DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

S. W. STRATTON, Director

SUPPLEMENT NO. 3 TO CIRCULAR NO. 24: PUBLICATIONS OF THE BUREAU OF STANDARDS

January 1, 1920

This supplement is designed to keep reasonably current the more important facts concerning the Bureau's publications. It is planned that the list of publications (Circular 24) will be revised biennially, and a supplement containing information of the character listed herein will be issued quarterly.

The initial letters preceding the numbers indicate the special series; i. e., S for Scientific Papers, T for Technologic Papers, C for Circulars, M for Miscellaneous Publications. In referring to publications the series initial and number give complete identification.

PUBLICATIONS NOT AVAILABLE

The publications listed below are not available for distribution by the Bureau of Standards, nor for sale by the Superintendent of Documents, but they may be consulted at any of the designated Government libraries listed in this supplement, pages 12–15.

Scientific papers				Technologic papers		Circulars		Miscellaneous	
S2	S64	S114	S161	T1	T59	C1	C29	M18	M29
S3	S65	S115	S163	T2	T66	C2	C30	M20	M30
S6	S66	S116	S164	T14	T73	C4	C34	M22	M31
S7	S68	S121	S166	T25	T74	C12	C38	M25	
S9	S72	S122	S170	T26	T76	C15	C39		
S12	S77	S129	S174	T27	T79	C21	C42		
S14	S79	S133	S177	T28	T82	C22	C45		
S16	S80	S134	S182	T29	T88	C26	C46		
S18	S81	S137	S186	T35		C28	C60		
S20	S83	S139	S187						
S22	S84	S140	S190						
S25	S85	S141	S197						
S27	S90	S142	S198						
S29	S93	S144	S202						
S33	S94	S145	S211						
S36	S95	S149	S217						
S37	S99	S151	S222						
S38	S100	S152	S226						
S49	S106	S153	S243						
S50	S111	S156	S257						
S60	S112	S157	S306						
S61	S113	S158							
S62		S159							

PUBLICATIONS OBTAINABLE ONLY BY PURCHASE FROM THE SUPERINTENDENT OF DOCUMENTS

The publications listed below may be procured only by purchase from the "Superintendent of Documents, Government Printing Office, Washington, D. C.," and all orders should be accompanied by money order or cash (stamps and checks are not acceptable).

Scientific papers	Technologic papers	Circulars	Miscellaneous
S1 S92 S165 S233 S5 S96 S168 S234 S24 S98 S172 S238 S35 S101 S203 S265 S41 S102 S207 S266 S46 S109 S210 S309 S52 S130 S216 S317 S53 S136 S221 S55 S143 S232	T3 T45 T19 T57 T22 T86 T33 T96 T38 T97 T44	C23 C55 C43	M10 M11

GENERAL INFORMATION

The large number of requests for Bureau of Standards publications precludes the sending of personal replies in each case. The request is returned with a form letter to notify the writer that the publications requested will be forwarded, if available.

1. *Free distribution.*—Free distribution is limited to one copy of any publication dealing with an individual's specialty. Additional copies may be purchased (see paragraph 4). This does not mean that any person will be furnished with copies of all papers on a general subject such as electricity, but only those dealing with his special branch of such general subject. This applies to all general subjects. Orders should be sent in accordance with paragraph 3.

2. *Designations of publications.*—Four series are issued, under distinctive titles, as follows: Scientific Papers, Technologic Papers, Circulars, and Miscellaneous Publications, and the issues in each series are numbered consecutively. The Scientific Papers were originally entitled "Reprints," but this title should not now be used. Bulletins (comprising 6 to 8 numbers of the Scientific Papers bound under one cover) are to be obtained by purchase only (see paragraph 4) and only for issues for volume 14 and prior issues.

3. *Ordering and delivery of publications.*—Order by group name and number, in addition to title, thus assisting in the prompt filling of your order. Deliveries require from 1 to 2 weeks' time, as stocks are maintained by the Superintendent of Documents and forwarded only by him, as provided by law, on orders drawn by the various Government offices.

4. *Ordering of sales copies.*—Orders for the purchase of any Government publication should be addressed *direct* to the Superintendent of Documents, Government Printing Office, Washington, D. C., and *not* to the office issuing same. Orders should be accompanied by cash or money order remittance.

