that uniform principles of accountancy should be worked out for typical industrial undertakings, these principles to cover cost accounting, sales, and purchases, etc.

The necessity of centralizing all standardization work in the Czechoslovak Standardization Association was unanimously recognized, and it was recommended from various quarters that corporations which had hitherto studied standardization work outside the Czechoslovak association should conclude an agreement with the latter with a view to closer cooperation, in order that there may be no unnecessary division of forces.

The conference recommends that all State authorities, autonomous bodies, and corporations should prescribe and demand in their tenders and contracts that all goods and supplies must accord with the Czechoslovak standards, and that they should follow the example of the Ministry of National Defense and conform to the practice already adopted in the electrotechnical industry, where standardized goods are used exclusively.

The conference urged Czechoslovak Departments of State and autonomous offices which have not yet introduced standardized Czechoslovak paper sizes to do so wherever possible and without delay, and thus assist in obtaining the maximum possible use of these standards. The conference was convinced that substantial economies will result therefrom.

Further resolutions demanded that the Czechoslovak Standardization Association should receive effective financial support from the State and that intensive propaganda should be conducted in trade journals as well as in the daily press.

TESTING EQUIPMENT FOR AUTOTRUCK SCALES

New Publication of National Bureau of Standards Describes Equipment Recommended for State Weights and Measures Officials

Fifteen thousand pounds of test weights are carried on a special truck by a New York State weights and measures official for the testing of autotruck scales. This and similar outfits in use in other parts of the country are illustrated and described in a recent publication of the National Bureau of Standards entitled "Testing Equipment for Large-Capacity Scales."

The bureau urges the various States, counties, and cities not having special equipment of this character to take immediate steps to secure it, in order that "greater service may be rendered to the owners of commercial scales and greater protection afforded to those who buy commodities over them." It is pointed out that the inspector who tests a modern 15 or 20 ton autotruck scale with only a light load of 1,000 or 2,000 pounds of test weights knows nothing about the accuracy of that scale in the most important part of its weighing range, which is above the weight of the empty truck and where the weights of commodity are actually determined.

There is a popular conception that a scale which will weigh a small load correctly will weigh any load within its capacity range with equal accuracy. This belief is entirely erroneous. A scale is, after all, nothing but a machine; it may have been improperly designed, made, or installed, or it may get out of condition through use, abuse, accident, or intent on the part of the owner or user. The superficial appearance of a good scale may not differ from that of a poor scale; initial and continued accuracy may only be demonstrated by adequate and regular tests. The recommendation for an adequate test-weigh load for use by the inspector is 10,000 pounds.

Copies of this publication (Miscellaneous No. 104 of the Bureau of Standards) may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

PAINT INDUSTRY MAY SIMPLIFY CONTAINERS

Industry on Record Recommending the Elimination of One-half Gallon Can

The question of simplification in the paint and varnish industry was revived at the February meeting of the National Association of Paint Distributors, held in New York. A resolution was passed by that organization recommending the elimination of the one-half gallon can as an unnecessary container in the paint and varnish line.

In 1924 similar action was contemplated by the industry when it was preparing a program for passage, through the procedure of the division of simplified practice. That effort resulted in the adoption of a "limitation of variety" recommendation for shades and tints and no sizes less than gallons in barn, roof, and shingle paint. The National Bureau of Standards has been requested by the National Association of Paint Distributors to cooperate with them in this renewed endeavor, in the event the manufacturers accept their resolutions.

STANDARD CONTAINER LAW

Act of 1916 Standardizing Various Types of Baskets in Daily Trade Simplified Shipment and Aided Basket Makers to Produce Standard Containers for Products

By H. A. Spilman, *United States Department of Agrieulture*

The marketing of fruits and vegetables depends largely on two factors—quality and quantity. To a great extent shippers now guarantee the quality of the fruits and vegetables they ship by packing them in accordance with United States grades. The quantity, so far as fruits and vegetables packed in baskets or barrels are concerned, is taken care of by three Federal laws. These are the barrel law and the standard container acts of 1916 and 1928. The standard container act of 1916 standardized Climax baskets, berry boxes, and till baskets; and the 1928 law, hampers, round-stave baskets, and splint baskets.

Many benefits accrue to various groups from the enforcement of the container or basket laws. The manufacturer is aided and his hand strengthened in at least three ways: The elimination of many sizes enables him to concentrate on a small number of sizes and thus lowers his manufacturing cost. The standard container act of 1916 reduced the number of sizes of Climax baskets by 93 per cent, of till baskets 84 per cent, and of berry boxes 82 per cent. It is obvious that such reductions cut costs or keep them from advancing. It is possible for him to make up stock ahead, knowing that there will be a market for standard sizes. When a great number of sizes were in use the manufacturer had no way of knowing which one his customers would order, and consequently did not dare to make up a large stock. This meant putting on two shifts when crops were moving in order to keep up with the demand.

Standards make for wider market.

A third gain to the manufacturer comes through the wider market which standardization opens to his products. When packages varied according to local ideas he was forced to confine his sales efforts to the local market or to engage in the manufacture of so many different sizes as to be in danger of carrying over heavy inventories. To-day he knows that his product is standard in any section of the country and that his markets are limited only by manufacturing costs and freight rates.

Growers and shippers are served in several ways by standardization of containers. They profit by the lower cost of production of the baskets they must buy. As the number purchased runs to at least 700,000,000 each year, it will be seen that any saving in cost constitutes an important item for the country as a whole.

Unfair competition through the use of short sizes is eliminated by standardization. The grower who packs in full bushels or other standard baskets knows that no other grower or section can come in and break the price by using short packages. Market quotations have a more definite meaning when they are based on containers of known capacity and there is assurance that short containers will not appear on the market.

Shipping simplified.

The loading of cars and trucks is facilitated when containers of the same capacity and of the same approximate dimensions are used. Those employed in loading such containers tend to become more expert at it. Since containers are standard throughout the country, the shipper or grower has a much larger supply of baskets from which to make his purchases, as a greater number of manufacturers are competing for his business. This assures him an adequate supply at a fair price.

The provisions of the standard container act of 1928 nullify and make inoperative all weight-per-bushel laws passed by the various States so far as commodities packed in hampers, round-stave baskets, and splint baskets are concerned. For most parts the weights per bushel established by the States were unfair to growers, since they sought to compel the delivery of a greater weight of a given commodity than could be placed in a closed basket. The bushel is a unit of volume and it is impossible to define it accurately in terms of weight.

Railroads benefit.

The railroads which carry the fruits and vegetables of the United States to market can make a threefold use of standardization. The standardization of containers makes possible the working out of sound and practicable loading methods for the different sizes and types and the incorporation in tariffs of regulations embodying such methods. The reduction in the number of sizes makes it possible for the railroads to devise and embody in their tariff regulations specifications as to the construction of baskets with some hope of being able to enforce them. As a result of the use of better baskets and of better loading, there should be a reduction in the number of claims for damage to fruits and vegetables.

Those engaged in handling fruits and vegetables in wholesale markets also find good results from standardization. It places all receivers on the same basis as to size of containers. In other words, any one wholesaler knows that every other dealer in his market who has commodities in baskets has them in standard baskets and can not undersell him with a short container. Market quotations mean more when based on standard containers. It is axiomatic in the trade that goods are more easily sold when packed in containers with which the retail trade is familiar. The retail trade quickly becomes familiar with standard sizes, and hence a dealer does not hesitate to buy through fear that he may be able to get a little larger container from some other firm.

Benefits to retailer.

The retailer profits because he knows the exact quantity of any commodity he is getting. He knows that he can buy from any dealer with the assurance that he is getting the same sized container from him that he could from anyone else. Experience in handling goods in standard containers enables him to figure his retail price more readily.

The principal advantages secured by the consumer through standardization is the assurance that he will not get short measure when he buys by the basket. To the city consumer who makes many purchases by small quantity and by weight this does not appear to mean so much. However, anything which tends to cut down waste or expense in the marketing process helps the consumer to some extent, and if the retailer has greater assurance as to the quantity he is purchasing he is enabled to figure his costs a little more closely.

