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SOURCES OF INFORMATION ON THE PROPERTIES OF METALS AND ALLOYS
(BOOKS)

The National Bureau of Standards receives frequent requests for general information on the properties of metals and alloys which are often so comprehensive in scope that reference to sources of information is the only reply practicable. This Letter Circular has been prepared for that purpose. The list of references is by no means complete. The attempt has been made to give only a working bibliography. Many references, particularly foreign ones, have been intentionally excluded from the list together with books intended for specialists' use. Articles appearing in technical periodicals have not been listed except for several series of special metallurgical lectures, symposia and general discussions. The indices and abstracts listed in this Letter Circular will be helpful in locating articles on special subjects in the technical literature. The National Bureau of Standards has prepared a number of information circulars dealing with individual metals and alloys. These are included in the lists of references. Information on mechanical properties of specific alloys and metals is often included in specifications for such materials.

The various sources contained herein have been arranged topically, the reference books and periodicals are generally available in any large technical or scientific library. Addresses of publishers of most of the books are listed on page 31, only the name being given after that of the book, except in the case of unusual or less common addresses, which are given together with the title of the book.

Letter Circular LC 118 of the National Bureau of Standards lists all the metallurgical publications which have originated in work carried out at the Bureau. A copy of that Letter Circular will be sent on request.

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A. Lists of alloys

Ref.

- A 1 1001 alloy formulas, Niagara Falls Smelting & Refining Co., Buffalo, N. Y.
E. C. Jarvis (1927)
- 2 Tous les alliages. A. Chaplet.
G. Villars, Paris (1925)
- 3 A list of alloys. W. Campbell.
Am. Soc. Testing Materials 22 (I) (1930)
- 4 Engineering alloys, A. J. Dornblatt and N. E. Woldman.
Am. Soc. Metals (1936)

B. Abstracts and indices

Ref.

- B 1 Chemical Abstracts (monthly)
Am. Chem. Soc., Mills Bldg., Washington, D. C.
- 2 Metals and Alloys: Current Metallurgical Abstracts (monthly)
330 West 42nd Street, New York, N. Y.
(See publications) Cumulative index 1929-1931
" " 1932-1934
" " 1935
- 3 Industrial Arts Index.
H. W. Wilson Co., New York, N. Y.
- 4 Engineering Index
Am. Soc. Mech. Engrs.
- 5 Journal of Chemical Society
Gurney and Jackson, 33 Paternoster Row, London, EC 4.
- 6 Science Abstracts.
Spon and Chamberlain.
- 7 Physikalische Berichte.
F. Vieweg.
- 8 Journal of Institute of Metals. London.
Metallurgical Abstracts (Monthly).
- 9 Journal, Iron and Steel Institute. Semi-annual. London.
Notes on progress of iron and steel industry.

C. Handbooks

Ref.

- C 1 Metals Handbook.
Am. Soc. Metals (1936).
- 2 International Critical Tables (II. Metallurgical data).
National Research Council. McGraw-Hill Book Co. (1926-28).
- 3 Handbook of chemistry and physics (annual).
Chemical Rubber Publishing Co., Cleveland, Ohio (1935).
- 4 Smithsonian Physical Tables.
The Smithsonian Institution, Washington, D. C. (1932).
- 5 Handbook of nonferrous metallurgy. D. M. Liddell. (2 volumes)
McGraw-Hill Book Co. (1926).
- 6 Cast Metals Handbook.
Am. Foundrymen's Assn. (1935). 222 West Adams Street,
Chicago, Ill.
- 7 The Founder's Manual. David W. Fayne.
D. Van Nostrans Co. (1920).
- 8 Mechanical Engineers Handbook.
L. S. Marks. McGraw-Hill Book Co. (1930).
- 9 Mechanical Engineers Handbook.
R. T. Kent. John Wiley & Sons (1923).
- 10 Physikalische-Chemische Tabellen. Landolt-Bornstein-Roth.
J. Springer (1925).
- 11 The Goldsmith's Handbook; containing full instructions for
the alloying and working of gold. G. E. Gee.
Crosby Lockwood & Sons (1922).
- 12 Scientific American Cyclopedia of Formulas. Hopkins.
Sci. Am. Pub. Co., New York (1921).
- 13 Metal Worker's Handy Book of Receipts and Processes. W. T.
Brant.
H. C. Baird & Co. (1919).
- 14 Iron and Steel, a pocket encyclopedia. H. P. Timmann. 3rd ed
McGraw-Hill Book Co. (1933).
- 15 Henley's Twentieth Century Book of Receipts, Formulas and
Processes. N. Henley (1919).
- 16 Metallurgical calculations. J. W. Richards.
McGraw-Hill Book Co. (1918).
- 17 Chronology of Iron and Steel. S. L. Goodale.
Pittsburgh Iron & Steel Foundries Co. (1920).

D. Statistics

Ref.

- D 1 Metal statistics.
Am. Metal Market Co., 11 Cliff St., New York, N. Y.
- 2 Mineral industry.
McGraw-Hill Book Co. (annual).
- 3 Annual statistical report of the American Iron and Steel Institute.
Am. Iron and Steel Inst.
- 4 Mineral resources of the United States. Bureau of Mins.
Government Printing Office.
- 5 Directory Iron and Steel Works of the United States and Canada.
Am. Iron and Steel Inst. (latest edn. 1935 or 36).

E. Nonferrous metals and alloys (general).

Ref.

- E 1 Science of metals. Z. Jeffries and R. S. Archer.
McGraw-Hill Book Co. (1924).
- 2 Alloys and their industrial applications. E. F. Law. 4th edn.
C. Griffin & Co., London (1926).
- 3 Metallic alloys. G. H. Gulliver. 5th edn.
C. Griffin & Co. (1926).
- 4 A comprehensive treatise on inorganic and theoretical chemistry.
J. W. Mellor. 16 vols. 15 issued to date.
Longmans, Green & Co. (1922-36).
- 5 Brazing and soldering. J. F. Hobart.
D. Van Nostrand Co. (1919)
- 6 Tin solders. A modern study of the properties of tin solders and soldered joints. J. S. Nightingale.
British Nonferrous Metals Res. Assn., Euston St., London, N.W. 1. (1929)
- 7 Metals and metallic compounds. U. R. Evans. 4 vols.
E. Arnold & Co. London (1923).
- 8 Aeronautics, metallurgy, general index. R. Glazebrook.
MacMillan & Co. Ltd., London (1923).