5. *Mailing list.*—A mailing list covering *announcement of issues* of new publications, but not providing for forwarding of copies, is maintained by this Bureau.

PUBLICATIONS ISSUED SINCE PUBLICATION OF CIRCULAR 24

1. [The following-named new papers were described in Supplement No. 2, issued October 1, 1919:]

S335. The Effect of Rate of Temperature Change on the Transformations in an Alloy Steel ..... *H. Scott*

July 10, 1919. 10 pp. Price, 5 cents.

S336. A Simplification of the Inverst-rate Method for Thermal Analysis. . *P.V.Merica*
July 11, 1919. 4 pp. Price, 5 cents.

S337. Constitution and Metallography of Aluminum and Its Light Alloys with Copper and with Magnesium.
P. V. Merica, R. G. Waltenberg, and J. R. Freeman, Jr.
Aug. 16, 1919. 14 pp. Price, 10 cents.

S338. Some Optical and Photoelectric Properties of Molybdenite.
W. W. Coblentz and H. Kahler
Aug. 16, 1919. 30 pp. Price, 10 cents.

T124. The Constitution and Microstructure of Silica Brick and Changes Involved Through Repeated Burnings at High Temperatures. . . . . *H. Insley*
July 11, 1919. 31 pp. Price, 10 cents.

T125. The Viscosity of Gasoline. . . . . *Winslow H. Herszhel*
May 5, 1919. 18 pp. Price, 5 cents.

T126. A Study of the Goutal Method for Determining Carbon Monoxide and Carbon Dioxide in Steels. . . . . *J. R. Cain and Earl Pettijohn*
Apr. 30, 1919. 8 pp. Price, 5 cents.

T128. Effect of Solar Radiation Upon Balloons.
Junius David Edwards and Maurice Blaine Long
June 13, 1919. 29 pp. Price, 5 cents.

T129. Notes on the Graphitization of White Cast Iron upon Annealing.
P. V. Merica and J. J. Gurevich
July 12, 1919. 12 pp. Price, 5 cents.

T136. The Determination of Free Carbon in Rubber Goods.
A. H. Smith and S. W. Epstein
Aug. 12, 1919. 8 pp. Price, 5 cents.

T138. Effects of Glucose and Salts on the Wearing Quality of Sole Leather.
P. L. Wormley, R. C. Bowker, R. W. Hart, L. M. Whittemore, and J. B. Churchill
Oct. 6, 1919. 38 pp. Price, 10 cents.

C82. Recommended Specification for Linseed Oil—Raw, Refined, and Boiled.
June 14, 1919. 9 pp. Price, 5 cents.

2. [The following publications, not previously announced, have been issued since Supplement No. 2, to Circular No. 24:]

SCIENTIFIC PAPERS

S339. Standardization of the Sulphur Boiling Point. . . *E. F. Mueller and H. A. Burgess*
Experiments were made to determine the effects of various experimental conditions, such as type of radiation shield, type of apparatus, purity of sulphur, etc., upon temperature observed with a resistance thermometer in the sulphur-boiling apparatus. The variation of boiling point with pressure over the range 700 to 800 mm was redetermined. Proposed standard specifications for the boiling-point apparatus and its use are given in an appendix. (Oct. 4, 1919.) 22 pp. Price, 5 cents.

S340. A Standardized Method for the Determination of Solidification Points, Especially of Naphthalene and Paraffin. . . . . *R. M. Wilhelm and J. L. Finkelstein*
This paper deals with a method of determining the solidification point of naphthalene recommended at a conference of Bureau of Standards and United States customs officials. The method is shown to be applicable, with obvious modifications, to the determination of the solidification point of paraffin and other substances. (Sept. 12, 1919.) 13 pp. Price, 5 cents.

S341. Airplane Antenna Constants..... *J. M. Cork*

Methods for measuring the capacity, inductance, resistance, and natural wave length; also the directional transmitting effect of airplane antennas, with the plane in flight, are described. Using these methods, results obtained upon various forms of fixed antennas, as well as one, two, and four trailing wires, are recorded. (Sept. 17, 1919.) 15 pp. Price, 5 cents.

S342. Reflecting Power of Stellite and Lacquered Silver.