To the consumer who makes purchases from roadside stands, a practice which is growing rapidly, the standardization of baskets is a great protection. In many cases his purchase is delivered to him in the basket. Even when it is delivered to him in a paper sack the unit of sale is generally a basket of some standard size.

With the exception of the consumers, the groups mentioned in the foregoing long since recognized the advantage of having a simplified set of containers. They realize they have profited through standardization and are ready to cooperate in the enforcement of standard container laws. The consumer generally is unaware when such legislation is enacted and hardly realizes that any change has taken place, even though he has been protected by the elimination of a fraudulent package.

Probably this is true of the consumer's attitude toward any law affecting weights and measures, whether it relates to standard containers, correct scales, or accurate gasoline pumps. This attitude is natural and simply emphasizes the need of vigilance on the part of the servants hired by the people to protect them.

INTERCHANGEABLE GROUND GLASS JOINTS

Commercial Standard Widely Accepted by Industry to Be Effective August 1, 1930

The commercial standard for interchangeable ground glass joints has been approved promptly and with many indications of whole-hearted approval by all interests of the industry and the ratification of the project was accordingly announced on April 1.

This standard provides for interchangeability of ground glass joints as used in physical and chemical laboratories thus eliminating the necessity of tedious hand grinding in an effort to secure a tight joint. Further economies are possible with the use of interchangeable joints in that breakage of complicated apparatus requires only replacement of the broken part.

The convenience and economy in the use of interchangeable ground glass joints was evidenced by the large demand for them from users. Accordingly, several manufacturers began to produce interchangeable ground glass joints, but unfortunately they developed individual standards of size and taper and consequently the product of one manufacturer was not interchangeable with that of another.

The manufacturers, together with the larger distributors of laboratory apparatus, saw the advantages of complete interchangeability and requested the assistance of the National Bureau of Standards in establishing a commercial standard for the guidance of all interested in interchangeable glass joints whether as producers, distributors, or users.

Preliminary standards were formulated by a committee of manufacturers, and these in turn were recommended for presentation to the industry at a general conference of all interests held at the Bureau of Standards, December 17, 1929.

The commercial standard had the immediate support of practically all the manufacturers, many of the larger distributors, and large numbers of users as represented by college and commercial laboratories. It provides a definite basis of operations for the manufacturer and the greater usefulness of standardized interchangeable joints effected through complete interchangeability will increase the demand. By this action the distributor's problem is simplified since there is little chance of confusion and misunderstanding with a single well understood standard of size and taper and the consumer is benefitted as previously mentioned and by all of the other features of standardization without forsaking service or utility.

The commercial standard becomes effective on August 1, 1930, after which time joints made in accordance therewith will bear the following symbol $\overline{\$}$ indicating standard taper and will also be marked with the diameter size and a designating name or trade-mark of the manufacturer or distributor.

CANADIAN ELECTRICAL CODE

The 1930 Edition of Code in Line With American National Electrical Code

The 1930 edition of part 1 of the Canadian Electrical Code has been issued by the Canadian Engineering Standards Association at Ottawa. This part of the Canadian code agrees rather closely with the National Electrical Code as published by the National Board of Fire Underwriters in the United States, but is somewhat briefer owing to the omission of some of the rules.

The Canadian Electrical Code also contains some safety rules which are in conformance with rules in the National Electrical Safety Code. It contains some material not found in the other codes, such as a section on maintenance and operation, instruction for resuscitation from electrical shock, a table for lead-covered communication cables, and a cross reference list showing changes from the previous edition.

A local code committee was organized in each one of the Canadian Provinces. All of these committees have contributed to the revision, which was in the hands of a committee of the Canadian Engineering Standards Association. The previous edition of the code was officially adopted by the Provinces of Nova Scotia, Quebec, Ontario, Saskatchewan, and British Columbia. It has been adopted by municipalities in other Provinces and has legal recognition in Alberta. It is anticipated that it will become generally used throughout Canada.

CENSUS TO GATHER DATA ON CONSTRUCTION INDUSTRY

Information Secured is Expected to Form Basis for Promoting Greater Efficiency and Standardization Within the Industry; Comprehensive Inquiry First One of Type Made by the Federal Government

By Dr. Alanson D. Morehouse, *United States Bureau of the Census*

The first census of the construction industry ever undertaken by the United States Government is now under way as a part of the 1930 decennial census. It is being taken at the urgent request of the contracting group of that industry, as, for many years, leaders in the industry have realized the necessity of obtaining more complete and accurate statistics of their business in order to promote efficiency and standardization in the conduct of the construction industry.

While in the past they have been largely forced to use estimates and general assumptions, it is now expected that essential facts will be available for this purpose as a result of the census. It will be particularly pertinent information at this time when President Hoover is emphasizing the importance of public works construction as well as private construction, as "the balance wheel of American industry," in securing and maintaining general prosperity throughout the Nation. The figures obtained will also furnish the basis for further statistical research of even a more intensive nature.

First census of this nature.

Construction statistics have previously been gathered by various private agencies to serve certain particular purposes, but a comprehensive census, such as that now contemplated, is, of course, not feasible for such private agencies to undertake.

As a result of the present census, information will be available concerning the approximate number and kind of general contractors, subcontractors, and operative builders throughout the United States and the total value of work performed by them in the various States and cities during the year 1929. General contractors will classify themselves as building, highway, grading, waterworks, dredging, railroad, and the other contractors. Similarly subcontractors will indicate whether they are engaged in carpentering, concreting, heating and piping work, electrical work, masonry, plastering, sheet-metal work, marble and tiling work, or other trade.

Questions regarding the number of skilled and unskilled workmen on the pay rolls, and the total annual pay roll, will have a direct bearing on the matter of employment in this great industry which ranks second among all industries in the United States. It will also indicate the seasonal character of construction work of various kinds. The trend toward rental rather than the ownership of construction equipment in the endeavor for greater efficiency and lower unit costs will also be disclosed, as well as the various items of expense, such as rent, liability insurance, bond premiums, and all other overhead expenses. This "cost of industry" will be of value to each individual concern engaged in any particular type of construction, enabling them to compare their overhead expenses with the average overhead of concerns in their line, thus informing them as to whether or not they are in line with their fellow contractors and spurring them on to greater efficiency in their methods.

Scope of data requested.

In general, the inquiries on the report blanks are designed to obtain information of the number of salaried employees and total salaries paid; the number of skilled and unskilled workmen employed on specific dates or nearest normal working day during each month of the year; total wages paid them during the year; the working days per week; time lost due to strikes, lockouts, and accidents; equipment investment and cost of rented equipment; rents, interest, bond premiums, compensation and liability insurance paid; the types and values of general contract and subcontract work performed; the total value of the year's operation by type of work, by class of construction, and also by class of ownership; the value of construction in the city in which the firm's office and each branch office is located; also in the State excluding such city, and in other States; and finally the value of the various materials used and building equipment installed on the various construction projects. Manufacturers and lumber and material dealers will be able to gain much valuable information from the last-mentioned item, showing them the location and size of their prospective markets for all their various lines. No attempt, of course, will be made to ascertain in any way an estimate of the contractor's profits.

Data required by Congress.

Replies to the inquiries are required by act of Congress. All information furnished by the individual contractor will be held in strict confidence. It will not be used as a basis for taxation, but only for statistical purposes. Only employees of the Bureau of the Census, sworn to secrecy, will be permitted to examine the reports, and the information when analyzed and made available will not disclose, exactly or approximately, any of the figures in any individual report.

A committee representing contractors' associations and the Advisory Committee on Distribution composed of nationally known business men appointed by the Secretary of Commerce, and various persons informed on construction matters, have materially assisted the Bureau of the Census in the preparation of the report blanks and are otherwise helping in the prosecution of the work. While some of the questions asked may seem burdensome or superfluous, each of them has been carefully considered by the contractors' committee and all others concerned in preparing them, and they were considered necessary to obtain a true picture of the activities and tendencies of the construction industry.

The benefit of this census comes primarily and chiefly to the contractors themselves, who should keep in mind that the results of this first effort toward obtaining a comprehensive understanding of their great industry will depend upon their cooperation and upon the completeness and promptness with which they fill out the reports.