Ref. Nonferrous metals (Continued)

- E 9 Engineering nonferrous metals and alloys. L. Aitchison and W. R. Barclay.
H. Frowde & Hodders & Stoughton. London (1923).
- 10 Metals and their alloys. G. Vickers.
H. C. Baird & Co. (1923).
- 11 Metallography. 2. Metals and their common alloys. S. Hoyt.
McGraw-Hill Book Co. (1921).
- 12 Chemistry of the rare metals. B. F. Hopkins.
D. C. Heath & Co., Boston (1923).
- 13 Modern uses of nonferrous metals. Edited by C. H. Newbenson.
Am. Inst. Mining & Metallurgical Engrs. (1935).
- 14 The materials of aircraft construction. F. T. Hill.
Sir I. Pitman & Sons (1933).
- 15 Bearing metals and bearings. W. H. Corsec.
Reinhold Pub. Co. (1930).
- 16 Metallurgy of white metal scrap. E. R. Thoms.
D. Van Nostrand. (1930).
- 17 The metallurgy of bronze, H. C. Doolittle.
Sir I. Pitman & Sons (1930).
- 18 Impurities in metals. C. J. S. Smithells. 2nd edn.
J. Wiley & Sons (1936).
- 19 Gold alloys, their manufacture and application. G. E. Gee.
Crosby Lockwood & Son, London.
- 20 Precious metals. L. A. Smith.
N.A.G. Press, London (1934).
- 21 The casting of brass ingots. R. Genders and G. L. Bailey.
Brit. Nonferrous Metals Rec. Assoc., London (1934).

F. Iron and Steel

Ref.

- F 1 An introduction to the metallurgy of iron and steel. H. M. Boylston.
J. Wiley & Sons (1928).
- 2 Lectures on steel and its treatment. J. F. Keller.
Am. Soc. Metals (1935).
- 3 Steel and its heat treatment. D. K. Bullens.
J. Wiley & Sons (1935).
- 4 Principles of metallurgy. An introduction to the metallurgy of metals. C. H. Fulton.
Am. Soc. Metals (1927).
- 5 Non-technical chats on iron and steel. L. W. Spring.
F. A. Stokes Co., New York (1927).
- 6 Stainless iron and steel. J. H. G. Monypenny. 2nd edn.
McGraw-Hill Book Co. (1931).
- 7 Production, heat treatment, and properties of iron alloys.
L. Jordan.
Circular of the Nat. BS, 0409 (1936). Superintendent of Documents.
- 8 Metallography and heat treatment of iron and steel. A. Sauveur. 4th edn.
Cambridge Mass. University Press (1935).
- 9 The making, shaping and treating of steel. J. Camp and C. B. Francis. 4th edn.
Carnegie Steel Co., Pittsburgh (1925).
- 10 Metallurgy in aircraft construction. S. Daniels and F. T. Sisco.
Air Service, Dayton, Ohio (1925).
- 11 Molybdenum, cerium and related alloy steels, H. W. Gillett and E. L. Mack.
Reinhold Pub. Co. (1925).
- 12 Das technische Eisen, Konstitution und Eigenschaften. P. Oberhoffer.
J. Springer (1925).
- 13 Metallurgy of steel. F. W. Harbord and J. W. Hall.
J. B. Lippincott Co. (1923).

Ref. Iron and Steel (continued -1-)

- F14 Metallurgy of iron and steel. E. Staughton.
McGraw-Hill Book Co. (1954).
- 15 Invar and related nickel steels. Cir. BS, C58.
Superintendent of Documents (1923).
- 16 Aircraft steels and materials. L. Aitchison.
Constable & Co. London (1922).
- 17 Heat treatment of soft and medium steels. F. Giolitti.
McGraw-Hill Book Co. (1921).
- 18 Engineering steels, L. Aitchison.
D. Van Nostrand (1921).
- 19 Sheet steel and tin plate, R. W. Shannon.
Reinhold Pub. Co. (1930).
- 20 Working, heat-treating and welding of steel, H. L. Campbell.
J. Wiley & Sons (1935).
- 21 Bibliography on non-metallic inclusions in iron and steel.
L. F. McCombs and M. Scherrer.
Carnegie Institute of Technology (1935).
- 22 Chromium steels. R. H. Greaves.
His Majesty's Stationery Office, London (1935).
- 23 Book of stainless steels. E. E. Thum. 2nd edn.
Am. Soc. Metals (1935).
- 24 Tool steels, J. P. Gill. Am. Soc. Metals (1935).
- 25 The quenching of steels. H. J. French. Am. Soc. Metals (1935).
- 26 Constitution of steel and cast iron. F. T. Sisco.
Am. Soc. Metals (1935).
- 27 Inclusions in iron. Wehrman.
Am. Soc. Metals (1935).
- 28 Principles of phase diagrams. J. S. Marsh.
McGraw-Hill Book Co. (1935).
- 29 The metal - iron. H. E. Gleeves and J. G. Thompson.
McGraw-Hill Book Co. (1935).

Ref. Iron and Steel (continued -2-)