W. W. Coblentz and H. Kahler

The reflecting power of stellite varies somewhat in the visible spectrum, depending upon the homogeneity and no doubt upon the exact composition of the alloy. Measurement on lacquered silver mirrors, made before and after exposure to ultra-violet light, show that, owing to photochemical action in the lacquer, the silver is turned brown in color, thus reducing the reflecting power. (Sept. 11, 1919.) 3 pp. Price, 5 cents.

S343. Location of Flaws in Rifle-Barrel Steel by Magnetic Analysis.

R. L. Sanford and Wm. B. Kouwenhoven

This paper describes an investigation which was undertaken for the purpose of determining whether an application of magnetic analysis was practicable for the detection of flaws in rifle-barrel steel. By means of apparatus especially constructed for the purpose, a large number of bars were explored for magnetic uniformity along their length. The results demonstrated that the method is amply sensitive to detect and locate flaws. Further study is necessary to determine to what degree the sensitivity should be reduced in order not to cause the rejection of material which is satisfactory for all practical purposes, and also to determine the type and magnitude of the effect which will be produced by a pipe. The investigation is being continued by the Winchester Repeating Arms Company. (Oct. 3, 1919.) 12 pp. Price, 5 cents.

S344. Spectral Photo-electric Sensitivity of Silver Sulphide and Several Other Substances..... *W. W. Coblentz and H. Kahler*

Data are given on the change in the electrical resistance of the sulphide of silver and of bismuth when exposed to radiations of wave lengths extending from 0.6μ to 3μ. Measurements were also made on galena, cylindrite, pyrites, and jamesonite. The effect of temperature, of the intensity of the exciting light, and of mechanical working upon photo-electrical sensitivity of silver sulphide was investigated. (Sept. 19, 1919.) 19 pp. Price, 5 cents.

S345. Measurements of Wave Lengths in the Spectra of Krypton and Xenon.

Paul W. Merrill

This paper records photographic measurements of wave lengths in the spectra of krypton and xenon, principally in the red and infra-red. In krypton 37 new lines were measured between 6576 A and 8928 A, in xenon 52 new lines between 6318 A and 9162 A. In this region there are numerous strong lines which are probably among the most important in the spectra of these elements. Notable among these are xenon lines at 8231 and 8280. These and other lines may be of value as wave-length standards in the infra-red. (Oct. 3, 1919). 8 pp. Price, 5 cents.

S346. Oxygen Content by the Ledebur Method of Acid Bessemer Steels Deoxodized in Various Ways..... *J. R. Cain and Earl Pettijohn*

It is shown that the Ledebur method for determining oxygen in steels indicates no marked difference in oxygen content of steels practically identical as to chemical composition and heat treatment, but made by different deoxidation treatments, Some differences in physical properties of such steels are also shown. (Nov. 11, 1919.) 12 pp. Price, 5 cents.

S347. The Heat Treatment of Duralumin.

P. D. Merica, R. G. Waltenberg and H. Scott

A study was made of the heat treatment of alloys of the type of duralumin and the effect on the mechanical properties observed of variations in the various heat-treatment conditions. Conclusions are drawn relative to the best conditions for commercial heat treatment of this alloy. A theory of the mechanism of hardening during aging of duralumin is proposed, which is based upon the decreasing solubility with decrease of temperature of $CuAl_2$ in aluminum. The precipitation of this compound, suppressed during quenching, proceeds during aging, and takes place in highly dispersed form. To the presence of this highly dispersed constituent is due the hardness of the aged alloy. (Nov. 15, 1919.) 46 pp. Price, 10 cents.

S348. Use of a Modified Rosenhain Furnace for Thermal Analysis.

H. Scott and J. R. Freeman

The furnace developed by Rosenhain for the thermal study of metals has several objectional features which the authors have corrected in building a furnace of that type. A description of this improved furnace is given with the advantages derived from the modifications, and its operation as applied to inverse-rate thermal analysis is discussed. The construction of the furnace is shown in sufficient detail to permit reproduction. (Oct. 24, 1919.) 7 pp. Price, 5 cents.

S349. Photo-electric Spectrophotometry by the Null Method .....*K. S. Gibson*

Reliable determinations of spectral transmission throughout the green, blue, and violet have been made by means of the photoelectric null method described in the paper. All errors have been eliminated, as well as the necessity of any tests, calibrations, or corrections, in connection with the current-irradiation law or the dark currents of the photoelectric cells, or with electrometer deflection methods. Measurements can be made from 380 to 650 millimicrons, the best range being from 410 to 550. Measurements of spectral diffuse reflection relative to that of magnesium carbonate have also been made. (Oct. 11, 1919.) 28 pp. Price, 5 cents.