CURRENT ACTIVITIES OF AMERICAN MARINE STANDARDS COMMITTEE

Outlines of Proposed Standards for Port Facilities Approved; Executive Board has Approved Several Standards for Promulgation

Outlines of proposed standards have been approved by the technical committee on port facilities, subject to a number of suggested modifications. Preliminary drafts, in which the suggestions have been carried out, have been prepared for submittal to those members of the American Marine Standards Committee concerned in dock construction and equipment in connection with ship operation, also to the corporate members of the American Association of Port Authorities. This is the first group of proposed standards for port facilities to be submitted for definite action as a result of the recent organization of the technical committee on port facilities in collaboration with The American Association of Port Authorities.

New standards promulgated.

At its recent meeting, the executive board of the American Marine Standards Committee approved several standards for promulgation, subject to incorporation in final drafts of suggestions received in connection with the membership vote, as far as such can be correlated. These standards are as follows:

Specification for 2½-inch unlined linen fire hose. This is a revision of a prior marine standard specification promulgated in 1926 and embodies the present requirements of the Underwriters' Laboratories. The revision is in line with the committee's announced policy to review its standards from time to time, and to revise them if and when deemed advisable, in order to keep abreast of industrial progress and requirements of service.

Specifications for uniform outfits for merchant marine officers. This defines items to constitute the standard outfit, and rank and corps insignia, and contains specifications for garment materials and manufacture, and standard buttons. The general style of the uniforms is similar to those worn by officers of the United States Navy, with, however, different insignia and buttons. The project was undertaken with the thought that general adoption of standard uniforms would enhance the prestige of the merchant marine officers on shipboard and ashore, promote national esprit de corps, and conduce to material economy for manufacturers and users. Distinguishing insignia of different lines or services is to be worn on the cap only.

Specifications for materials for insulation of piping and machinery subject to temperatures over 550° F., comprising molded insulation coverings, calcined diatomaceous earth, and diatomaceous earth insulating brick and mortar.

Fair-water caps for propeller hubs on ships fitted with a contrapropeller or an Oertz rudder. This is complementary to a standard promulgated in 1927 for the conventional type of fair-water cap for built-up propellers with recessed blades used in ordinary installation.

Condenser tube ferrules and tube sheets.

In view of conflicting criticisms relative to the marine standard promulgated in 1926, it has been decided to resubmit the standard to the subject and technical committees concerned for review and recommendations as to advisability of revising it.

Projects in development.

A recent report issued by the secretary of the American Marine Standards Committee shows, among others, the following projects in course of development: Fittings for oil-tight hatches, standard sockets for hatch beams, supply and exhaust cowls and fittings for natural ventilation, air ports, cleats for ships, steel for ship construction, flanged pipe fittings and pipe flanges for three zones of pressures up to 400 pounds, structural steel cargo masts for docks, and platform cargo slings.

Some time ago it was proposed that manufacturers of materials, fittings, or appliances, whose product is in accordance with American marine standards, state this fact in their advertisements. The secretary of American Marine Standards Committee states that encouraging replies, indorsing the suggestion, have been received from various sources.

Publications available.

Printed publications containing standards promulgated by the American Marine Standards Committee are available to prospective users, also to institutions teaching naval architecture and marine engineering. A list of the publications is obtainable from the secretary of the committee. The publications can be purchased at nominal prices from the Superintendent of Documents, Government Printing Office, Washington, D. C.

INDUSTRY REVIEWS PAVING-BRICK SIMPLIFICATION

The 1929 survey of shipments of vitrified paving brick showed an increase of 3.2 per cent in adherence over the year 1928. It was reported that 87.8 per cent of the actual shipments of paving brick were in accordance with the six recognized varieties and sizes as recommended by the permanent committee. At the April 1, 1930, meeting of the committee, careful consideration was given to the survey material, to determine whether further eliminations or additions should be made. No changes in the present set-up were justified by the volume figures, and simplified practice recommendation No. 1 was reaffirmed for the period of another year.

STUDIES OF TEXTILES ARE CONDUCTED TO INCREASE USEFULNESS AND WEARING QUALITY

Weaver's Art Ancient; Varieties of Textile Products Presents Problems for Technician; Substitute for Parachute Silk Sought; Heat-Retaining Property of Fabric Useful Characteristic of Clothing and Bedding

By Henry D. Hubbard, *National Bureau of Standards*

To spin yarn and weave cloth is an ancient art. Power looms have made it a giant machine industry. It is easy to visualize a loom; not so easy is it to picture the infinite detail of processing which makes the weaver's art. The National Bureau of Standards, with its experimental textile cotton and knitting mills, is equipped to produce many kinds of woven fabrics, and is engaged in researches in which desired characteristics are being designed into types of fabric of great diversity and utility. Research is transforming the textile industry.

View in National Bureau of Standards experimental cotton mill

The bureau has several of these complete manufacturing plants, where actual mill operations can be duplicated, under carefully controlled conditions.

Weaving is so old that we see it in the nest building of birds, while spinning is the art of spider and silk worm. Man now spins his own fibers in attempts to duplicate nature's finest fiber—silk. Meanwhile we are learning how to build any desired quality or characteristics into fabric. This is done by measuring the characteristic, then building the measures into the yarn spin and weave. The bureau deliberately built a cotton fabric as a substitute for linen for use as airplane wing cloth when the world's linen supply was cut off.

Each of the endless varieties of textile products presents problems for the technician, the solution of which enhances their utility, creates new uses, promotes comfort and well-being of the user.

Parachute function depends upon fabric qualities.

How quickly a parachute opens when the draw string is pulled depends upon two fabric qualities—slip quality and resiliency. The first step is to measure these. The bureau is developing methods and devices for measuring these characteristics and for measuring the permeability of the fabric to air. The development of these devices will give basic data pointing the way to improved parachute fabrics. Injury was found in such fabrics which was traced to the abrasion and burning when the fabric rubs on the shroud lines. This was minimized by suitably oiling the lines.

In the search for a good substitute for parachute silk, it was found that cotton yarn treated with cellulose ester dope, combined with mercerization, produced a yarn with many equivalent properties of silk. Some 26 fabrics were examined for suitability. It was found that parachute silk of American make could be made equal to or superior to imported cloth. To insure the high quality desired, the bureau drafted technical specifications.

Studied different fabrics.

For balloon gas cells and airship cloth it is important in reducing weight to produce a surface requiring minimum rubber covering. In the bureau's experi-

mental cotton mill some 44 different fabrics have been woven under constant tension and made up with 90 by 90 threads per inch and different types of weave. They have all been tested for breaking strength, stretch, tear, weight, thread count, crimp, and yarn size as a basis for selecting the most efficient cloth.

A balloon envelope must be gas tight. Gas tightness is a primary merit for construction of balloons, dirigibles and kite balloons in which hydrogen is used. Test methods were developed by the bureau to measure this essential quality. They are judge and jury of permeability.

In a rubber-coated balloon fabric the hydrogen and the air pass through the rubber film in opposite directions, each dissolving in the rubber in the process. The effects of temperature, pressure, humidity, and time were carefully measured as a basis for improving the performance of balloon fabric.

Heat-retaining property of fabric.

The heat-retaining property of fabric is a most useful characteristic of clothing and bedding. For blankets it is a chief merit. To buy a blanket is to buy heat-retaining power. The measurement of the rate of heat transfer through blankets then becomes the criterion for judging their primary utility.

Such apparatus and the technical method for measuring the heat-insulating quality of blankets were developed in the textiles laboratory of the National Bureau of Standards. Heat insulation varies with the number and size of the enmeshed air cavities and the ease with which air passes between them. This may be controlled in the manufacture if suitable measured data are available. The research developed the importance of weave structure in retarding the escape of heat through a fabric.

The outcome of the research was to stimulate the production of blankets with enhanced heat-retaining quality. The conservation of this quality in laundering was also given consideration and "renapping," if effectively done, retains this quality. Renapping is now a laundry operation.

