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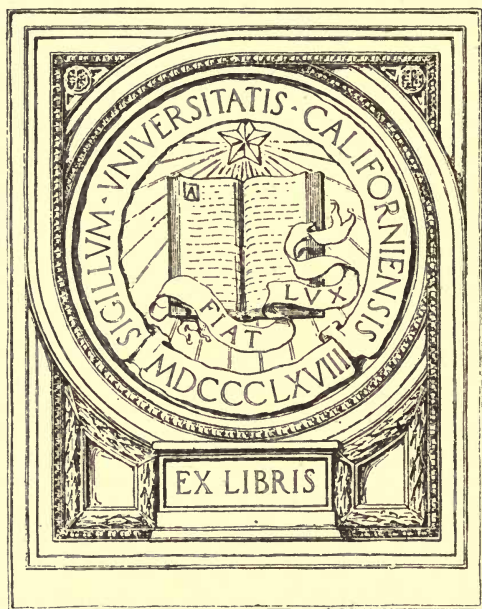
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Sand; Its Occurrence, Properties and Uses

This list, compiled by Mr L. L. Hopkins, represents a fairly thorough search through the material in the Technology Department of the Carnegie Library of Pittsburgh. The use of sand in the manufacture of sand-lime brick was dealt with in a former publication of this Library (Brick Manufacture and Bricklaying, 1912) and has not been included in the present list. Sandblasting, sand roads, and some other applications of sand have also been omitted.

E. H. McCLELLAND,

January 1, 1918.

Technology Librarian.

Abbreviations

ed. edition.	pt. part.
n. s. new series.	ser. series.
no. number.	v. volume.
p. page or pages.	

Occurrence and Properties

Economic Geology

General

Böhm, C. Richard.

Monazitsand. 1906. (In *Chemische industrie*, v.29, p.2-7.)

The same, abstract translation. 1906. (In *Engineering and mining journal*, v.81, p.842.)

General review of monazite sand industry of the world, giving occurrence, method of mining and subsequent treatment. Many references.

Bowles, Oliver.

Sandstone quarrying in the United States. 1917. (In *United States—Mines bureau. Bulletin no.124.* 135 p.)

Includes information regarding the sand obtained from sandstone, its uses and properties.

Burchard, Ernest F.

Glass-sand industry of Indiana, Kentucky and Ohio. 1907. (In *United States—Geological survey. Bulletin no.315: Contributions to economic geology*, 1906, pt.1, p.361-376.)

Production, preparation, rocks utilized, chemical analyses, and detailed descriptions of sand quarries of the district.

Burchard, Ernest F.

Glass sand of the middle Mississippi basin. 1906. (In *United States—Geological survey. Bulletin no.285: Contributions to economic geology*, 1905, p.459-472.)

Location, production, properties and uses.

Burchard, Ernest F.

Notes on various glass sands, mainly undeveloped. 1907. (In United States—Geological survey. Bulletin no.315: Contributions to economic geology, 1906, pt.1, p.377-382.)

Covers undeveloped glass sand deposits in Alabama, Arkansas, Georgia, Florida, Iowa, Kansas, Missouri and Nebraska. Table of analyses of sands from these deposits.

Day, David T. & Richards, R. H.

Investigation of black sands from placer mines. 1906. (In United States—Geological survey. Bulletin no.285: Contributions to economic geology, 1905, p.150-164.)

Concerned principally with data on the economic value of the black sands of the Pacific coast.

Day, David T. & Richards, R. H.

Useful minerals in the black sands of the Pacific slope. 1907. (In United States—Geological survey. Mineral resources, calendar year 1905, p.1175-1258.)

"Papers bearing on black sands," p.1258.

The same, abstract. 1907. (In Scientific American supplement, v.63, p.26056.)

Lahee, Frederick H.

Field geology. 508 p. 1916. McGraw.

Contains a very considerable amount of information on the geology of sands in general.

Randolph, Beverley S.

Silica sand industry. 1907. (In Engineering and mining journal, v.84, p.1211-1212.)

Sources of supply, economic considerations, and preparation.

Silica. 1909. (In Mineral industry, v.17, p.764-767.)

General information on deposits, production and uses. Includes sand-lime brick and pumice.

Special Districts

United States

California

De Groot, Henry.

Manufacture of glass in California. 1890. (In California—State mining bureau. Annual report (9th), calendar year 1889, p.324-329.)

Treats of glass-making in California, its difficulties on account of lack of suitable sand and the discovery of a deposit that promised to be of great value.

