

Bureau of Standards (Div. VIII-3)
Department of Commerce,
Washington, D. C.

147
Letter Circular ~~VIII-4~~
Revised July 26, 1920.

SOURCES OF INFORMATION AND DATA ON THE PROPERTIES OF METALS AND ALLOYS.

The Bureau receives many requests for general and comprehensive information on the properties of metals and alloys; general requests of this sort for such a volume of information it is really possible to answer only with a statement of sources where the information may be obtained. This letter circular attempts to give a working bibliography of reference and handbooks on this subject. The Bureau itself is preparing circulars dealing with the properties of individual metals and alloys but these are as yet too few to permit a general circular to be based on them dealing with all metals and alloys.

The sources below are arranged topically, the reference books mentioned should be available in any good technical or scientific library. Mechanical properties of such materials are most excellently described by standard specifications for the materials such as those of the American Society for Testing Materials.

Date of
latest
edition

Handbooks of Tables and Constants

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- (2) 1918 Liddell, D.M., METALLURGISTS' & CHEMISTS' HANDBOOK; McGraw-Hill Book Co., Inc., New York City.
- (3) 1918 METALS AND ALLOYS; The Metal Industry, London.
- (4) 1916 SMITHSONIAN PHYSICAL TABLES; The Smithsonian Institution, Washington, D. C.
- (5) 1916 MECHANICAL ENGINEERS' HANDBOOK; McGraw-Hill Book Co. Inc., New York City.
- (6) 1915 STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS; McGraw-Hill Book Co., Inc., New York City.
- (7) 1914 TABELLES ANNUELLES DE CONSTANTES ET DONNEES NUMERIQUES DE CHEMIE DE PHYSIQUE ET DE TECHNOLOGIE; Gauthier-Villars, Paris.
- (8) 1913 Societe Francaise de Physique, REQUEIL DE CONSTANTES PHYSIQUES; Gauthier-Villars, Paris.
- (9) 1912 Landolt-Bornstein-Roth; PHYSIKALISCH-CHEMISCHE TABELLEN; Julius Springer, Berlin.
- (10) 1911 HUTTE, pts. I, II, III; Wilhem Ernst & Sohn, Berlin.
- (11) 1909 Winkelmann, A., HANDBUCH DER PHYSIK, pts. I-VI; Johann Ambrosius Barth, Leipzig.

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- (12) 1918 MINERAL INDUSTRY; McGraw-Hill Book Co., New York.
(13) 1919 ANNUAL STATISTICAL REPORT OF THE AMERICAN IRON AND STEEL INSTITUTE, American Iron and Steel Institute, New York City.
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(15) 1913 METAL STATISTICS; American Metal Market Co., New York City.

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(17) 1919 Gulliver, G. H., METALLIC ALLOYS; Chas. Griffin & Co. Ltd., London.
(18) 1915 Wood, R. A., THE WATERBURY BOOK OF ALLOYS; Law Printing Co., New York City.
(19) 1914 Hofman, H. O., METALLURGY OF COPPER; McGraw Hill Book Co., Inc., New York City.
(20) 1914 Law, E. F., ALLOYS AND THEIR INDUSTRIAL APPLICATIONS; C. Griffin & Co., Ltd., London.
(21) 1914 Gowland, W., METALLURGY OF NON-FERROUS METALS; Chas. Griffin & Co., London.
(22) 1913 Ledebur, A., DIE LEGIERUNGEN; M. Krayan, Berlin.
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(24) 1909 Krupp, A., DIE LEGIERUNGEN; A. Hartleben, Leipzig.
(25) 1908 Brann, W. T., THE METALLIC ALLOYS; Henry Carey Baird & Co., Philadelphia, Pa.
(26) 1908 Wust, F., LEGIER-UND LOT-KUNST; Berhn Friedr. Voigt, Leipzig.
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(28) 1903 Sack, M., BIBLIOGRAPHIE DER METALLEGIERUNGEN; L. Voss, Leipzig.
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- (49) 1918 Hatfield, W. H., CAST IRON IN THE LIGHT OF RECENT RESEARCH; Chas. Griffin & Co., London.
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UNGEN; A. Hartleber, Leipzig. |
| | (57) 1905 | Minet, A., THE PRODUCTION OF ALUMINUM AND
ITS INDUSTRIAL USE; John Wiley & Sons,
New York. |
| Antimony | (58) 1909 | Wand, C. Y., ANTIMONY; C. Griffin & Co.,
London. |