When the cotton fabric was the framework of automobile-tire construction it became important to devise test methods of the desirable traits of such fabric in order to measure strength and serviceability. It was found that air moisture might contribute as much as 8 per cent to the weight of the tire, and when used to increase the strength might be as high as 10 per cent. The standard test methods devised by the bureau avoided or settled disputes and permitted more accurate comparison of quality, so that gradual improvement might be effected with each new lot studied.

Cord tires studied.

When cord tires were first produced the bureau was asked to cooperate in studying the relative efficiency of fabric and cord tires. It was the bureau's demonstration of the high efficiency of the cord tires that is credited with the rapid and practically complete transition to the cords, at a saving estimated by the industry as equal to $40,000,000 a year to the users of automobile tires.

A device is now built at the bureau to simulate the effect of walking wear of carpets and rugs. A horizontal stress and a vertical pressure (150 pounds) are provided so that a slippage caused by the rotation of a disk produces wearing stresses comparable to that caused by the movement of the shoes in walking. The measure of wear with this instrument is the thickness of the carpet.

With this device both the wearing forces and the resulting wear can be accurately measured and directly correlated. This is typical of the simulated service measurements which are characteristic of laboratory research.

A study is in progress based upon the results with the object of determining the relation between the carpet structure and the resulting wear. From the result of this research carpet and rug makers may design their fabrics to minimize wear and prolong the service of these useful and ornamental floor coverings.

MEASUREMENT OF X RADIATION

Thimble Chamber Inadequate for Physical Standardization of X-Ray Dosage, National Bureau of Standards Finds

Heretofore the use of the "thimble" ionization chamber (fingerhutkammer) has been the only method employed for the comparison between primary standards of different laboratories, according to a paper of the National Bureau of Standards dealing with the precise calibration of the portable X-ray dosage meter against the standard ionization chamber.

While the thimble chamber is adequate for the purposes of medical dosage measurement, it is questionable whether such a chamber will meet the exacting requirements of interlaboratory comparisons. The precise calibration of two thimble chambers is discussed in this paper. Five principal factors determine the accuracy of such a calibration, and it is shown that the errors are, in general, all in the same direction. It is shown that the X-ray beam must have a uniform section sufficient to cover the thimble chamber and yet not be so diaphragmed that off-focus radiation may impair the readings of the standard chamber.

The chamber must be carefully aligned in the beam experimentally and not merely centered on the basis of its geometrical shape, since the distribution of measured ionization is found to vary considerably over the length of the chamber. In the investigation of the standard ionization chamber the special conditions affecting the applicability of the inverse square law were described. The same general conditions were found to hold true for the thimble chamber, indicating the necessity of making a careful analysis of the diaphragm system before proceeding with the calibration of a thimble chamber.

The "wall effect" of two thimble chambers was studied, and the very strong dependence upon quality of radiation indicated that any intercalibration by means of such a chamber will be valid only under identical conditions of voltage, filtration, and wave form of generator. The work on the whole indicates that the thimble chamber is entirely inadequate for physical standardization of X-ray dosage.

RATIONALIZATION IN GERMANY

New Book Shows that Rationalization in Germany Arose Out of Economic Postwar Conditions and Stresses the Importance of International Cooperation

At the end of last year a book appeared which is of the utmost importance to students of rationalization. The Reichskuratorium fur Wirtschaftlichkeit in Berlin, which has been in existence for eight years and a half, has combined the historical origin and present position of the rationalization movement and rationalization methods in Germany, in a comprehensive handbook of nationalization compiled by Dr. Fritz Reuter.

In Germany, as in many other countries, rationalization arose out of the economic scarcity caused by the war. The need for it, however, did not end with the war, and the postwar period, in which money was at first plentiful under inflation and then scarce when stabilization followed, gave German rationalization a particular character of its own.

Walter Rathenau's early recognition of the fact that the war would swallow up raw materials in hitherto undreamed of quantities and, therefore, call for the husbanding of available supplies, had two consequences: It acted as a spur to technical invention in its search for new methods of economic production or for substitute materials, and it led the German industrialists to group themselves together in war-time associations. This is perhaps the reason why team work and technical rationalization have played so large a part in the rationalization movement in Germany.

The fact that Germany for many years had only one big customer, namely, the State, was the cause of a strong movement toward standardization, which began with the creation of the standardization commission in the spring of 1917, at first for the machine industry only. Thanks, however, to its inherent soundness, the idea of standardization soon spread to all other branches of industry.

But German science had more to offer to industry than technology alone and, as the war absorbed more and more men, industry applied for aid to other spheres of knowledge. In particular, it learned from the psychologists how to select and employ its human material. As in the United States and Great Britain, so too in Germany, the beginnings of industrial psychotechnology date back to the requirements of war-time industry.

It was the conclusion of peace which decided that, of these two lines of development, the technical should at first outstrip the human element. Industry, and especially machinery, had to be converted to peace-time production, and at first money was available in sufficient quantity, though steadily depreciating. Thus technical rationalization was both necessary and possible. On the other hand, human material was suddenly forthcoming in larger supplies than ever, since not only did the demobilized army swell the ranks of industry, but the two sexes competed for employment.

Nevertheless, the collapse of the currency and stabilization soon showed how short of capital Germany had really become, and thus it was that the German rationalization movement began to be dominated by the idea of "efficiency." The handbook contains continual references to this motive. "The great advantage of flow work," we find, "consists in the saving of capital. This saving is due on the one hand to the fact that, owing to the abolition of periods of idleness, there are fewer articles in process of manufacture. On the other hand, the shortening of the processes allows capital to be more quickly turned, provided there are satisfactory sales facilities."

"Provided there are satisfactory sales facilities," that is the important qualification which determines the value of all technical rationalization. Hence, the term "efficiency" employed in the title of the German central organization; this expression is taken not from science but from political economy. Hence, too, the establishment of a German organization to study business cycles, the resort to marketing analysis, the study of sales questions and the possibilities of rationalization in commerce. On page 773, we find the following passage:

> The problems of the distribution of commodities are becoming more and more prominent in the German rationalization movement. * * * Trade is characterized—especially in its own particular sphere of sales—by the complete overshadowing of the human factor.

In the main, however, it is man as a producer which gives the book its special stamp. As an example we may take the exceedingly instructive section on "Rationalization as a means of vocational training," in which we read as follows:

> Though there is much talk to-day of rationalization, the reference is nearly always to purely technical rationalization. The rationalization of the human factor as an important element in the process of manufacture has hardly begun. Germany's wealth consists of her labor resources. Vocational selection is the means by which these resources can be still better, because more rationally, employed, and by which they can be made more productive than they have been in the past.

The nature of the gradual growth of the rationalization movement in Germany appears as much from the history and description of its spheres of work as from the results which the book quotes as having been already obtained. In addition to its central organizations, there are also numerous departments at work in various special branches of labor, and noteworthy successes have already been recorded. The rapid development of a special branch of rationalization can in nearly every case be explained by the particular circumstances of the case; simplification and standardization were inspired by the need for avoiding waste; economy in heating, by the scarcity of fuel in the post-war period; time studies, terms of delivery, and testing of materials are the result of transformations and uncertainties during the war and the period of transition. But even if the development of rationalization in the different branches appears unequal, and if some seem to have received less consideration than others, that is not because the Reichskuratorium shut its eyes to certain problems, but because it had to deal with the most urgent first. This is clear from a passage

concerning the part played by vocational selection in social policy.

The difficulty of the problem with which we are here faced consists in the fact that the rationalization of all industry and the technical rationalization of the individual concern, are two different ideas which do not always coincide. There can be little doubt that the harder problem to solve is that of rationalization as a whole.

Here is a problem still unsolved, but is not the posing of a problem the first step toward its solution?

The international reader of this book will add one important fact among many others, to his knowledge. He will learn, if he has not already done so, the importance of international cooperation. Not only does the Reichskuratorium deal in a special chapter with rationalization in foreign countries, from which it has received many suggestions, but more important, this comprehensive survey of the rationalization work of a nation shows us that while all countries are confronted with similar economic problems, they can be of great assistance to one another as regards the methods of dealing with these problems. (Bulletin of the International Management Institute.)