- F30 The alloys of iron and copper. J. L. Gregg and B. N. Daniloff.
McGraw-Hill Book Co. (1934).
- 31 The alloys of iron and molybdenum. J. L. Gregg.
McGraw-Hill Book Co. (1932).
- 32 The alloys of iron and tungsten. J. L. Gregg
McGraw-Hill Book Co. (1934).
- 33 The alloys of iron and silicon. E. S. Greiner, J. S. March,
and Bradley Stoughton.
McGraw-Hill Book Co. (1933).
- 34 The alloys of iron and carbon. S. Epstein. Volume 1.
McGraw-Hill Book Co. (1936).
- 35 The manufacture of electric steel. F. T. Sisco.
McGraw-Hill Book Co. (1924).
- 36 The physical chemistry of steel-making; the solubility of
iron oxide in iron. C. H. Herty.
Carnegie Inst. of Technology (1932).
- 37 High-speed steel. M. A. Grossman and E. C. Bain.
J. Wiley & Sons (1931).
- 38 Automobile steels. (Translation). A. Mueller-Hauff and
K. Stein.
J. Wiley & Sons (1927).
- 39 Photomicrographs of iron and steel. E. L. Reed.
J. Wiley & Sons (1929).
- 40 Elements of ferrous metallurgy. J. Rosenheltz.
J. Wiley & Sons. (1930).
- 41 Steel treating practice, R. H. Sherry.
McGraw-Hill Book Co. (1935).
- 42 Steel physical properties atlas.
Am. Soc. Metals (1936).
- 43 Sonderstahlkunde. E. Hondremont.
J. Springer (1935).
- 44 The manufacture of electric steels. F. T. Sisco.
McGraw-Hill Book Co. (1924).
- 45 Non-metallic inclusions in iron and steel. Carl Bonodicks
and H. Lofquist.
J. Wiley & Sons (1931).

Iron and Steel (continued -3-)

The names of steel manufacturers with the type of product they manufacture are listed in the Iron and Steel Works Directory of the United States and Canada, American Iron and Steel Institute, 350 Fifth Avenue, New York, N. Y. Useful pamphlets describing their products have been issued by many companies. The following are typical:-

Bethlehem Steel Company, Bethlehem, Pa.

The Midvale Company, Nicetown, Philadelphia, Pa.

The Carpenter Steel Company, Reading, Pa.

Crucible Steel Company of America, 17 East 42nd Street,
New York, N. Y.

Republic Steel Corporation, Cleveland, Ohio.

American Rolling Mill Co., Middletown, Ohio.

Vanadium Alloys Steel Company, Latrobe, Pa.

Latrobe Electric Steel Company, Latrobe, Pa.

Tacony Steel Company, Tacony, Philadelphia, Pa.

Carnegie-Illinois Steel Company, Pittsburgh, Pa.

Firth-Sterling Steel Company, McKeesport, Pa.

Titanium Alloys Manufacturing Company, Niagara Falls, N. Y.

Vanadium Corporation of America, Bridgeville, Pa.

Interstate Iron & Steel Co., 104 So. Michigan Ave., Chicago, Ill.

Universal Steel Company, Bridgeville, Pa.

Cyclops Steel Company, Titusville, Pa.

Ludlum Steel Company, Watervliet, N. Y.

Donner Steel Company, Buffalo, N. Y.

Tiiken Steel & Tube Company, Canton, Ohio.

Simonds Saw and Steel Company, Lockport, N. Y.

Climax Molybdenum Company, New York, N. Y.

The International Nickel Company, 67 Wall Street, New York,
N. Y.

G. Foundry, cast iron and nonferrous metals

Ref.

- G 1 Cast iron in the light of recent research, W. H. Hatfield.
3rd edn.
C. Griffin & Co. (1928).
- 2 Foundry sand, its uses and abuses. E. W. Smith.
For sale by the author, Chicago (1926).
- 3 Metal spraying. T. H. Turner and N. F. Budgen.
J. B. Lippincott (1926).
- 4 Industrial furnaces. W. Trinks. 2 volumes.
J. Wiley & Sons (1925).
- 5 Steel foundry. J. H. Hall.
McGraw-Hill Book Co. (1935).
- 6 Bibliography on cast iron, J. W. Bolton.
Am. Foundrymen's Assn. (April 1935, continuing).
- 7 Electric melting practice. A. G. Robiette.
J. B. Lippincott Co. (1934).
- 8 Cast metals handbook.
Am. Foundrymen's Assn. (1935).
- 9 Die castings. H. L. Chase.
J. Wiley & Sons (1935).
- 10 A manual of foundry practice. J. Laing and R. T. Rolfe.
The Sherwood Press (1935).
- 11 The principles of iron founding. B. Moldenke. 2nd edn.
McGraw-Hill Book Co. (1930).
- 12 Testing and grading foundry sands. Committee on Molding
Sand Research.
Am. Foundrymen's Assn. (1931).
- 13 Effect of elevated temperatures on certain mechanical properties of gray cast iron and malleable iron. Symposium on Effect of Temperatures on the Properties of Metals. J. W. Bolton and H. Bornstein.
Am. Soc. Testing Materials and Am. Soc. Mech. Engrs. (1931).
- 14 Symposium on cast iron prepared by Am. Foundrymen's Assn. and Am. Soc. Testing Materials. (1933).

G. Foundry (continued).

Ref.

- G15 Practical iron founding. T. G. Korner.
Sir I. Pitman & Sons (1920).
- 16 American malleable cast iron. H. A. Schwartz.
The Penton Pub. Co., (1922).
- Also references: E 17
E 21
F 1
F 14

H. Individual metals

a. Aluminum.

Ref.

- Hal Light metals and alloys. Cir. BS C346.
Superintendent of Documents (1927).
- 2 Working of aluminum. E. T. Painton.
Chapman & Hall (1927).
- 3 Aluminum, the metal and its alloys, M. G. Corson.
D. Van Nostrand (1926).
- 4 Metallurgy of aluminum and aluminum alloys. B. J. Anderson.
H. C. Baird & Co. (1925).
- 5 Aluminum and its alloys, N. F. Budgen.
Sir I. Pitman & Sons (1933).
- 6 Metallography of aluminum and its alloys. V. Fuss.
(translated by R. J. Anderson). The Sherwood Press (1935).
- 7 Secondary aluminum. R. J. Anderson.
The Sherwood Press (1931).
- 8 The aluminum industry. 2 volumes. J. D. Edwards, F. C.
Frery and Z. Jeffries.
McGraw-Hill Book Co. (1930).
- 9 Service characteristics of light metals and alloys.
Committee B-7, Am. Soc. Testing Materials.

Ha. Aluminum (continued),.

Ref.

HalC Aluminum in aircraft

Aluminum Co. of America, Pittsburgh, Pa.

- 11 The technology of aluminum and its light alloys
Alfred von Zeerleder, trans. A. J. Field, Gustav Fock,
145 W 44th St., New York, N. Y. (1936).

Also reference: C 1, E 4, E 7, E 13.