Georgia

McCallie, S. W.

Preliminary report on the mineral resources of Georgia. 1910. (In Georgia—Geological survey. Bulletin no.23.)

Includes, p.179-181, section on "Sand and gravel," giving briefly the location, geology, properties, uses and production of Georgia sand.

Illinois

Alden, William C.

Description of the Chicago district. 1901. (In United States—Geological survey. Geologic atlas of the United States, folio no.81.)

Brief description of building sands and of molding-sands in Riverside, Chicago, Desplains and Calumet quadrangles, Illinois-Indiana, p.12-13.

Bain, H. F.

Analysis of certain silica deposits. 1907. (In Illinois—Geological survey. Bulletin no.4, p.185-186.)

Gives analyses of fine-grained silica sands from Union and Alexander counties.

Burchard, Ernest F.

Concrete materials produced in the Chicago district. 1908. (In United States—Geological survey. Bulletin no.340: Contributions to economic geology, 1907, p.383-410.)

"Literature and maps," p.410.

The same, enlarged. 1907. (In Illinois—Geological survey. Bulletin no.8, p.345-372.)

Sections on "Glacial sand and gravel (outwash and moraine materials)" and on "Lake shore deposits," p.398-409.

Udden, Johan A. & Todd, J. E.

Structural materials in Illinois. 1910. (In Illinois—Geological survey. Bulletin no.16, p.342-390.)

Gives occurrence and description of sand deposits for many localities in the state.

Indiana

Barrett, Edward.

Glass sands of Indiana—Industries. 1914. (In Indiana—Department of geology and natural resources. Annual report (38th), for calendar year 1914, p.41-59.)

Economic geology, analyses and production statistics.

Leverett, Frank, & Taylor, F. B.

Pleistocene of Indiana and Michigan and the history of the Great lakes. 1915. (In United States—Geological survey. Monographs, v.53.)

"Sand of Kankakee-Tippecanoe area," p.128-130; "Sand and gravel," p.521-522.

Maryland

Clark, William Bullock, & Mathews, E. B.

Maryland mineral industries, 1896-1907. 1909. (In Maryland—Geological survey. [Report], v.8, p.99-223.)

"Sand and gravel," p.146-150, is concerned with the deposits of building sand, concrete sand, glass sand, molding-sand and engine sand of the state.

Miller, Benjamin L.

Mineral resources of Prince George's county. 1911. (In Maryland—Geological survey. [Report on county resources], v.6, pt.1, p.137-150.)

"The sands," p.139-140, gives brief treatment of location and uses of sands of the region.

Massachusetts

Gratacap, L. P.

Sands of Cape Cod. 1902. (In Scientific American, v.100, n. s. v.86, p.127.)

Brief treatment of some of the geological features of the district.

Michigan

See also Leverett & Taylor, under Indiana.

Grabau, A. W. & Sherzer, W. H.

Monroe formation of southern Michigan and adjoining regions. 1910. (In Michigan—Geological and biological survey. Publication no.2; geological series no.1, 248 p.)

Contains much geological information on the character of the various sands.

Smith, R. A.

Mineral resources of Michigan, with statistical tables of production and value of mineral products for 1913 and prior years, pt.2: Non-metallic minerals. 1914. (In Michigan—Geological and biological survey. Publication no.16; geological series no.13, p.81-141.)

Contains brief reference to the sand and gravel industry of the state, with production statistics.

Minnesota

Burchard, Ernest F.

Structural materials available in the vicinity of Minneapolis, Minn. 1910. (In United States—Geological survey. Bulletin no.430: Contributions to economic geology, 1909, p.280-291.)

Section on "Materials for concrete" has subsection "Sand and gravel," p.285-287. Section on "Materials for mortar and plaster" has subsection "Sand," p.291.

Mississippi

Logan, William N.

Structural materials of Mississippi. 1911. (In Mississippi—Geological survey. Bulletin no.9.)

Contains considerable on the economic geology of the sands of Mississippi.

Missouri

Fenneman, N. M.

Geology and mineral resources of the St. Louis quadrangle, Missouri-Illinois. 1911. (In United States—Geological survey. Bulletin no.438, p.1-73.)

Section on "Economic geology" has subsection on "Sand and gravel," p.56-58. Covers glass sand, building sand, molder's sand, and cement gravel.

Nebraska

Barbour, Erwin H.

Report of the state geologist. 1903. (In Nebraska—Geological survey. Publications, v.1, p.1-258.)

Brief reference to sand resources of the state, p.206-210.