QUALITIES OF RUBBER STUDIED TO INCREASE UTILITY OF PRODUCTS

Methods of Reclaiming and Regenerating Material are Developed by National Bureau of Standards

By P. L. Wormeley, *National Bureau of Standards*

One of the subjects being investigated by the rubber section of the National Bureau of Standards is the regeneration of old vulcanized rubber, which differs from reclaiming in that while the latter aims chiefly to recover the rubber from old rubber products, in regeneration an attempt is made to restore the old vulcanized rubber as far as possible to the condition of new unvulcanized rubber.

To achieve this end several things must be accomplished. It is first of all necessary to remove the sulphur which has combined with the rubber during vulcanization.

Overcome effects of aging.

It is also necessary to overcome the effects of aging, which consist partly of oxidation of the rubber, but also include other changes which are not yet fully understood, and, finally, it is necessary to devulcanize the rubber; that is, to reverse those changes in the physical characteristics of rubber which were brought about by the process of vulcanization. This last step may or may not be bound up with that of desulphurization.

To solve these problems it is desirable first of all to know just what constitutes vulcanization; that is, to understand just what physical and chemical changes are involved in the process of vulcanization. Back of this is the need of a better knowledge of the chemical constitution and physical structure of rubber, both raw and vulcanized. Very little real knowledge is available on any of these questions at the present time.

Removal of sulphur.

Work has been done on the removal of sulphur from vulcanized rubber. In the course of this investigation it was found desirable to have a method of determining the amount of sulphur in rubber which would be both rapid and reasonably accurate. Such a method has been developed.

Another important result of this research is the discovery that all vulcanized rubber is continually undergoing a slow chemical decomposition involving the splitting off of the elements of sulphur and hydrogen (in the form of hydrogen sulphide) from the rubber-sulphur compound. This decomposition is, therefore another factor in the "aging" of vulcanized rubber, and it also presents a new problem in the regeneration of rubber, since it makes necessary the replacement of the hydrogen lost from the rubber in the course of this deterioration.

Insulation for submarine cables.

At the request of the Signal Corps of the Army, the electrical division of the Bureau of Standards undertook several years ago a study to determine the suitability of rubber as an insulating material for submarine cables. Gutta-percha, which is commonly used in deep-sea cables, is available in limited supply, and that under foreign control.

The bureau, as a result of its researches, reported that rubber insulation could be made which was fully equal to gutta-percha in electrical properties.

In the course of this work it was found that little was accurately known about the electrical properties of rubber. Few measurements had been made on some electrical properties; in case of other properties there was no dearth of measurements, but these measurements did not agree among themselves. Each sample of rubber seemed to follow a law of its own.

The cause of the variability was found to reside not in the rubber itself but in small amounts of other substances which the plants produced along with rubber, such as salts, proteins, resins, and sugars. When these substances were removed the differences between rubbers from various sources vanished. Purified rubber is constant in electrical properties, whether it was derived from the guayule shrub in a Mexican desert or from a vine in tropical Africa or from a Hevea tree on the Amazon or in the Far East.

Effects of temperature and pressure.

Measurement of the electrical properties were made on samples of the purified rubber vulcanized with increasing proportions of sulphur so as to form an unbroken series of materials from soft to hard rubber.

The manner in which temperature affects the properties of these substances was studied all the way from −80° C., at which temperature even the soft rubber became brittle as glass, up to 150° C., when some samples began to decompose.

With increasing temperature the dielectric constant and power factor of rubber increase to a maximum and then decrease. The temperature at which this maximum occurs increases with the percentage of sul-

phur combined with the rubber. Resistivity, in general, decreases with increasing temperature.

Measurements were made at several frequencies, and the range is now being extended to include radio-frequencies. The properties of rubber at high frequencies are generally quite different from those at low frequencies.

The effect of pressure on rubber is important, both for theoretical reasons and for practical use by the submarine-cable engineer. An increase in pressure has an effect in the same direction as a decrease in temperature.

Electrical tests are being made under pressures up to 10,000 pounds per square inch, duplicating in the laboratory the conditions at ocean bottom.

Research directed by committees.

The bureau takes an active part in committee work of the American Marine Standards Committee, the American Standards Association, the American Chemical Society, and the American Society for Testing Materials. A very close contact is maintained with the Rubber Association of America in promoting standards of quality and performance.

The American Chemical Society maintains a research fellowship at the bureau to investigate those problems which are of the greatest importance in the standardization of test procedure. Studies have been made of the effect of humidity and temperature, during the preparation and testing of samples, upon the tensile properties and resistance to abrasion of rubber compounds. Other studies have been started which are of vital importance to the industry. The program is being carried out under the direction of a committee.

The greatly increased consumption of rubber in recent years has been accompanied by rapid advances in the art of manufacturing rubber products. Efforts toward standardization are playing an important part in the development of the rapidly expanding industry.

The brief references made to standardization work and researches that have received attention at the Bureau of Standards are illustrations of important problems now confronting the rubber industry.

STANDARDS YEARBOOK FOR 1930

New Issue Reports the Activities in Standardization Throughout the World During 1929

The Standards Yearbook for 1930, which was released last month, is more than a summary of interesting news. It covers broadly the developments in standardization all over the world during 1929. In science standards are the basis of countless kinds of measurement. New methods of measurement may begin in the laboratory. They graduate into industry. A measuring device at first a novelty of the laboratory may later control the process of a giant industry—the pyrometer, for example, or the photo-electric cell.

Industry has become a vast complex of measurements controlling the design, making, and use of its products. Broadly, standardization is the measured control of industrial evolution. Hence, it reaches out to touch every field of human activity. It includes simplification and "rationalization" as parts of a system designed to place the measurements of science in the controlling positions of industry.

The current yearbook begins with an article on the Government's interest in advancing standardization and simplification, a discussion prepared by the former assistant director in charge of the commercial standardization group of the National Bureau of Standards.

Organizes International Standards Association.

The yearbook points out that to promote uniformity of national standards, wherever this is feasible and desirable, and to exchange information on standardization work in the different countries, an International Standards Association has been organized. This is supported by the national standardizing bodies of the following 18 countries: Austria, Belgium, Czechoslovakia, Denmark, Finland, France, Germany, Holland, Hungary, Italy, Japan, Norway, Poland, Rumania, Russia, Sweden, Switzerland, and the United States. Thus, what is being done in the interests of national standardization in the United States by the American Standards Association is about to be undertaken on a world-wide basis and should result in great benefits to all the countries concerned. In this connection it is interesting to note that 21 nations now have national standardizing bodies, though they do not all support the international association at the present time.

The yearbook records gratifying progress in the redetermination of the electrical units on a fundamental basis, thus tying them in with the mechanical and thermal units, since all refer back to standards of length, mass, and time. This work is being directed by the International Bureau on Weights and Measures, the research work itself being divided among the various national laboratories according to their facilities.

The publication of a revision of Rowland's preliminary table of solar-spectrum wave lengths is of fundamental importance in astronomy and physics. This paper was issued by the Carnegie Institution, of Washington, during the year and is based upon a recommendation of the International Astronomical Union. Part of the work was performed by the spectroscopy section of the National Bureau of Standards.

Institute of geography and history.

An important event in connection with international standardization was the organization meeting, held in Mexico City, September 16 to 22, of the Pan American Institute of Geography and History. This institute is designed to further the interests of geography throughout the Western Hemisphere, this science being considered to include geodesy. Already there is an arc of continuous triangulation from northwestern Canada, across the United States, to the southern border of Mexico. It is hoped in the near future to extend this

arc southward into Central and South America. Undoubtedly the institute will have this in mind as one of the projects to advocate and push forward.

In his letter of transmittal to the Secretary of Commerce, Dr. George K. Burgess, Director of the Bureau of Standards, points out that while, as in earlier issues of the yearbook, special attention has been paid to the organization and procedure of the national standardizing agencies in the United States and abroad, the present volume likewise contains outlines of the activities and accomplishments of State, county, and municipal agencies, as well as those of technical societies and trade associations, "with special emphasis on their accomplishments during the year 1929, their program for future work, and the methods employed by each organization to encourage or facilitate the use of its standards and specifications."