The Aluminum Company of America, 801 Gulf Building, Pittsburgh Pa. has prepared technical pamphlets which discuss aluminum, its alloys and their industrial uses.

H.b. Antimony

Ref.

- Hb1 Antimony, C. Y. Wang, 2nd edn.
C. Griffin & Co. (1926)
Also E 4, E 13.

H.c. Arsenic

Ref.

- Hc1 Handbook of non-ferrous metallurgy. Chapter XII of Vol. 2.
Arsenic. W. C. Smith.
McGraw-Hill Book Co. (1926).
Also E 4, E 13.

H.d. Beryllium

Ref.

- Hd1 Beryllium, its production and application. Translated by
R. Rimbach and A. J. Michel. Reinhold Pub. Co. (1932).
Also reference: Hal, E 4, E 13

H.e. Bismuth

Ref.

- He1 Bismuth, J. G. Thompson, Cir. BS C382.
Superintendent of Documents (1930).
Also E 4, E 13.

H.f. Cadmium

Ref.

Hf1 Cadmium, its metallurgy, properties and uses. N. M. Budgen.
C. Griffin & Co. (1924).

Also C 1, E 4, E 13

H.g. Calcium, barium, lithium, etc.

C 1, E 4, E 13.

H.h. Chromium

Hg1 Reference: E 4, E 13.

H.i. Cobalt

Hi1 Cobalt, nickel and the elements of the platinum group. J.
A. N. Friend. Vol. IX.
C. Griffin & Co. (1922).

Also E 4, E 13.

H.j. Copper

Ref.

Hj1 The story of copper. W. Davis.
The Century Co., 352 Fourth Ave., New York, N. Y. (1924).

2 Copper. Cir. B5 C73.
Superintendent of Documents (1922).

3 Arsenical and argentiferous copper. J. L. Gregg.
Reinhold Pub. Co. (1934).

4 Metallurgy of copper. H. O. Hofman. (revised by C. R.
Maynard) 2nd edn.
Mining & Metallurgy, 29 West 39th St., New York, N. Y.
(1934).

5 Commercially important copper alloys.
Chase Copper and Brass Co., Waterbury, Conn. (1936).

Also reference: C 1, E 4, E 13, F 30.

Pamphlets relating to the various industrial uses of copper
are available from the following:

Copper and Brass Research Association, 420 Lexington Ave.,
New York, N. Y.

Copper Development Association, London, England.

H.k. Gold

Ref.

Hk1 Metallurgy of gold. T. K. Rose, 6th edn.
J. B. Lippincott Co. (1926).

2 Working in precious metals. E. A. Smith.
N. A. G. Press, Ltd., London (1934).

Also reference: C 1, E 4, E 13, E 19, E 20.

H.l. Lead.

Ref.

Hl1 Lead, the precious metal. O. C. Harn.
The Century Co. (1924).

2 Lead, its occurrence in nature, the modes of its extraction,
its properties and uses. J. A. Smythe.
Longmans, Green & Co. (1923).

3 Useful information about lead.
Lead Industries, 420 Lexington Avenue, New York, N. Y. (1931)

This association also issued "Lead", a quarterly publication
and some other technical pamphlets.

Also C 1, E 4, E 13.

H.m. Magnesium

Ref.

Hm1 Magnesium. Am. Magnesium Corp., Cleveland, Ohio (1923)

Also reference: C 1, E 4, E 13, Hal.

The Dow Chemical Company, Midland, Michigan has issued several
pamphlets on the subject. The outstanding ones are "Downmetal"
and "Downmetal Laboratory Methods".

H.n. Niobase

Ref.

Hnl Niobase: Uses, preparation, mining costs and production of ferro-alloys, C. H. White. P. 13. of 13. Bul. 173. Superintendent of Documents (1920).

Also E 13.

H.o. Mercury

Ref.

Hol Mercury of quicksilver. L. E. Disch. C. H. Schuette. Bureau of Mines Bul. 222. Superintendent of Documents (1925).

Also E 4, E 13.

H.p. Molybdenum

Ref.

Hpl Molybdenum. V. L. Barclay-Wilmot. Canada Department of Mines, Ottawa (1925).

Also reference: E 13, F 11, F 31.

The Climax Molybdenum Corporation, 500 Fifth Avenue, New York City issues a pamphlet monthly entitled "Moly-Matrix". The Molybdenum Corporation of America, Pittsburgh, Pa. also issued pamphlets.

H.q. Nickel

Ref.

Hql Nickel and its alloys. Cir. 18 C100 Superintendent of Documents (1921).

- 2 Nickel: the mining, refining and applications of nickel. D. B. H. White. Sir F. Pitman & Sons (1925).

The International Nickel Company, 67 Wall Street, New York City distributes several series of pamphlets dealing with nickel and nickel alloys.

Also C 1, E 4, E 13, F 15.

H.r. Platinum and related metals

Ref.

Hrl Platinum metals. E. A. Smith.
Sir I. Pitman & Sons (1925).

The various platinum manufacturers have issued technical pamphlets on platinum: Baker & Co. Platinum Works, Newark, N. J.; Sigmund Cohn, 44 Gold Street, New York City; J. Bishop & Co., Malvern, Pa.

Also C 1, E 13.

H.s. Silicon

Ref.

Hsl Reference: Hal

Also E 4, F 33.

H.t. Silver

Htl Silver: its properties and industrial uses. B. A. Rogers,
I. C. Schoonover and L. Jordan.
Cir. BS C412. Superintendent of Documents (1936).

Also E 13.

H.u. Tin

Ref.

Hul Tin. C. L. Mantell. Reinhold Publishing Corp. (1929).

2 Tin and the tin industry; the metal, history, character and application. A. H. Munday.
Sir I. Pitman & Sons (1925).

The International Tin Research and Development Council, 149 Broadway, New York, N. Y. from time to time issues pamphlets dealing with tin and its various uses.

Also C 1, E 4, E 13, F 19.

H.v. Titanium.

Ref.

Hvl Titanium, with special reference to the analysis of titaniferous substances. W. M. Thornton.

Reinhold Publishing Corp. (1927).

Also E 13.

H.w. Tungsten

Ref.

Hwl Tungsten- C. J. Smithells.
D. Van Nostrans (1927).