Bismuth	(59)	1914	Gowland, (21)
		1884	Charleton, G. A., TIN, ARSENIC, BISMUTH, AND WOLFRAM; E. & F. Spon, Ltd., London.
Cadmium	(60)	1913	Liebig, R.G.M., ZINC UND CADMIUM; O, Spinner, Leipzig.
	(61)	1911	Bouchonnet, A., ZINC, CADMIUM, CUIVRE, MERCURE; O. Doin et fils, Paris.
Chromium	(62)	1910	Ouvar, L.V.R., INDUSTRIES DU CHROME, DU MANGANESE, DU NICKEL ET DU COBALT; O. Doin et fils, Paris.
		1909	Escard, (88)
Cobalt		1914	Gowland, (21)
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Copper		1914	Hofman, (20)
Gold	(63)	1915	Rose, T. R., THE PRECIOUS METALS; D. Van Nostrand Co., New York City.
		1914	Gowland, (21)
Iron	(64)	1918	Carnegie, D., LIQUID STEEL; Longmans, Green & Co., New York City.
	(65)	1918	Turner, T., THE METALLURGY OF IRON; C. Griffin & Co., London.
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Lead	(66)	1918	Hofman, H. O., METALLURGY OF LEAD; McGraw-Hill Book Co., New York City.
	(67)	1910	Collins, H. F., THE METALLURGY OF LEAD; C. Griffin & Co., London.
		1909	Richter, (80)
Magnesium	(68)	1916	Grosvenor, W. M., MANUFACTURE AND USE OF METALLIC MAGNESIUM; Paper before Amer. Electrochem. Soc. in New York, Feb. 1916
Manganese		1910	Ouvar, (62)
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Molybdenum	(69)	1916	Horton, F. W., MOLYBDENUM, ITS ORES, ETC., Government Printing Office, Washington, D. C.
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Nickel	(70)	1917	REPORT OF ROYAL ONTARIO NICKEL COMMISSION, A. Wilgress, Toronto.
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Platinum		1914	Gowland, (21)
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SECRET

1. The purpose of this document is to provide information regarding the activities of the [redacted] in the [redacted] area.

2. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

3. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

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4. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

5. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

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6. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

7. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

8. The [redacted] has been observed in the [redacted] area, and it is believed that it is engaged in [redacted] activities.