Developments in calendar simplification.

Included among the special features of the 1930 yearbook are certain developments in the attempt to simplify the calendar (contributed by C. F. Marvin, Chief of the United States Weather Bureau), and a bibliography of recent publications on standardization, furnished through the courtesy of W. A. Slade, chief of the division of bibliography of the Library of Congress.

Copies of this publication (Miscellaneous Publication No. 106 of the Bureau of Standards) may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 75 cents each.

STANDARDIZATION AND RESEARCH WORK AND WORKERS AT THE NATIONAL BUREAU OF STANDARDS

Results Enter into Nation-Wide Practice in Industry; Successful Enterprises at the Bureau Promote General Welfare of the American People

By George K. Burgess, *Director National Bureau of Standards*

"A city of science set on a hill," is a phrase applied to the National Bureau of Standards. Its score of laboratories is the workshop in which are solved some of the most interesting problems for science and industry.

A remarkable aspect of the work is the great number of specialists. Here are dye researchers who specialize in the study of sensitization of photographic plates. The work ranges from how to build a house to such remote themes as measuring the temperature on the polar ice cap of the planet Mars.

Here is another who studies quartz disks and their properties, especially those useful in the control of radio-frequency. Here is another who studies the behavior of air streams around objects which must encounter the air with speed, precision, or efficiency. Here is another group who specialize in determining the properties of steam. One expert devotes his time to determining the heat-insulating properties of materials. A laboratory is built for the study of the atoms, another for the study of the rays characteristic of the atoms.

To tell the full story would give a romance and epic of achievement scarcely excelled by similar organizations. At the basis of scientific industry are the units and standards of measurements. Bureau workers develop new kinds of measurement. A group of laboratory workers test radium which is sold in the United States according to the strength certified at the Bureau of Standards. A crew of engineers carry the Bureau of Standards' test car from State to State in a nation-wide errand of standardization for the railroad-track scales and the master scales, upon the readings of which $6,000,000,000 of freight rates in America are collected. This work assures fair dealing and mutual confidence between shipper and carrier. Steadily improved accuracy noted in large scales is evidence of the effectiveness of this work.

In the bureau at Washington precise weighings are made by experts whose task it may be to add another decimal place to the testing of weights which must govern the weighings of science, industry, and trade. Here we see balances that must be read from adjoining rooms. Again, the balance must be made in the dark for some scientific purpose where accuracy must be assured to one part in a billion, in weighing crystals in quest of a possible flaw in Einstein's theory of relativity. Another may have to weigh an electrodeposit of silver with unprecedented accuracy as a basis for fixing the unit of electrical current, for the silver deposit is a measure of the electrical current which deposits it.

In other laboratories workers measure the standards of light and heat and certify their corrections as a basis for shop standards in American factories. Accuracy in the countless measurements of industry has its birthplace and continued service in such groups of conscientious, skilled young scientists. Here is an expert ruling linear scales using wave lengths of light directly without any material standard, and doing it so perfectly that there is no measurable error. A skilled glassworker may grind flat quartz disks of 11 inches in diameter without any error in the flatness as great as 1/5,000,000 inch. Few can realize the great skill and science exhibited in this achievement. The world does not know its value nor the effort it requires. Expert men of science, however, do know how fundamental such accurate standards are in the new industries in which precise measurement is a supreme factor.

In a low, 2-story building are radio workers. One group of these ingenious young men is developing radiobeacons to make safe the airways. Others are developing with unprecedented accuracy the quartz crystal control of radio-frequency—the heart and soul of successful broadcasting and reception. A former

chief of this radio laboratory invented the direction finder, which is the basis of to-day's radio fog signals and radiobeacons which make navigation on sea and air safe. The service which this staff has put in radio and aviation can not be measured in dollars.

A special staff of young women is checking the thermometers used to detect fever, doing their part to add to the dependable resources used in diagnosis of the sick. Here is another group whose task is to make sure that the measuring apparatus used by the chemist is accurate and suitable. They equip laboratories in chemistry and medicine with perfect tools for the measurements which safeguard the invalid or make sure measurements of the science upon which recoveries must depend.

In the optics laboratory a group of experts is working to make sure the scientific foundations for measuring color so that a color description may not be a mere matter of chance opinion, but may be specified and obtained reproducibly in the thousands of commercial products where color is a factor of utility. Sealed samples of import sugars reach another laboratory. Here the experts control the accuracy with which sugar cargoes are analyzed in assessing the duty, since our Government desires payment only on the pure sugar content, and accurate analyses are assured by this work.

In a near-by room are being grown new kinds of crystals and the conditions are studied for crystal growth. In the next building metals are studied. The foundrymen are testing out different kinds of molding sand and perfecting processes of casting metals. Here is a complete steel mill with electric furnaces in which the workers can produce any metal or any alloy for research. Here are the rolls, drawbars, and hydraulic hammers which give shape and texture to metal parts. On the next floor the staff is using the microscope to photograph the polished metal surfaces and study the minute crystals, the size and form of which fix the quality of the metals. Some of these are engaged in finding why car rails fail, how a transverse fissure may wreck a train.

In some interesting shops highly trained and skilled laboratory artisans are at work—glassworkers, glassblowers, instrument makers, photographers, foundrymen, and woodworkers. Many new scientific instruments are made for the first time in these shops from designs which the mechanician helps to perfect during the course of the work.

Air navigation owes much to bureau workers on aeronautical instruments. Some 40 instruments essential to perfect flying have been improved or redesigned by these experts. To them in part is to be credited the recent rise of instrument "flying"—air navigation based upon the readings of instruments rather than by observation. Such reliance is essential for flying at night in fogs. These workers also standardize the altitude records which the airplane instruments bring back from high flights. For a polar expedition it was desired to have a photographic sextant. Within the brief time allowed the technician assigned to the task produced a successful instrument which replaced direct observation of the sun's position.

A special group of experts has the interesting task of producing high-speed wind streams to study the behavior of such air streams passing models of skyscrapers, stacks, factory buildings, and the like, and to study the behavior of parts of airplanes or models of aircraft in the wind stratum. Such careful observations and measurements are making aviation of to-morrow. They compare the results on models of stacks with those on full-size tracks.

In a far corner of the bureau grounds a group of young men are at work helping to make the automobile practice of to-morrow. Four members of this group gave their lives in an important experiment which proved that low-volatility liquid fuel could be used in automobile motors. Almost every phase of the modern operation is studied by the workers in this laboratory.

The industrial laboratory houses a small army of research workers. Here scientific men manufacture yarn, cloth, paper, rubber, glass, clay products, and the like under controlled conditions. New processes are discovered. New materials are tried out and the American people profit by the discoveries. Small groups are scattered throughout the country—in the heart of the cement field a group is engaged in testing the cement for Government use. In Columbus, Ohio, there is a clay-products laboratory manned with a technical staff busily at work on ceramics research. In other places electrical bureau workers in the field are studying the disastrous effects of stray currents underground in destroying piping and other metal structures.

In the bureau offices experts are at work on codes of safety and practice. Successful work of this type has been done on codes for electricity, lightning, aeronautics, protection of the heads and eyes, interlocking systems, and others. These codes are in a sense a continuous nation-wide, life-saving service. They assure not merely the safety but in most cases adequacy of the service.

The staff of the superintendent of plant is an interesting group. Their task is to assure continuity and adequacy in a unique and complex set of piped and wired services—gas, compressed air, vacuum, high-pressure steam, exhaust steam, freezing brine, and a great variety of voltages and electrical currents. To keep these circulating through a scientific village of 20 or more buildings scattered on a site of 43 acres is a 24-hour-a-day service by dependable, experienced men. The complex equipment for such services is indispensable in research. For its success much credit is due the staff in charge of the mechanical plant.

A small group at work on the control of sound and elimination of noise has devised means to make the interior of an airplane cabin relatively as quiet as a Pullman car. These experts have given public buildings good acoustical properties where they had seemed hopeless. A similar group is engaged in testing types of structural columns used in bridges and in the design and building of giant skyscrapers. The great Hudson River bridges and the Camden will be the safer for the tests made at the bureau laboratories. The designers and builders of these bridges were happy to receive the reports of the bureau's experts as an assurance of adequate strength and stability.