Also reference: C 1

The Fansteel Company, North Chicago, Ill. has issued pamphlets on tungsten, columbium, tantalum and other uncommon metals.

Also E 13, F 32, J 8.

H.X. Uranium, Vanadium

The Vanadium Corporation of America, Bridgeville, Pa. has available pamphlets for distribution.

Also E 13.

H.y. Zinc

Ref.

- Hyl Zinc and its corrosion resistance.
Am. Zinc Inst., 60 East 42nd St., New York, N. Y. (1928)
- 2 La galvanisation a chaud. C. Kluytmans.
L'Usine, Paris (1936).
 - 3 Galvanizing. H. Bablik. translated by M. Juers-Budicky.
E. & F. N. Spon, London (1936).
 - 4 Zinc and its alloys.
Cir. 48, C395, Superintendent of Documents (1931).

The American Zinc Institute issues a monthly bulletin entitled "Make It of Zinc". Address is given above. The New Jersey Zinc Company, Palmerton, Pa. also issues periodicals on zinc and its alloys.

Also C 1, L 13.

H.z. Zirconium

Ref.

- H21 Zirconium and its compounds. F. P. Venable.
Reinhold Publishing Corp. (1922)
- 2 Investigations of zirconium. J. W. Marden and M. N. Piclo.
Bu. Mines Bul. 186. Superintendent of Documents (1921).
- Also reference: E 13, F 11.

H.z.z. Rare metals

Ref. See reference E 12, E 13, E 20

I. General metallurgical subjects

Ref.

- I 1 Manufacture of seamless tubes, ferrous and nonferrous. G. Evans.
H. F. & G. Witherby, London (1934).
- 2 Protective films on metals. E. S. Hedges.
D. Van Nostrand (1933).
- 3 A textbook of metallurgical problems. A. Butts.
McGraw-Hill Book Co. (1934).
- 4 Metals and alloys. L. Cassier Co. Ltd.
22 Henrietta Street, London, W. C. 2 (1931).
- 5 Metallurgical dialogue. A. Sauveur.
Am. Soc. Metals (1935).
- 6 Principles of heat treatment. M. A. Grossmann.
Am. Soc. Metals (1935).
- 7 Grain size symposium. Am. Soc. Metals (1935).
- 8 Heat treatment, uses and properties. Knowlton.
Am. Soc. Metals (1935).
- 9 The principles of physical metallurgy. G. E. Doan.
McGraw-Hill Book Co. (1935).
- 10 Fatigue strength and construction. A. Thum and W. Buchmann.
VDI Verlag, Berlin (1932).

I. General metallurgical subjects (continued)

Ref.

- 111 Finishing metal products. H. R. Simonds.
McGraw-Hill Book Co. (1935).
- 12 Chemical coloring of metals. S. Tatch and S. R. Bonney.
Chapman and Hall, London (1925).
- 13 Metallurgy and its influence on modern progress. R. A.
Hedfield.
Chapman and Hall (1925).
- 14 Corrosion, causes and prevention. F. N. Speller. 2nd edn.
McGraw-Hill Book Co. (1935).
- 15 The corrosion of metals. U. R. Evans.
Longmans, Green & Co. (1924).
- 16 Corrosion resistance of metals and alloys. R. J. McKay and
R. Worthington.
Reinhold Pub. Corp. (1936).
- 17 Introduction to physical metallurgy. W. Rosenhain.
D. Van Nostrand (1922).
- 18 Protective metallic coatings. H. S. Rawdon
Chemical Catalog Co. 1928 (out of print)

Also reference: F 28

J. Metallography, general

Ref.

- J 1 Atlas metallographicus. I. Iron and steel. II. Nonferrous
metals. H. Hanemann and A. Schrader.
G. Borntrager, Berlin (1927).
- 2 Metallographic researches. C. Benedicks.
McGraw-Hill Book Co. (1926).
- 3 Practical microscopical metallography. R. H. Greaves and
H. Wroughton.
Chapman and Hall (1924).

J. Metallography, general (continued)

Ref.

- J 4 Theoretical metallurgy. R. S. Dean.
J. Wiley & Sons (1924).
- 5 Moderne Metallkunde in Theorie und Praxis. J. Czochralski.
J. Springer (1924).
- 6 Structural metallography. H. B. Pulsifer.
Reinhold Pub. Corp. (1924).
- 7 Metallographie. W. Guertler.
Gebruder Borntrager, Berlin (1923).
- 8 Metallographic study on tungsten steels. A. Hultgren.
J. Wiley & Sons (1920).
- 9 An introduction to the study of metallography and macro-
graphy. L. Guillet and A. Portevin. translated by L.
Taverner.
G. Bell & Sons, Ltd. London (1921).
- 10 Das Ätzen der Metalle für Kunstgewerbliche Zwecke. H. Schubert.
A. Hartleben. Wein u. Leipzig (1923).
- 11 Structure and related properties of metals. Cir. PS C113.
Suprintendent of Documents (1922).
- 12 Metallography. C. H. Desch.
Longmans. Green & Co. (1922).
- 13 Crystallization of metals. N. T. Bolaiow.
Univ. of London Press, Ltd. London (1925).
- 14 Traite de metallurgie generale. L. Guillet.
J. B. Bailliere et Fils, Paris (1922).
- 15 Metallography. S. L. Hoyt. 2 vols.
McGraw-Hill Book Co. (1921).
- 16 Metallographie. E. Heyn. translated and condensed. M. A.
Grossmann.
J. Wiley & Sons (1925).
- 17 Introduction a l'etude de la metallurgie, le chauffage
industriel.
L. LeChatelier. Dunod. Paris (1920)

J. Metallography, general (continued)

Ref.

- J18 Heat treatment and metallography of steel. H. C. Innerr.
Temple Univ. Philadelphia (1935).
- 19 An outline of metallography, W. Campbell
McGraw-Hill Book Co. (1933).
- 20 An introduction to physical metallurgy. L. R. van Wert.
McGraw-Hill Book Co. (1935).
- 21 Metallographers' handbook of etching. T. Berglund. translated
by W. H. Dearden.
Sir I. Pitman & Sons (1935).
- 22 Principles of metallography. E. S. Williams and V. O.
Homerburg.
McGraw-Hill Book Co. (1935).
- 23 The chemistry of solids. C. H. Desch.
The Cornell University Press. Ithaca, N. Y. (1934).