S350. Equilibrium Conditions in the System Carbon, Iron Oxide, and Hydrogen in Relation to the Ledebur Method for Determining Oxygen in Steel.

J. R. Cain

It is shown that mixtures of iron oxide and Acheson graphite are not reduced, and mixtures of iron oxide with "cemented" iron or white iron (annealed or unannealed) are reduced at 900° C by the carbon in them, when hydrogen is passed over them at rates of 2 liters per hour or faster. Because of these facts it is probably impossible to determine by the Ledebur method more than 75 per cent of the oxygen present in steels as ferrous oxide. The effect of rate of passage of hydrogen on the Ledebur oxygen content of certain steels is shown. (Nov. 10, 1919.) 14 pp. Price, 5 cents.

S351. Dependence of the Input Impedence of a Three-Electrode Vacuum Tube upon the Load in the Plate Circuit.....*John M. Miller*

Because of the capacities between the electrodes of a three-electrode vacuum tube, the input impedence, which determines the input voltage supplied to the grid of the tube by the apparatus in the input circuit, depends upon the electrical characteristics of the plate or output circuit. In this paper theoretical relations are established which permit the input impedence to be calculated when the impedence in the plate circuit is known. These relations are also checked by experiment. (Nov. 21, 1919.) 19 pp. Price, 5 cents.

S352. Thermal Expansion of Insulating Materials.

Wilmer H. Souder and Peter Hidnert

The present paper gives data on the thermal expansion of some of the more important insulating materials. In most cases the expansions are too irregular to justify the use of the general quadratic equations. A knowledge of the thermal behavior of these materials is essential before assembling them in certain types of apparatus subjected to wide temperature variations. The most striking peculiarities are: (1) The wide range in the values of the coefficients of procelain from 1.6 to 19.6 millionths per unit length per degree centrigrade. (2) The three varieties of expansions for porcelain; namely, straight line, concave and convex expansion curves. (3) The shrinkage and the loss in weight of the phenol and similar compounds when subjected to excessive heat treatment. (4) The permanent growth and variations of different marbles when subjected to heat treatment. (5) The negative coefficient of expansion of marble at low temperatures. (Dec. 27, 1919.) 30 pp. Price, 10 cents.

S353. Variation in Direction of Propagation of Long Electromagnetic Waves.

Lt. A. Hoyt Taylor

The observed direction of radio waves as obtained with a direction finder varies with time, when long waves are used such as those from very high power stations. The variations of direction are of the order of 90° for very long waves. No such large variations are found for short damped waves produced by spark apparatus. A method of increasing the sharpness of determination of direction has been worked out. A theoretical explanation of the variations of direction is given, based on the existence of media in the earth's atmosphere capable of reflecting and refracting the waves. (Nov. 29, 1919.) 15 pp. Price, 5 cents.

S354. Principles of Radio Transmission and Reception with Antenna and Coil Aerials.

J. H. Dellinger

The functioning of the two principal types of radio aerials is worked out quantitatively from fundamental electromagnetic theory. Experiments have verified the formulas and conclusions presented. Formulas for the current received in either antenna or coil aerial in terms of current in either type of transmitting aerial are given, as well as comparison formulas giving the relative performance of antenna and coil aerials under various conditions. The advantages of the condenser type of aerial are presented. The theory and nature of radiation are discussed and applied to the elucidation of some current fallacies. The basic principals of design of aerials are given. Desirable lines of future research are pointed out. The use of the coil aerial as a direction finder, interference preventer, reducer of strays, and submarine aerial are not among the subjects treated. (Dec. 11, 1919.) 60 pp. Price, 10 cents.

S355. The Determination of the Output Characteristics of Electron Tube Generators.

Lewis M. Hull

Owing to saturation and rectification effects in three-electrode vacuum tubes, the currents which they deliver to any type of output circuit, when used as a generator, are heavily loaded with harmonics. Experimental results indicate that the frequency of the oscillating currents generated is the natural frequency of the output circuit. Hence this circuit behaves as a filter in series with the tube and the direct current power system, and the useful output current is approximately sinusoidal, whatever the distortion of the tube currents, and depends in amplitude solely upon the fundamental constituents of the tube currents. General expressions are derived for the power and current output in terms of static characteristics of the generating tube and are corroborated by experimental results obtained with a particular tube. (Dec. 1, 1919.) 21 pp. Price, 5 cents.