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| Silver | 1915 | Rose, (63) |
| | 1914 | Gowland, (21) |
| (72) | 1912 | Molinie, M., and Dietz, H., INDUSTRIES DES METAUX PRECIEUX; O. Doin et fils, Paris. |
| Tin | (73) | 1911 Louis, H., METALLURGY OF TIN; McGraw-Hill Book Co., New York. |
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| Titanium | (74) | 1905 Truchot, P., LES PETITS METAUX, TITANE, YUNGSTENE, MOLYBDENUM; Gauthier-Villars, Paris. |
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| | (80) | 1909 Richter, K., ZINK, ZINN UND BLEI; A. Hartleben, Leipzig. |
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| | 1915 | Johnstone, (83) |
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- (97) 1912-1913 Guertler, W., HANDBUCH DER METALLOGRAPHIE; Gebr. Borntrager, Berlin.
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- (99) 1912 Robin, F., TRAITE DE METALLOGRAPHIE; A. Hermann et fils, Paris.
- (100) 1909-1912 Bornemann, K., DIE BINAREN METALLEGIERUNGEN; pts. I and II; Wilhelm Knapp, Halle, A.S.
- (101) 1909 Guillet, L., TREMPÉ, RECUIT, REVENU, Dunod, et Pinat, Paris.
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- (104) 1920 U. S. NAVY DEPARTMENT SPECIFICATIONS; published through the Bureau of Supplies and Accounts, of the Department.
- (105) 1920 U. S. NAVY AERONAUTICAL SPECIFICATIONS; PUBLISHED through the Bureau of Construction and Repair of the Department.
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- (119) 1904- REVUE DE METALLURGIE; Dunod et Pinat,
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- (120) 1899- PROCEEDINGS OF THE AMERICAN SOCIETY FOR
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- (121) 1911- INTERNATIONAL ZEITSCHRIFT FUR METALLKUNDE;
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- (122) 1855- THE IRON AGE; The Iron Age Publishing Co.,
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- (123) 1872- THE FOUNDRY; Penton Publishing Co.,
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- (128) 1907- CHEMICAL ABSTRACTS; American Chemical
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- (129) 1884- ENGINEERING INDEX; Now published in Mechan-
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- (130) 1910- BULLETINS AND TECHNICAL PAPERS OF THE
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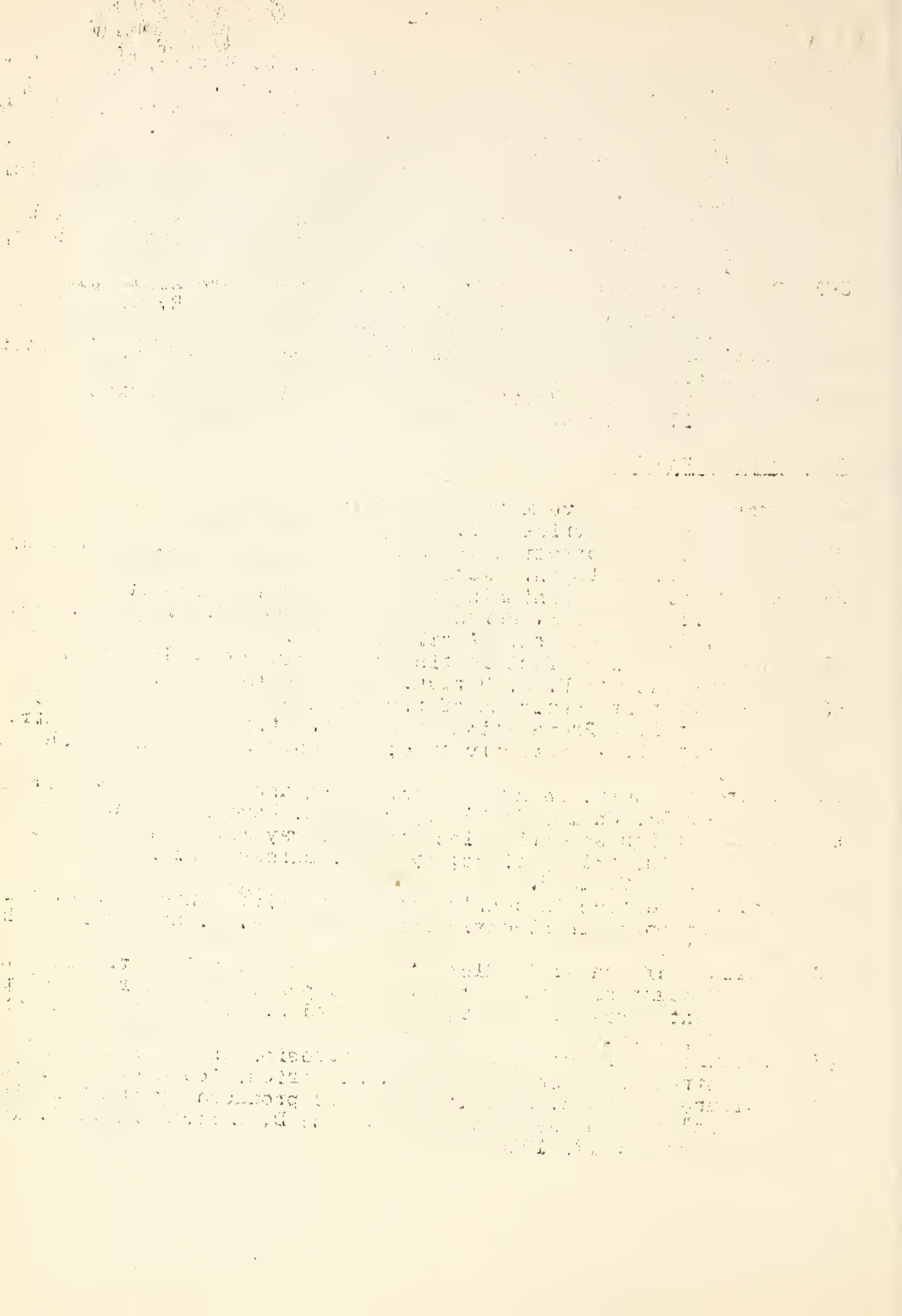
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- 105 Radiation constants of metals; by W. W. Coblentz, August 22,
1908.
- 109 Testing of transformer steel; by M. G. Lloyd and J. V. S.
Fisher, January 29, 1909.
- 120 The thermoelectric properties of tantalum and tungsten; by
W. W. Coblentz, January 15, 1909.
- 124 Platinum resistance thermometry at high temperatures; by C.
W. Waidner and G. K. Burgess, June 25, 1909.
- 147 Temperature coefficient of resistance of copper; by J. H.
Dellinger, July 13, 1910.
- 148 Electrical conductivity of commercial copper; by F. A. Wolff
and J. H. Dellinger, August 1, 1910.
- 205 Melting points of refractory elements; I, Elements of atomic
weight from 48 to 50; by G. K. Burgess and R. G. Waltenberg,
April 25, 1913.