Condra, George Evert.

Sand and gravel resources and industries of Nebraska. 1911. (In Nebraska—Geological survey. Publications, v.3, pt.1, p.1-206.)

Very complete treatment of sand resources of the state. Considers geology, properties, exploitation and uses.

Woodruff, Elmer Grant.

Geology of Cass county, Nebraska. 1906. (In Nebraska—Geological survey. Publications, v.2, pt.2, p.176-290.)

Makes brief reference, p.226-229, to the sand resources of the county.

New Jersey

Kümmel, Henry B. & Gage, R. B.

Glass-sand industry of New Jersey. 1907. (In New Jersey—Geological survey. Annual report (43d) of the state geologist, for 1906, p.77-96.)

The same, abstract. 1907. (In Mining reporter, v.56, p.357.)

Discusses digging, washing, etc. briefly.

Kümmel, Henry B. & Hamilton, S. H.

Report on some molding sands of New Jersey. 1905. (In New Jersey—Geological survey. Annual report (41st) of the state geologist, for 1904, p.187-246.)

"Properties of molding and core sands," "Distribution of New Jersey molding sands," "Local details." Includes many tables of test results, principally mechanical analyses.

Twitchell, M. W.

Mineral industry of New Jersey for 1913. 1914. (In New Jersey—Geological survey. Bulletin no.15.)

Sand and gravel briefly considered, p.24-25.

New Mexico

Brady, Frank W.

White sands of New Mexico. 1905. (In Scientific American supplement, v.59, p.24649.)

Describes an extensive deposit of granular gypsum, often erroneously referred to as "sand."

New York

Nason, Frank L.

Economic geology of Albany county. 1894. (In New York (state) —Museum. Annual report (47th), for 1893, p.459-481.)

"Gravels, sands and clays." p.460-468. "Molding sands," p.468-471. Table of molding and building sand production of the district, p.480. Brief treatment.

Newland, D. H.

Albany molding sand. 1915. (In Transactions of the American Institute of Metals, v.9, p.404-408.)

Treats of Albany sand, as found in the middle Hudson valley between Glens Falls and Kingston. Gives geological features, general character, method of production and supply.

See also author's more extensive paper on same subject.

Newland, D. H.

Albany molding sand. 1916. (In Transactions of the American Foundrymen's Association, v.24, p.161-176.)

Discussion, p.176-178.

Treats of Albany sand, as found in the middle Hudson valley between Glens Falls and Kingston. Gives geological features, characteristics of sand, methods of extracting, and statistics of production and supply.

See also author's briefer paper on same subject.

Newland, D. H.

Mining and quarrying industry of New York state. 1914. (In New York (state)—Museum. Annual report (66th), for 1912, pt.2, p.5-114.)

Section on "Sand and gravel," p.57-62, treats of the deposits of molding-sand, glass sand and building sands.

Similar material available in earlier annual reports, and in New York State Museum Bulletin before the latter was merged with the Annual report.

Sarle, Clifton J.

Economic geology of Monroe county and contiguous territory. 1904. (In New York (state)—Museum. Annual report (56th), for 1902, pt.1, p.r 75-r 106.)

"Sand and gravel industry," p.r 92-r 100. Treats of occurrence of sand in this district, and gives list of sand and gravel pits.

Ohio

Braune, G. M. & Myers, C. C.

Tests of river and bank sands and gravels in Cincinnati, Ohio. 1917. (In Concrete, v.10, p.115-117.)

Account of tests made for the Committee on reinforced concrete of the Cincinnati Engineers' Club. Includes test results on sands and gravels available near Cincinnati.

Carney, F. & Brumback, A. M.

Deposits of glass sand at Toboso, Ohio. 1908. (In Ohio naturalist, v.8, p.358-361.)

Description of deposit in quarries of the Edward H. Everett Company.

Oklahoma

Buttram, Frank.

Glass sand. 1910. (In Oklahoma—Geological survey. Bulletin no.6, pt.2, p.88-90.)

Brief description of location and properties of Oklahoma deposits.

Buttram, Frank.

Glass sands of Oklahoma. 1913. (In Oklahoma—Geological survey. Bulletin no.10, 91 p.)

Includes information on the status of the glass industry of the state, on glass-making and glass-making materials, deposits of glass sand, etc.

Gould, Charles N.

Gravel and building sand. 1910. (In Oklahoma—Geological survey. Bulletin no.6, pt.2, p.82-83.)

Brief description of location and properties of Oklahoma deposits.