S356. Notes on the Microstructure of Iron and Mild Steel at High Temperatures.

Henry S. Rawdon and Howard Scott

The structure of iron and mild steel at high temperatures was examined by means of heat etching, i. e., heating polished specimens in vacuo; a distinct and characteristic pattern corresponding to the structure of the different allotropic forms is produced upon the polished face. A considerable change in composition occurs in the surface metal upon heating, due to loss of carbon. This is most pronounced just above the A_1 transformation. The increased rate of diffusion of carbon in iron at higher temperatures aids in making the change at the surface at such temperatures. The pattern produced by heat etching reveals not only the condition of the surface metal, but also that of the interior. 9 pp. (In press.)

S357. Constants of Radiation of a Uniformly Heated Inclosure.....*W. W. Coblentz*

A recalculation is given of data previously published (Scientific Papers 261 and 262). The new value of the coefficient of total radiation is $\sigma=5.722 \times 10^{-12}$ watt cm.$^{-2}$ deg.$^{-4}$, which is in agreement with the value previously published Experimental data are given on the absorption of dry and humid air. The effect of atmospheric absorption is discussed, and it is concluded that, if corrections are made for absorption by water vapor, the value of σ obtained recently at Naples is close to the average value, $-\sigma=5.7$. (Jan. 16, 1920.) 7 pp. Price, 5 cents.

S358. Concerning the Annealing and Characteristics of Glass.

A. Q. Tool and J. Valasek

Methods available for determining the temperature at which glass should be annealed were tested, and the annealing temperatures are given for a number of glasses. Determinations of the critical ranges for these glasses were also made, and the results are discussed. The relations which possible transformations occurring in this range bear to the annealing procedure are especially considered. Methods for determining the length of time the glass should be held at the annealing temperature and the mode of cooling were investigated and some conclusions are given. 34 pp. (In press.)

S359. Efflux of Gases through Small Orifices.

Edgar Buckingham and Junius David Edwards

The paper describes experiments undertaken with the object of throwing light on the difficulties encountered in the practical use of Bunsen's method of determining specific gravity. An elementary theory of the effects of viscosity and thermal conductivity is developed and applied to the observations; and it is shown that, within the limits of accuracy of the experiments, this theory accounts for most of the observed facts. (Jan. 28, 1920.) 42 pp. Price, 10 cents.

TECHNOLOGIC PAPERS

T127. Leakage Resistance of Street-Railway Roadbeds and Its Relation to Electrolysis of Underground Structures.....*E. R. Shepard*

Several methods of making electrical resistance measurements on street-railway roadbeds and on experimental roadbeds are described, and the results of such measurements are given in tabular and graphical form. Certain conclusions are reached regarding the best type of roadbeds and the best methods of treating ties where the reduction of stray currents is important. (Oct. 6, 1919.) 39 pp. Price, 10 cents.

T130. A Comparison of the Heat-Insulating Properties of Some of the Materials Used in Fire-Resistive Construction.....*Walter A. Hull*

The Bureau of Standards has made a somewhat entended investigation of the heat-insulating properties of materials used in fire-resistive construction. Cylindrical specimens were heated in a suitable furnace, temperatures at different

depths in the specimen being measured during the test. The results show that dense, hard-burned clay bodies heat through more readily than more porous ones, and that there is but little difference between porous clays and various concretes in respect to temperature progress. A surprising indication is that limestone concrete showed fire-resistive properties superior to those of other concretes. Temperature progress was shown to be very slow in all gypsum specimens. (Nov. 12, 1919.) 40 pp. Price, 10 cents.

T131. Application of the Interferometer to Gas Analysis..... *Junius David Edwards*
This paper describes the principle of the apparatus and method, and discusses the calibration. The effect produced upon the observation by variations in gas composition and method of operation are pointed out, and equations are developed for calculating the same. Typical cases in which the interferometer may be used are analyzed in order to determine its suitability. (Oct. 6, 1919.) 19 pp. Price, 5 cents.