K. Crystal structure of metals; X-ray study

Ref.

- K 1 Physics of crystals. A. F. Joffe
McGraw-Hill Book Co. (1923).
- 2 X-rays, past and present. V. E. Pullin and W. J. Wiltshire.
D. Van Nostrand (1927).
- 3 X-rays in theory and experiment. A. H. Compton and S. H.
Allison.
D. Van Nostrand (1935).
- 4 Bibliography of crystal structure. J. H. Morse.
Univ. of Chicago Press (1928).
- 5 An introduction to crystal analysis. W. H. Bragg.
G. Bell & Sons, London (1928).
- 6 Die Verwendbarkeit der Röntgenverfahren in der technik. G.
Kautner and A. Herr.
V. D. I. Verlag, G.m.b.H. Berlin (1928).

K. Crystal structure of metals; X-ray study (continued)

Ref.

- K 7 Materialprüfung mit Röntgenstrahlen. R. Glocker.
J. Springer (1927).
- 8 Applied X-rays, G. L. Clark.
McGraw-Hill Book Co. (1927).
- 9 X-rays. G. W. C. Kaye. 5th edn.
Longmans, Green & Co. (1926).
- 10 Die Verwendung der Röntgenstrahlen in Chemie und Technik.
H. F. Mark.
J. A. Barth, Leipzig (1926).
- 11 X-rays and crystal structure. W. H. and W. L. Bragg.
G. Bell & Sons, Ltd. (1924).
- 12 The structure of crystals. R. W. G. Wyckoff.
Reinhold Pub. Corp. (1924).
- 13 The distortion of metal crystals. C. F. Elam.
Oxford Press, Cambridge, England (1935).

Also Ng 11.

L. Mechanical properties.

Ref.

- L 1 Plasticity. A. Nadai.
McGraw-Hill Book Co. (1931).
- 2 Mechanical testing. I. Testing of materials of construction. R. G. Batson and J. H. Hyde. 2nd edn.
Chapman and Hall (1931).
- 3 Handbuch der Physik. V. Mechanik der Elastischen Körper.
J. Springer (1928).
- 4 Fatigue of metals. H. F. Moore and J. B. Kommers.
McGraw-Hill Book Co. (1927).
- 5 Manual of the endurance of metals under repeated stress.
H. F. Moore.
McGraw-Hill Book Co. (1927).

L. Mechanical properties (continued)

Ref.

- L 6 Fatigue of metals. H. J. Gough.
D. Van Nostrand (1924).
- 7 Engineering and metallurgy. L. Descroix.
Charles Marie, 9 Rue de Bagneux, Paris (1924).
- 8 Strength and structure of steel and other metals. W. E. Dalvy.
Longmans, Green & So. (1923).
- 9 Fatigue of metals. H. F. Moore and T. M. Jasper.
Univ. of Illinois Bul. 136 (1923).
- 10 Testing precious metals. C. M. Hoke.
Jewelers Technical Advice Co., New York (1935).
- 11 Steel, physical properties atlas.
Am. Soc. Metals (1936).
- 12 Materials of construction. A. P. Mills.
J. Wiley & Sons (1922).
- 13 Textbook of the material of engineering. H. F. Moore.
McGraw-Hill Book Co. (1920).
- 14 Bibliography on cutting metals. O. W. Boston. 2 vols.
Edwards Bros., Ann Arbor, Mich. (1935).
- 15 The hardness of metals and its measurement. H. O'Neill.
The Sherwood Press (1935).
- 16 Creep of metals. H. J. Tresell.
Oxford University Press, London (1931).
- 17 Creep of steel at high temperatures, F. H. Norton.
McGraw-Hill Book Co. (1929).
- 18 Wire drawing and the cold working of steel. A. T. Adam.
2nd edn.
The Sherwood Press (1935).
- 19 Materials of construction, J. B. Johnson, 7th edn, rewritten
by Withey, Aston and Turneaue,
J. Wiley & Sons (1936).

M. Specifications

Ref.

- M 1 Standards and specifications for metals and metal products.
Federal Specifications Misc. Publ. 120, National Bureau
of Standards.
Superintendent of Documents (1933)
- 2 National directory of commodity specifications, Misc. Publ.
130, National Bureau of Standards.
Superintendent of Documents (1932).
- 3 Federal standard stock catalog. Federal Specifications, Index.
Superintendent of Documents 10¢ (1935) (Specifications
sold as separates, 5¢ each).
- 4 Standards.
Am. Soc. Testing Materials (triennial)
- 5 U. S. Navy Department specifications.
Bureau of Supplies and Accounts and Bureau of Construction
and Repair, Navy Department.
- 6 U. S. Army Aeronautical specifications.
Chief, Materiel Division, Wright Field, Dayton, Ohio.
- 7 Society of Automotive Engineers.
29 West 39th Street, New York, N. Y.
- 8 Recommended practices.
Handbook of the Am. Soc. Metals.
- 9 American Engineering Standards Committee.
29 West 39th Street, New York, N. Y.

N. Special sources, metallurgical lectures, symposia, etc.

N.a. Institute of Metals Lectures, Am. Inst. Min. Met. Engrs.

(All are published in Transactions of Institute).

Ref.

- Nal Colloid chemistry and metallurgy. W. D. Bancroft (1922).
- 2 Solid solution. W. Rosenhain (1923).
- 3 The trend in the science of metals. Z. Jeffries (1924).

II. Special sources, metallurgical lectures, symposia, etc. (continued)

N.a. Institute of Metals Lectures, Am. Inst. Min. Met. Engrs.

Ref.