In one of the newest lines American industry is voluntarily simplifying the sizes and varieties of commercial products, saving hundreds of millions of dol-

lars to the Nation. Standards of size and quality are also being agreed upon by American industry. One writer has characterized the work of the bureau staff in this headline "To do the Impossible is Their Job." Another headlined a descriptive magazine article, "House of a Thousand Wonders." Its workers are engaged on research problems on the frontiers of scientific advance. As they reach fruition the results are published by the Government and the 1,600 publications which have been issued are a monument to the industry of the entire staff, a monument which is more than a shaft of stone. It is rather a spirit of accuracy which in an induring way pervades mechanical industry. The spirit of discovery through industrial research has been stimulated profoundly during the life of the bureau. While practically no industrial research laboratories existed when the bureau was established in 1901, to-day there are hundreds. The work of the bureau staff has also been a stimulus to the establishment of similar institutions in other lands.

Bureau discoveries receive nation-wide adoption.

Only a few types of work can be mentioned, and these examples are mere samples of other enterprises in which the workers of the Bureau of Standards are doing their part in perfecting materials, devices, and processes which are the making of the material civilization of to-morrow. In fact, all through the bureau laboratories are men whose labors will become nation-wide practice in the industries and sciences of the future.

I can only mention the vast amount of correspondence, personal visits to the great industries, meetings of national societies, conferences held here and abroad. Through all of these are diffused the results of the bureau's researches and testing. Through these in a great measure discoveries enter the factory and become permanent productive factors.

The work of some of the staff is so technical that the general public never understands. Its appeal is to the industrial technician through whom its results become factors of industry.

Graduates of the bureau have become heads of industrial-research laboratories. One is chief of a great silk-research laboratory; another is the head of a textile conditioning laboratory; another is just occupying a new laboratory building erected for research in oil; another heads up a large municipal testing laboratory; another has perfected a system of television. To-day is an era of science and the bureau aims to do its full part to bring new science to American industry. Its greatest contribution is to furnish methods of measurements and the measured controls which make industry most effective. In fact, its early development of methods of precise measurement in such great variety was the occasion for the bureau's active part in the industrial applications of such measurements.

The men who have made all this possible many of them sacrificed wealth and position to carry on the work of the institution. Those of us who know the Bureau of Standards best from within believe that the workers here organized and at work stand high among the builders of to-morrow.

The rise of scientific work in the Government during this century has been phenomenal. The Bureau of Standards has shared this development. Nearly 1,000 workers in some 60 specialized groups in administrative duties, scientific research, and testing are actively engaged in the discovery of new materials, new processes, or new devices, perfecting them or the data concerning them through laboratory research. However notable the equipment, it is the men and women of its staff who are responsible for the astonishing list of successful enterprises which flow from the Bureau of Standards' laboratories to promote the general welfare of the American people.

In concluding this somewhat sketchy account of the bureau workers and their work in the research laboratories of the Bureau of Standards, I may quote the appreciation of laboratories by Pasteur, a master mind in the field of scientific research.

> Take an interest, I beg you, in those sacred structures which we designate by the expressive term "laboratories." Insist that they multiply and that we adorn them. They are the temples of the future, of wealth, and well-being. It is there that humanity grows, becomes strong, and becomes better. It there learns to read in the works of nature, the works of progress and of universal harmony; though her works are too often those of barbarism, unreason, and destruction.

1930 HANDBOOK OF AUTOMOTIVE BATTERIES

The Society of Automotive Engineers (Inc.), 29 West Thirty-ninth Street, New York, N. Y., has just issued to its members and others the 1930 revised issue of the S. A. E. Handbook. This handbook is the official publication of the society containing the S. A. E. standards and recommended practices for the automotive and allied industries.

The original standards of the society were first published in 1911 and have been revised from time to time as the automotive industry developed. New standards and recommended practices have also been added to meet the needs of the industry for them. It is difficult to determine the actual value in dollars and cents that these standards have been to the automotive industries without devoting a very considerable amount of time and effort to securing such information, but according to a statement from S. A. E. headquarters a reliable estimate indicates that without these standards the automotive industries would have had to spend something more than $8,000,000 a year more than they do for the same production without the benefit of standards.

FEDERAL SPECIFICATION FOR STORAGE BATTERIES

A proposed Federal specification for storage batteries has been circulated among the Federal Government departments and others interested, for criticism and comment. This tentative specification covers storage batteries of the lead-acid type for starting, lighting, and ignition service on passenger automobiles, motor trucks, and motor coaches. All materials used in the construction of batteries to be purchased under the proposed specification conform, in general, to standards of the best commercial practice. Any correspondence in reference thereto should refer to proposed Federal specification W–B–131.

FACILITIES FOR TESTING STRUCTURAL MATERIALS

Testing Machines, Strain Gages, and Proving Rings for Engineering Tests

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

Those enthusiastic about the possibilities of welding have been making careful studies of this modern method of fabricating metal structural members. The engineering mechanic's section of the National Bureau of Standards is cooperating with the committee on structural steel welding of the American Bureau of Welding by making tests of a large number of welded joints. Materials testing laboratories in different parts of the country are also making tests.

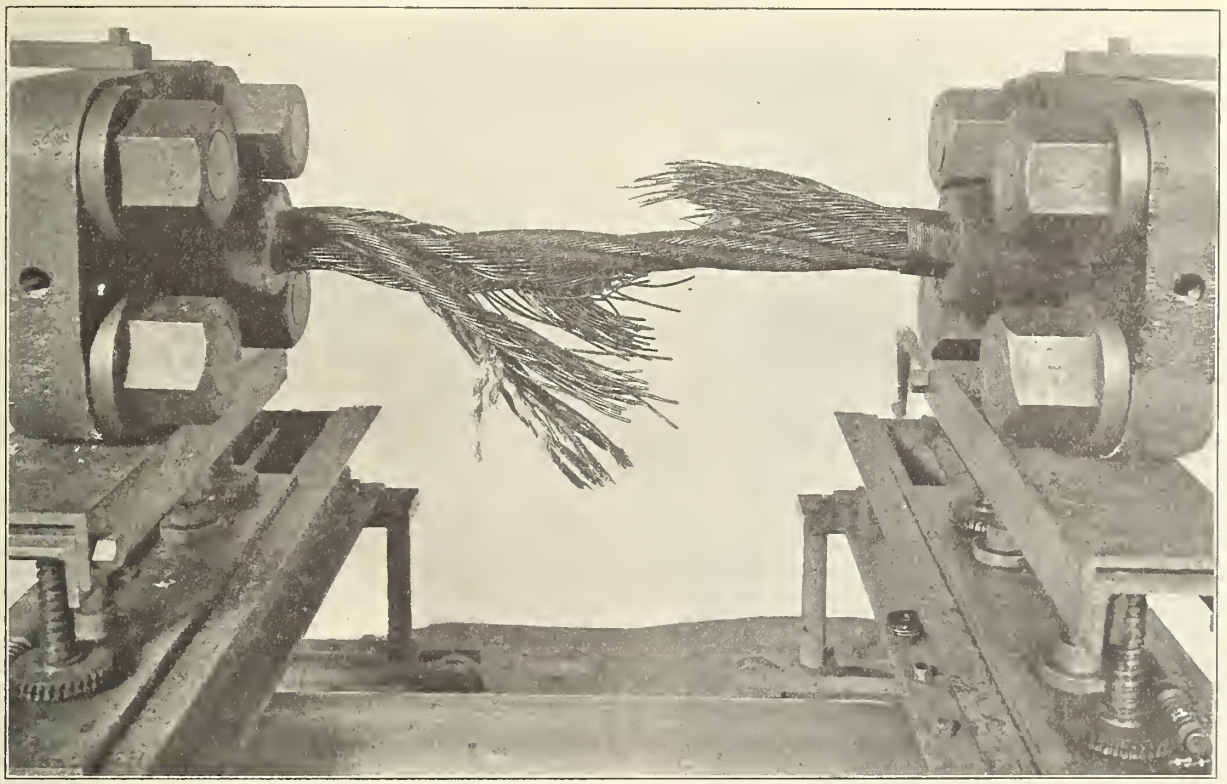
When designing structural members to be fabricated by welding the results of tests on similar specimens should be available. Welding, whenever it can be used, is desirable because the noise of riveting the field connections is eliminated.