- 213 Critical ranges A2 and A3 of pure iron; by G. K. Burgess and
J. J. Crowe, September 22, 1913.
- 224 Emissivity of metals and oxides; I, Nickel oxide (NiO) in
range 600° to 1300°C; by G. K. Burgess and P. D. Foote.
April 15, 1914.
- 231 Specific heat of copper in interval 0° to 50°C., with note
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May 30, 1914.
- 236 Electrical resistance and critical range of pure iron; by
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- 242 Emissivity of metals and oxides II; Measurements with micro-pyrometer; by G. K. Burgess and R. G. Waltenberg. October 24, 1914.
- 243 Emissivity of metals and oxides: III, Total emissivity of platinum and relation between total emissivity and resistivity; by Paul D. Foote. January 30, 1915.
- 245 Temperature coefficient of magnetic permeability within working range; by Raymond L. Sandford. January 30, 1915.
- 249 Emissivity of metals and oxides; IV, Iron oxide; by George K. Burgess and Paul D. Foote. June 24, 1915.
- 250 Characteristics of radiation pyrometers; by George K. Burgess and Paul D. Foote. August 10, 1915.
- 254 Study of quality of platinum ware; by George K. Burgess and P. D. Sale, August 25, 1915.
- 266m Preparation of pure iron and iron-carbon alloys, by J. R. Cain, E. Schramm, and H. E. Cleaves, February 29, 1916.
- 272 Correlation of magnetic and mechanical properties of steel; by Charles W. Burrows. March 29, 1916.
- 280 Further experiments of volatilization of platinum; by G. K. Burgess and R. G. Waltenberg. June 16, 1916.
- 294 Freezing point of mercury; by R. M. Wilhelm. October 26, 1916.
- 296 Thermoelectric measurement of critical ranges of pure iron; by George K. Burgess and H. Scott. November 22, 1916.
- 300 Emissivity of Straight and Helical Filaments of Tungsten; by W. W. Coblentz. June 8, 1917.
- 307 Note on Electrical Conduction in Metals at Low Temperatures; by Francis B. Silsbee. July 23, 1917.
- 308 The Reflecting Power of Tungsten and Stellite by W. W. Coblentz and W. B. Emerson, August 10, 1917.
- 321 Thermal Expansion of Alpha & Beta Brass between 0° and 600°C, in Relation to the Mechanical Properties of Heterogeneous Brasses of the Muntz Metal Type by Paul D. Merica and L. W. Schad. May 9, 1918.
- 332 Preliminary Determination of the Thermal Expansion of Molybdenum by Lloyd W. Schad and Peter Hildner. January 29, 1919.
- 335 The Effect of Rate of Temperature Change on the Transformations in an Alloy Steel, by H. Scott. July 10, 1919.
- 336 A Simplification of the Inverse-Rate Method for Thermal Analysis, by P. D. Merica, July 11, 1919.
- 337 Constitution and Metallography of Aluminum and its Light Alloys with Copper and with Magnesium, by P. D. Merica, R. G. Waltenberg and J. R. Freeman, Jr. August 16, 1919.
- 342 Reflecting Power of Stellite and Lacquered Silver, by W. W. Coblentz and H. Kahler. September 11, 1919.
- 343 Location of Flaws in Rifle-Barrel Steel by Magnetic Analysis by R. L. Sanford and Wm. B. Kourbenhoven, October 3, 1919.
- 346 Oxygen Content by the Ledebur Method of Acid Bessemer Steels Deoxidized in Various Ways, by J. R. Cain and Earl Pettijohn. November 11, 1919.