T132. Mechanical Properties and Resistance to Corrosion of Rolled Light Alloys of Aluminum and Magnesium with Copper, with Nickel, and with Manganese..... *P. D. Merica, R. G. Waltenberg, and A. N. Finn*
Light alloys of three ternary series, aluminum-magnesium-copper, aluminum-magnesium-nickel, and aluminum-magnesium-manganese, were rolled into sheets and tested in cold-rolled condition, after annealing and after heat treatment. The resistance to corrosion in the salt spray test was also investigated. The alloys of the first series were superior to the others in respect to mechanical properties under all conditions, but were not, on the whole, as resistant to corrosion as the alloys of the last series. The heat-treated alloys of the first series are but little inferior in resistance to corrosion to the alloys of the last series. (Oct. 25, 1919.) 11 pp. Price, 5 cents.

T133. Tests of Flexible Gas Tubing..... *R. S. McBride and Walter M. Berry*
This paper shows results of various tests on about 30 samples of different kinds of gas tubing. The specifications proposed by the gas associations are discussed, and a modified set of specifications are presented for criticism and comment. (Oct. 27, 1919.) 37 pp. Price, 10 cents.

T134. Experimental-Retort Tests of Orient Coal.... *R. S. McBride and I. V. Brumbaugh*
In connection with coke-oven investigations the Bureau of Standards found it desirable to carry out a short series of experimental-retort tests of Illinois coal, to determine the influence of temperature of coking upon the characteristics of the coke and the quantity and quality of gas produced. This work was done at the Sparrows Point plant of the Bethlehem Steel Co., where apparatus was placed at the disposal of the Bureau through the courtesy of the engineers in charge. The gas produced at high temperatures was much greater in volume but lower in heating value than that produced at the lower temperatures, not only because of more complete elimination of volatile matter from the coal, but also as a result of the greater decomposition of the heavier volatile matter into gaseous constituents at the higher temperature. At the lower temperatures the coke was very inferior to that produced at the higher temperatures, but in no case was the temperature maintained as high as is generally used in coke-oven practice. Detailed results for the series of five tests are given, and a separate series of results on other coals is included, furnishing data given to the Bureau by the Steel Company covering tests made with the same apparatus during the preceding two years. (Sept. 26, 1919.) 10 pp. Price, 5 cents.

T135. Behavior of Wrought Manganese Bronze Exposed to Corrosion while under Tensile Stress..... *P. D. Merica and R. W. Woodward*
Specimens of wrought manganese rods were exposed in special test frames for a period of two years to corrosion in water and moist air while at the same time

under tensile stress, with the object of determining the maximum safe stresses for this material under these conditions. None of the test specimens fractured within this period under stresses below the proportional limit or below 35 000 pounds per square inch. Two specimens fractured, one under 40 000, the other under 43 000, pounds per square inch tensile stress. (Oct. 6, 1919.) 9 pp. Price, 5 cents.

T137. Coking of Illinois Coal in Koppers Type Oven....*R. S. McBride and W. A. Selvig*

The Bureau of Standards was ordered by the Administration to conduct an investigation of a new coke-oven process suited to utilization of by-products. The test demonstrated that some Illinois coals can be coked in the Kopers type oven without radical change in operating methods for producing coke for use in blast furnaces. The yield of gas and by-products from the Illinois coal is proved excellent, both in quantity and quality. The Bureau of Mines was responsible for the sampling and weighing, including the handling of the coke, analyses of coal, etc. The subject of costs was not discussed in the report, since this depends on local conditions. (Nov. 17, 1919.) 51 pp. Price, 10 cents.

T139. Some Tests of Light Aluminum Casting Alloys—The Effect of Heat Treatment.....*P. D. Merica and C. P. Carr*

The mechanical properties of a number of different compositions of cast light aluminum alloys have been determined, as well as the resistance of three commonly used alloys to the action of alternating stresses. Comparison was made of the resistance of some well-known alloys to corrosion in the salt spray test. It was found that the heat treatment of cast alloys, consisting of annealing at 500° C and cooling in air from that temperature, followed by aging for several days before testing, produced an increase in the tensile strength and the hardness, with an attendant decrease, usually, in the elongation. The application of such a heat treatment to light aluminum castings seems to have commercial possibilities. (Oct. 24, 1919.) 31 pp. Price, 10 cents.