Testing machines.

The bureau is equipped with a large group of testing machines for tensile and compressive tests of a wide variety of materials—structural metals and parts, wire rope, brick, concrete. With the resulting data engineers can design structures with minimum material consistent with safety.

Portable machine for testing brick.

One of the oldest materials used in construction is brick, which has many advantages for some buildings. To determine the strength of brick a transverse test, the brick being loaded as a beam, is often used. Heretofore, when brick was purchased on specification, it has been necessary to take samples of the brick to a testing laboratory and await the report before accepting shipment. A portable apparatus, light in weight and easy to use, has been developed during the past five years in our laboratory. This portable brick tester can easily be carried to the job and the strength of the brick quickly determined.



Wire rope (after test) submitted by the Panama Canal, 3¼ inches in diameter

Strain gages.

Without the strain gages to measure stresses in concrete and steel structures there would be no way of checking the computed stresses at different places in these structures. A useful instrument for this purpose is the Whittemore strain gage which has been developed in our laboratory. Experience has shown that readings obtained with this instrument are more consistent than those obtained with other strain gages which are held in the hands of the observer and applied in succession to different gage lines.

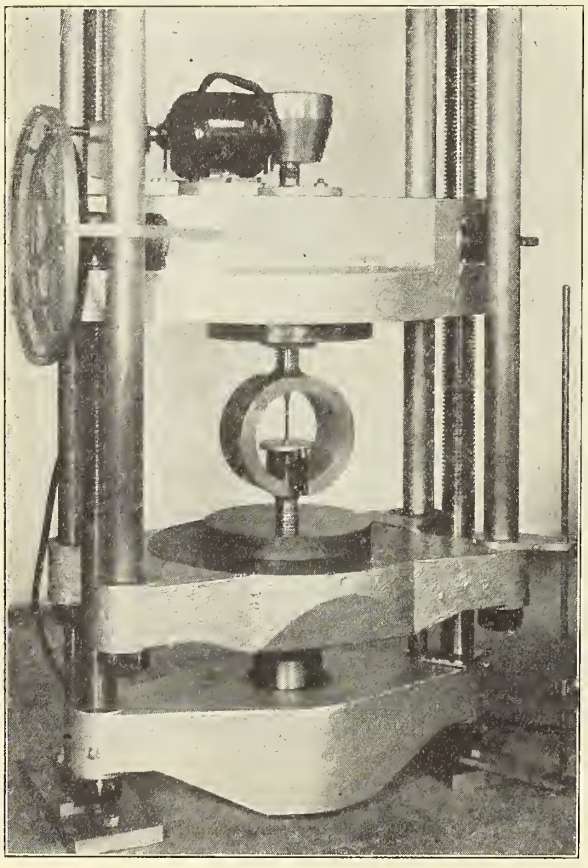
This strain gage has no levers, sliding, or rotating parts in the frame; therefore it is not affected by dust or corrosion in the frame. The frame consists of two parallel side bars connected near their ends by ful-

crum plates which prevent motion of one bar relative to the other except longitudinally.

These strain gages were used on the experimental arch dam at Stevenson Creek, Calif., constructed for the Committee on Arch Dam Investigation of the Engineering Foundation. They were also used to record stresses in the steel framework erected to safeguard the dome of the new National Museum in Washington.

Calibration.

If one buys steel and specifies a certain strength it is essential that the testing machine used in determining the strength give accurate values. The only possible way to obtain commercial accuracy in testing machines is to solve the problem of calibration, which we are carefully investigating.



Calibration of testing machines

Dead-weight machine with proving ring under compressive load.

Although large cast-iron weights are used in the railway test car of the Bureau of Standards, it is not practicable to provide dead weights sufficient to calibrate machines of large capacity. A dead-weight machine of 100,000 pounds capacity has been built and installed. Elastic devices can be loaded up to the capacity of the machine and then used anywhere to calibrate testing machines. An elastic instrument known as the proving ring has been developed here in the bureau. These rings, made of heat-treated alloy steel, range in capacity from 10,000 to 100,000 pounds. They are used to calibrate testing machines after the proving ring has been calibrated in the dead-weight machine.

CONFERENCE CONSIDERS SCREW THREAD CHANGES

Changes Proposed by the National Screw Thread Commission Would Make for Greater Uniformity of Standards

At a meeting of the National Screw Thread Commission held on April 9, at the National Bureau of Standards, several items of importance were discussed. In considering dimensions and tolerances for cut thread taper taps and nut taps, it was provisionally voted to make certain changes in the 1928 report of the commission, to bring it into complete agreement with the report of the sectional committee on small tools and machine-tool elements. The matter of fine-thread series in sizes above 1½ inches was discussed with a view to bringing the report of the commission and the Society of Automotive Engineers Handbook into complete agreement.

Until definite recommendations have been made by the sectional committee, no action will be taken by the commission in regard to revisions of the 1928 National Screw Thread Commission report as suggested to subcommittee No. 1 of the sectional committee on standardization and simplification of screw threads.

Delegates to the World Engineering Congress held at Tokyo, Japan, gave interesting reports of the meeting. They were particularly impressed with the rapid progress being made, and with the extent to which engineering and industrial research is being supported by the Japanese Government.

AUSTRALIAN STANDARDS ASSOCIATION CONFERENCE

Melbourne Conference Reviews Association Activities; Proposed Standard Government Contracts Drafted

During the recent conference of the simplified practice division of the Standards Association of Australia, held in Melbourne, the activities of the association were reviewed, according to information received from the American Trade Commission at Melbourne.

It was reported that the wire netting industry has been surveyed for the purpose of reducing the varieties. It was also reported that a committee appointed by the Victorian Government has drawn up a set of general conditions of contracts covering supply and delivery of purchases for Government departments, which conditions are being submitted to the various Governments, with the hope that five or six general conditions will take the place of the many now operating.

It is proposed, following a survey of cast-iron road gully gratings in use, to hold a conference to reduce the 38 sizes in use to a national standard of 3.

The Pipes and Plumbing Committee of the standards association has now reached agreements as to standard designs for high-pressure water fittings and brass plumbing and sewerage fittings, eliminating 25 per cent of the fittings now scheduled.

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

BUREAU OF STANDARDS JOURNAL OF RESEARCH

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

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

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

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

Issued monthly . Price, $2.75 per year

TECHNICAL NEWS BULLETIN

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

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

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

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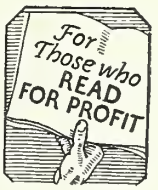

COMMERCIAL STANDARDS MONTHLY

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

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

Subscription price, $1 per year

STANDARDS YEARBOOK FOR 1930

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

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

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

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

THE UNITED STATES DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary of Commerce

AERONAUTICS BRANCH, Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

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

BUREAU OF THE CENSUS, William M. Steuart, Director.

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

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

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

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

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

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

The publicity of statistics on imports and exports.

The study of the processes of domestic trade and commerce.

BUREAU OF STANDARDS, George K. Burgess, Director.

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

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

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

BUREAU OF MINES, Scott Turner, Director.

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

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

Research on helium and operation of plants producing it.

BUREAU OF MINES—Continued.

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

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

BUREAU OF FISHERIES, Henry O'Malley, Commissioner

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

BUREAU OF LIGHTHOUSES, George R. Putnam, Commissioner

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

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

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

BUREAU OF NAVIGATION, Arthur J. Tyrer, Commissioner.

Superintendence of commercial marine and merchant seamen.

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

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

STEAMBOAT INSPECTION SERVICE, Dickerson N. Hoover, Supervising Inspector General.

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

UNITED STATES PATENT OFFICE, Thomas E. Robertson, Commissioner.

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

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

RADIO DIVISION, W. D. Terrell, Chief.

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

U. S. GOVERNMENT PRINTING OFFICE: 1930