- 347 The Heat Treatment of Duralumin, by P. D. Merica, R. G. Waltenberg and H. Scott, November 15, 1919.
- 348 Use of a Modified Rosenhain Furnace for Thermal Analysis by H. Scott and J. R. Freeman, October 24, 1919.
- 350 Equilibrium Conditions in the System Carbon, Iron Oxide, and Hydrogen in Relation to the Ledebur Method for Determining Oxygen in Steel, by J. R. Cain, November 10, 1919.
- 356 Notes on the Microstructure of Iron and Mild Steel at High Temperatures, by Henry S. Rawdon and H. Scott. March 15, 1920.
- 363 Preparation and Reflective Properties of Some Alloys of Aluminum with Magnesium and with Zinc, by R. G. Waltenberg and W. W. Coblenz. February 12, 1920.
- 376 Critical Range of Some Commercial Nickel Steels, by H. Scott April 6, 1920.
- 377 Intercrystalline Brittleness of Lead, by H. S. Rawdon. April 6, 1920.

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- 11 Comparison of five methods used to measure hardness; Ralph P. Devries. July 22, 1912.
- 25 Electrolytic corrosion of iron in soils; by Burton McCollum and K. H. Logan. June 12, 1913.
- 38 Observations on finishing temperatures and properties of rails; by G. K. Burgess, J. J. Crowe, H. S. Rawdon, and R. G. Waltenberg. April 28, 1914.
- 53 Investigation of fusible tin boiler plugs; by George K. Burgess and P. D. Merica. October 15, 1915.
- 59 Standard test specimens of zinc bronze (Cu 88, Sn 10, Zn 2)
Part I. - Preparation of specifications; by C. P. Karr.
Part II. - Microstructure; by Henry S. Rawdon, March 15, 1916.
- 60 Microstructural changes accompanying annealing of cast bronze (Cu 88, Sn 10, Zn 2); by Henry S. Rawdon. January 25, 1916.
- 61 Some foreign specifications for railway materials: Rails, wheels, axles, tires; by G. K. Burgess and P. D. Merica, April 20, 1916.
- 62 Modern practice in construction and maintenance of rail joints and bonds in electric railways; by E. R. Shepard, March 10, 1916.
- 82 Failure of brass: 1, Microstructure and initial stresses in wrought brasses of the type 60 per cent copper and 40 per cent zinc; by Paul D. Merica and R. W. Woodward, January 29, 1916.
- 83 Failure of brass: 2, Effect of corrosion on ductility and strength of brass; by Paul D. Merica, November 14, 1916.
- 84 Failure of brass: 3, Initial stress produced by the "burning in" of manganese bronze; by Paul D. Merica and C. P. Karr November 17, 1916.



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- 1 Temperature Measurements in Bessemer and Open Hearth Practice
by George K. Burgess, May 8, 1917.
- 7 Some Unusual Features in the Microstructure of Wrought Iron
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- 01 Tests of Large Bridge Columns, by J. H. Griffith and J. C.
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- 03 Typical Cases of the Deterioration of Muntz Metal (60:40
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The first part of the paper is devoted to a general
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