T140. Constant-Temperature Still Head for Light-Oil Fractionation.

Frederick M. Washburn

Methods in use for the fractionation of light oil and the determination of toluene are discussed. An apparatus has been developed and tested which gives exceptionally accurate results. (Oct. 18, 1919.) 12 pp. Price, 5 cents.

T141. An Electrolytic Resistance Method for Determining Carbon.....*J. R. Cain*

Method and apparatus are described for quickly and accurately determining carbon in steel by absorbing in a solution of barium hydroxide the carbon dioxide resulting from direct combustion of the metal in oxygen, and deducing the carbon content from the change in electrical resistance of the barium hydroxide solution. (Dec. 6, 1919.) 21 pp. Price, 5 cents.

T142. Materials and Methods Used in the Manufacture of Enameled Cast-iron Wares

Homer F. Staley

The sources, methods of preparation, and properties of raw materials used in white enamels for cast iron, and their effects in the enamel composition, are discussed. Methods of calculating enamel formulae and examples of enamel compositions of various types are given. The defects in enamels, their causes and remedies, are discussed from both the theoretical and the practical standpoints. Manufacturing methods and equipment used in compounding and applying the enamels and in making and preparing the castings are described. (Dec. 20, 1919.) 158 pp. Price, 20 cents.

T143. A Study of the Deterioration of Nickel Spark-plug Electrodes in Service.
H. S. Rawdon and A. I. Krynitzky

Some unusual as well as some more common types of deterioration which occur in nickel spark-plug electrodes are described. In service an intercrystalline brittleness is produced in the surface metal exposed to the hot gases and to the action of the spark. Sometimes definite "knife-cut" breaks occur in the wires. The brittleness is due to the action of hot reducing gases and to local heating of small areas. The greatly reduced strength of nickel wire when hot permits breaks to occur in electrodes under the relatively slight tensional stresses set up in service. This is particularly true of electrodes which are firmly anchored at both ends. (Jan. 22, 1920.) 16 pp. Price, 10 cents.

T144. The Properties of American Bond Clays and Their Use in Graphite Crucibles and Glass Pots.....*A. V. Bleininger*

The properties of American bond clays are described in detail and expressed through numerical values. It is shown that domestic materials equal to those formerly imported from Germany are available, and any desired combination of properties may be produced by suitable blending. The natural and artificial graphites are discussed, as well as the control of crucible mixtures. It is shown that the desirable quality of German glass pot clay is its low fire shrinkage, and suggestions are made for obtaining similar results with American materials. The compositions, preparation, and casting of semiporcelain and porcelain pots for the melting of optical glass are given. (Jan. 28, 1920.) 52 pp. Price, 10 cents.

T145. Direct Determination of India Rubber by the Nitrosite Method.
John B. Tuttle and Louis Yurow

The method described by Wesson (Technologic Paper No. 35) was applicable only to compounds containing new rubber, and even for these was not altogether satisfactory. By suitably varying the procedure, it has been found possible to extend the usefulness of the method to compounds containing reclaimed rubber and substitutes, as well as lampblack and bituminous substances. The method is based upon the formation of rubber nitrosite, which is purified and burned in a combustion furnace. The carbon dioxide formed is calculated to rubber. (Oct. 22, 1919.) 16 pp. Price, 5 cents.

T146. The Cadmium Electrode for Storage Battery Testing.
H. D. Holler and J. M. Braham

In the operation and testing of storage cells, it is frequently important to know the individual potentials of the positive and negative plates. No standard method has been recognized. The results obtained with the cadmium electrode are often contradictory. This investigation has been made to determine the reliability of the cadmium electrode, and the errors in measurement to which it is subject. The standard electrode used was the mercurous sulphate half-cell. It was found that the most serious error in using the cadmium electrode is due to polarization. By measuring the potential of the negative plate and computing the potential of the positive plate from this and the cell voltage, the most serious error of the cadmium electrode can be avoided, even when using an ordinary voltmeter. This investigation deals only with the accuracy of the cadmium electrode and does not discuss the cadmium readings with reference to the age or condition of the battery. (Dec. 12, 1919.) 15 pp. Price, 5 cents.