- 4 Action of a hot wall: a factor of fundamental influence in the rapid corrosion of water tubes and related to the segregation in hot metals.
C. B. Redicks (1925).
- 5 The relation between metallurgy and atomic structure. P. D. Foote (1926).
- 6 Growth of metallic crystals. C. H. Frank (1927).
- 7 Twinning in metals. C. H. Mathewson (1928).
- 8 The passivity of metals, and its relation to problems of corrosion.
U. R. Evans (1929).
- 9 Hard metal carbides and cemented tungsten carbide. S. L. Hoyt (1930).
- 10 X-ray determination of alloy equilibrium diagrams. Arne Westgren (1931).
- 11 The age-hardening of metals. P. D. Fowler (1932).
- 12 Present-day problems in theoretical metallurgy. Georg Nasing (1933).
- 13 Ferro magnetism in metallic crystals. L. W. McKeehan (1934).
- 14 Gamma iron metals. C. A. Edwards. 117-113 (1935).
- 15 Diffusion in solid metals. R. F. Mehl (1936).

N.a. H. C. H. C. Howe Memorial Lectures, A. Inst. Min. Met. Engrs.

(Also published in Transactions of the Institute).

N.a. V. G. L. L. L. Albert Sarveur (1924).

- 2 Austenitic and austenitic steels, John A. Mathews (1925)

M.B. Howe Marion Howe Memorial Lectures, A. Inst. Min. M. E.
Engrs. (continued)

Ref.

- Nb3 Twenty-five years of metallography. William Campbell (1926).
4 Alloy steels. Bradley Stoughton (1927)
5 Significance of the simple steel analysis. H. D. Hibbard (1928)
6 Studies of Hadfield's manganese steel with the high-power microscope. J. H. Hall (1929).
7 The future of the iron and steel industry. Z. Jeffries (1930).
8 On the art of metallography. F. F. Lucas (1931).
9 On the rates of reactions in solid steel. E. C. Bain (1932)
10 Steel making processes. G. B. Waterhouse (1933).
11 The corrosion problem with respect to iron and steel. F. N. Speller (1934).
12 Problems of steel making. E. C. Smith (1935).
13 Correlation between metallography and mechanical testing. H. F. Moore 120, 13, (1936).

N.c. Edgar Marburg Memorial Lectures, Am. Soc. Testing Materials

(All are published in Proceedings of the Society. Only those relating to metals are listed).

Ref.

- Nc1 The X-ray examination of materials in industry. G. L. Clark. 27, Pt. II, 5 (1927).
2 Cohesion and atomic structure. S. Dushman. 29, Pt. II. 7 (1929).
3 The phenomenon of slip in plastic materials. A. Nadai. 31, Pt. II, 11 (1931).
4 Crystalline structure in relation to failure of metals - especially by fatigue. H. J. Gough. 33, Pt. II, 3 (1933).
5 Aircraft: materials and testing. L. B. Tuckerman. 35, Pt. II, 3 (1935).

N.d. Edward DeWitt Campbell Memorial Lectures, American Society For Metals (formerly American Society for Steel Treating).

(All are published in Transactions of the Society).

Ref.

- Nd1 The corrosion of metals. W. A. Guertler. 13 759 (1926).
- 2 A contribution to the theory of hardening and the constitution of steel. Ray Jeffries. 13, 369 (1927).
- 3 The application of science to the steel industry. W. H. Hadfield. 15, 474, 652, 817, 986; 16, 121, 278 (1928).
(also published complete, in special volume).
- 4 Steel at elevated temperatures. Albert Sauveur. 17, 411 (1929).
- 5 Oxygen in steel. H. A. Grossmann. 18, 601 (1930).
- 6 Non-metallic inclusions in steel. C. H. Herty. 19, 1 (1931).
- 7 Factors affecting the inherent hardenability of steel. E. C. Bain. 20, 385 (1932).
- 8 Fatigue and the hardening of steel. H. J. French. 21, 899 (1933).
- 9 Alloys of iron and chromium. V. V. Krivobok. 23, 1 (1934).
- 10 The importance of aluminum additions in modern commercial steels. H. W. McQuaid. 25 797 (1935).

N.d. Institute of Metals (British) May Lectures

(All are published in Journal of Institute of Metals)

Ref.

- Nd1 The hard and soft states in metal. G. T. Beilby. 6, 5 (1911).
- 2 The inner structure of simple metals. Sir J. Alfred Ewing. 8, 8 (1912).
- 3 No lecture in 1913

N.C. Institute of Metals (continued)

Ref.

- No4 Internal strains in cold-wrought metals and some troubles caused thereby. E. Heyn. 12 3 (1914).
- 5 Conduction of electricity through metals. Sir J. J. Thompson. 14, 3 (1915).
- 6 X-rays and crystal structure, with special reference to certain metals. W. H. Bragg. 16, 2 (1916).
- 7 Researches made possible by the autographic load-extension optical indicator. W. E. Dalby. 18, 5 (1917).
- 8 The formation of diamond. Sir Charles Parsons. 20, 5 (1918).
- 9 Radio activity. Frederick Soddy. 22, 5 (1919).
- 10 Recent progress in thermo-electricity. C. A. F. Benedicks. 24, 7 (1920).
- 11 The casting of metals. Thomas Turner. 26, 5 (1921).
- 12 The relation of the elements. Sir Ernest Rutherford. 28, 3 (1922).
- 13 The inner structure of alloys. W. Rosenheim. 30, 3 (1923).
- 14 Atoms and isotopes. F. W. Aston. 32, 3 (1924).
- 15 The motion of electricity in metals. H. A. Lorentz. 33, 257 (1925).
- 16 The production of single crystals of metals and some of their properties. H. C. H. Carpenter. 35, 409 (1926).
- 17 The growth of crystals in supersaturated liquids. Sir Henry A. Miers. 37, 331 (1927).
- 18 The chemical properties of crystals. C. H. Desch. 39, 411 (1928).
- 19 States of mind which make or miss discoveries, with some ideas about metals. Sir Oliver Lodge. 41, 345 (1929).

N.e. Institute of Metals (continued)

Ref.

- 20 The influence of technique on research. P. A. Crosth. 43, 369 (1930).
- 21 The progress of power production. Wm. B. Woodhouse. 45, 395 (1931).
- 22 The plastic deformation of metals. F. Korber. 46, 317 (1932).
- 23 The phenomena of quenching and tempering in alloys. Albert Portevin. 51, 515 (1935).
- 24 Gases and metal surfaces. E. H. Rideal. 54, 257 (1934).
- 25 Atomic arrangement in metals and alloys. W. L. Bragg. 56, 275 (1935).

N.f. Institute of Metals Autumn Lectures.

(All are published in Journal of Institute of Metals).

Ref.

- 1 The science of human effort (Motion study and vocational training). 28, 469 (1922).
- 2 The use of non-ferrous metals in engineering. Sir Henry Fowler. 31, 3 (1923).
- 3 Recent developments in non-ferrous metallurgy in the United States. W. H. Corse. 32, 455 (1924).
- 4 Education, research and standardization. Sir John Downance. 34, 9 (1925).
- 5 Modern metallurgy and ancient industries. J. Rosenhain. 36, 7 (1926).
- 6 Non-ferrous metals in modern transport. L. Aitchison. 38, 7 (1927).
- 7 Non-ferrous metals in the shipping industry. F. G. Martin. 40, 7 (1928).
- 8 Aluminum and its alloys. A. G. C. Gwyer. 42, 11 (1929).

N.f. Institute of Metals Autumn Lectures (continued).

Ref.

- 9 The use of non-ferrous metals in the aeronautical industry. D. Hanson. 44, 5 (1930).
- 10 Thin films in relation to corrosion problems. U. R. Evans. 46, 7 (1931).
- 11 Corrosion fatigue of metals. H. J. Gough. 49, 17 (1932).
- 12 Twenty-five years' progress in metallurgical plant. W. R. Barclay. 52, 19 (1933).
- 13 The work of Walter Rosenhain. J. L. Haughton. 55, 17 (1934).
- 14 Metal melting, its effect on quality. H. W. Brownsdon. 57, 17 (1935).
- 15 The scientific organization of factories. P. A. J. Chevenard. (1936).

N.g. American Society for Testing Materials Symposia.

(For sale by American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pennsylvania).

Ref.

- Ng1 Aircraft materials. Proc. 30, Pt. II, 26 (1930).
- 2 Corrosion- and heat-resistant alloys (1930)
 - 3 Pearlitic malleable iron castings. Proc. 31, Pt. II, 317 (1931). (Jointly with Am. Foundrymen's Assn.)
 - 4 The effect of temperature on the properties of metals. (1931). (Jointly with Am. Soc. Mech. Engrs.)
 - 5 Welding (1931).
 - 6 Steel castings. Proc. 32, Pt. II, 43 (1932). (Jointly with Am. Foundrymen's Assn.)
 - 7 Cast iron. Proc. 33, Pt. II, 115 (1933). (Jointly with Am. Foundrymen's Assn.)

N.g. American Society for Testing Materials Symposia (continued).

Ref.

- Ng8 The outdoor weathering of metals and metallic coatings (1934).
- 9 Spectrographic analysis. Proc. 35, Pt. II, 47 (1935).
- 10 High-strength constructional metals (nickel, aluminum, copper, low-alloy steels). (1936).
- 11 Radiography and X-ray diffraction methods. (1936).

N.h. Symposia - American Society for Metals

Ref.

- Nhl Grain-size symposium. Trans. 22, 861 (Oct. 1934).
- 2 Nitriding symposium. Trans. 16, 1.
- 3 The plastic working of metals (1936).

N.i. Iron and Steel Institute (British).

Ref.

- Nil Symposium on welding of iron and steel (1935).
1. Present-day practice and problems.
2. Welding technique and metallurgy of welding.

N.j. The Faraday Society, General Discussions.

(For sale by Faraday Society, also in Transactions).

Ref.

- Njl Failure of metals under internal and prolonged stress (1921)
- 2 Physical chemistry of steel making processes. (1925).
- 3 1st, 2nd, and 3rd Reports, atmospheric corrosion. (1924, 1927, 1929).
- 4 The structure of metallic coatings, films and surfaces. (1935).

0. Publishers of books listed.

Ref.

- 0 1 American Foundrymen's Association
222 West Adams Street, Chicago, Illinois.
- 2 American Institute of Mining and Metallurgical Engineers
29 West 39th Street, New York, N. Y.
- 3 American Iron and Steel Institute
350 Fifth Avenue, New York, N. Y.
- 4 American Society of Mechanical Engineers
29 West 39th Street, New York, N. Y.
- 5 American Society for Metals
7016 Euclid Avenue, Cleveland, Ohio.
- 6 American Society for Testing Materials
260 South Broad Street, Philadelphia, Pa.
- 7 Baird, H. C. & Co.
2 West 45th Street, New York, N. Y.
- 8 Chemical Rubber Publishing Company
Cleveland, Ohio.
- 9 Hartleben, A.
Wien, Austria, and Leipzig, Germany.
- 10 Henley, Norman, Publishing Company
2 West 45th Street, New York, N. Y.
- 11 Industrial Press
140 South Lafayette Street, New York, N. Y.
- 12 Law Printing Company
22 Fulton Street, New York, N. Y.
- 13 Lippincott, J. B. Company
227 South Sixth Street, Philadelphia, Pa.
- 14 Longmans, Green & Company
114 Fifth Avenue, New York, N. Y.
- 15 MacMillan & Company
60 Fifth Avenue, New York, N. Y.

O. Publishers of books listed (continued).

Ref.

- 016 McGraw-Hill Book Company, Inc.
330 West 42nd Street, New York, N. Y.
- 17 Metals and Alloys
330 West 42nd Street, New York, N. Y.
- 18 Penton Publishing Company, The
Penton Building, Cleveland, Ohio.
- 19 Pitman, Sir I. & Sons
2 West 45th Street, New York, N. Y. (also London office).
- 20 Reinhold Publishing Corporation (successor to Chemical
Catalog Company) 330 West 42nd Street, New York, N. Y.
- 21 Spon and Chamberlain
330 West 34th Street, New York, N. Y.
- 22 Springer, J.
23-4 Lunkstrasse, Berlin W. 9, Germany.
- 23 Superintendent of Documents
Government Printing Office, Washington, D. C.
- 24 Van Nostrand, D.
250 Fourth Avenue, New York, N. Y.
- 25 Vieweg, F. & Sons
Braunschweig, Germany
- 26 Wiley, J. & Sons
440 Fourth Avenue, New York, N. Y.
- 27 Willars, G.
Paris, France.