T147. An Apparatus for Measuring the Relative Wear of Sole Leathers, and the Results Obtained with Leather from the Different Parts of a Hide.
R. W. Hart and R. C. Bowker

A short paper on the work done at the Bureau of Standards up to the present time on the wear resistance of sole leather in different parts of a bend. No attempt

is made to compare the wear resistance of one tannage with another, although several tannages were used in the work on this problem. The development of the laboratory wearing test machine is described, and the results of several comprehensive tests on this subject are given. There are also included in this paper the results of wearing tests made in the field and in the laboratory on the same leather, showing the manner in which the two methods correlate with each other. (Nov. 22, 1919.) 10 pp. Price, 5 cents.

CIRCULARS

C80. Protective Metallic Coatings for the Rustproofing of Iron and Steel.

The various classes of protective metallic coatings (including oxide and similar coatings) are discussed as to production, structure, and methods of testing. In general, when protection rather than finish is desired, zinc should always be depended upon. The advantages of the various types of zinc coatings for particular purposes are pointed out. No general rule can be laid down for the testing of coatings; each type must be considered by itself. The salt-spray test, while being far from entirely satisfactory, approximates service conditions quite closely and is preferable to the other methods of testing which have been proposed and used. (Oct. 4, 1919.) 34 pp. Price, 10 cents.

C81. Bibliography of Scientific Literature Relating to Helium.

This publication contains a bibliography of the scientific literature relating to helium published up to January 1, 1919. (Sept. 10, 1919.) 21 pp. Price, 5 cents.

C83. Specifications for the Manufacture and Installation of Railroad Track Scales,

This circular comprises specifications for the manufacture and installation of railroad track scales to establish a standard for the ordinary railroad freight-car weighing throughout the United States. They were prepared by a committee representing the American Railroad Association, the American Railway Engineering Association, the Railroad and Warehouse Commission of the State of Minnesota, the National Scale Men's Association, the Scale Manufacturer's Association, and the Bureau of Standards. These specifications will place in the hands of both railroads and private owners a definite and approved standard which will enable them to secure scales adequate to meet the modern weighing requirement, and it is hoped that a needed improvement in the weighing facilities will result. 35 pp. (In press.)

C84. Recommended Specifications for Basic Carbonate White Lead, Dry and Paste,

Prepared and recommended by the U. S. Interdepartmental Committee on Paint Specification Standardization, August 11, 1919. This committee was appointed at the suggestion of the Secretary of Commerce, and consisted of representatives of War, Navy, Agriculture, Interior, Post Office, Treasury, and Commerce Departments, the Railroad Administration, the Panama Canal, and the War Service Committee of the Paint Manufacturers' Association of the United States. The committee submitted a preliminary draft of this specification to a number of representatives of the paint and varnish industry, including all of the large manufacturers of white lead, and gave careful consideration to the replies received in time. (Dec. 27, 1919.) 10 pp. Price, 5 cents.

MISCELLANEOUS PUBLICATIONS

M39. Household Weights and Measures.

Weights and measures information most useful in the household and particularly about the kitchen is given upon the two sides of a card, which is designed to be hung in the kitchen. Most of this information is in tabular form and includes tables of common kitchen measures, liquid measure, dry measure, avoirdupois weight, weight of dry commodities most frequently used in the kitchen, etc. The most frequently used rules of mensuration are also given.

M40. Annual Report of the Director of the Bureau of Standards for 1919.

A review of the work of the National Bureau of Standards for the year ended June 30, 1919, is given in the Annual Report of the Director of the Bureau of Standards at Washington. The report describes the functions of the Bureau in connection with standards and standardization, and contains a chart and description of the several classes of standards dealt with. The Director also gives a clear idea of the relation of the Bureau's work to the general public, to the industries, and to the Government, and includes a special statement of the military work of the year. Brief statements are made upon practically all of the special researches and lines of testing completed or under way at the Bureau. The list of these topics occupies 12 pages in the table of contents. (July 1, 1919.) 293 pp.

LIST OF DEPOSITORY LIBRARIES

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DELAWARE.—Dover, Delaware State Library; Newark, Delaware College Library; Newcastle, Newcastle Library Company; Wilmington, Free Library.

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Library; Monmouth, Monmouth College Library; Normal, Illinois State Normal University Library; Olney, Carnegie Public Library; Peoria, Public Library; Rockford, Public Library; Springfield, Illinois State Historical Society Library, Illinois State Library; Urbana, University of Illinois Library.

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