Reeds, Chester Albert.

Report on the geological and mineral resources of the Arbuckle mountains, Oklahoma. 1910. (In Oklahoma—Geological survey. Bulletin no.3.)

Section on "Sand—Glass sand," p.60-61, gives brief treatment of the glass sand deposits of the region.

Shannon, C. W.

Handbook on the natural resources of Oklahoma. 96 p. 1916.

"Building sand and gravel" considered briefly, p.41, 43.

"Glass sand," p.57, 59.

Oregon

Darton, N. H.

Structural materials in parts of Oregon and Washington. 1909. (In United States—Geological survey. Bulletin no.387.)

"Gravel and sand," p.13-16.

Pennsylvania

Campbell, Marius R.

Description of the Brownsville and Connellsville quadrangles. 1902. (In United States—Geological survey. Geologic atlas of the United States, folio no.94.)

Brief description of glass sand deposits, p.19.

Shaw, Eugene Wesley.

Gravel and sand in the Pittsburgh district, Pennsylvania. 1909. (In United States—Geological survey. Bulletin no.430, p.388-399.)

Gives geologic data, output, uses, values, etc. of gravels and sands in the Pittsburgh district.

South Carolina

Sloan, Earle.

Catalogue of the mineral localities of South Carolina. 1908. (In South Carolina—Geological survey. Series 4, Bulletin no.2.)

Contains considerable on the sand deposits of the state.

Tennessee

Nelson, Wilbur A.

Some building sands of Tennessee. 1912. (In Tennessee—Geological survey. Resources, v.2, p.389-397.)

Economic geology of Tennessee sands.

Texas

Burchard, Ernest F.

Structural materials available in the vicinity of Austin, Texas. 1910. (In United States—Geological survey. Bulletin no.430: Contributions to economic geology, 1909, p.292-316.)

Section on "Materials for concrete" has subsection, "Sand," p.305. Section on "Materials for mortar and plaster" has subsection, "Sand," p.308.

Virginia

Watson, Thomas Leonard.

Economic products of the Virginia coastal plain. 1912. (In Virginia—Geological survey. Bulletin no.4, p.223-272.)

Section on "Sand and gravel," p.239-243, treats briefly of the occurrence, properties, analysis and production of sands of the region.

West Virginia

Stose, G. W. & Swartz, C. K.

Description of the Pawpaw and Hancock quadrangles [W. Va.-Md.]. 1912. (In United States—Geological survey. Geologic folio no.179.)

"Glass sand" and "Building and railroad sand," p.21.

Stose, George W.

Glass-sand industry in eastern West Virginia. 1906. (In United States—Geological survey. Bulletin no.285: Contributions to economic geology, 1905, p.473-475.)

Principally description of several glass-sand quarries.

Wisconsin

Ries, Heinrich, & Gallup, F. L.

Report on the molding sands of Wisconsin. 1906. (In Wisconsin—Geological and natural history survey. Bulletin no.15, p.193-247.)

Extensive investigation, giving information regarding character of Wisconsin molding-sands, and comparing them with those of other states.

Foreign Countries

Brazil

Gottschalk, Alfred L. M.

Brazilian monazite sands lie in coastal strip. 1915. (In Mining and engineering world, v.42, p.903-904.)

Pertains to sources and nature of monazite sands, especially those of Brazil.

Canada

Ells, S. C.

Investigation of bituminous sands of northern Alberta. 1916. (In Canada—Mines branch. (Department of mines.) Summary report for 1915, p.67-76.)

Economic geology of bituminous sand deposits, and results of investigations of the use of these sands for paving.

Ells, S. C.

Preliminary report on the bituminous sands of northern Alberta. 92 p. 1914.

Issued by the Mines branch of Department of mines of Canada.

Study of the economic importance of these sands, with special reference to utilization in road construction. Many photographs of sand deposits.

MacKenzie, George C.

Magnetic iron sands of Natashkwan, county of Saguenay, province of Quebec. 57 p. 1912.

Issued by the Mines branch of Department of mines of Canada.

Gives results of tests made of these sands, as to quantity and quality, to determine whether they were of economic importance.

France

Partiot.

Mémoire sur les sables de la Loire. 1871. (In Annales des ponts et chaussées, mémoires, ser. 5, v.1, p.233-292.)

Pertains principally to the geological features.

Great Britain

Boswell, P. G. H.

British glass-sands; their location and characteristics. 1917. (In Journal of the Society of Glass Technology, v.1, transactions, p.3-27.)

The same, abstract. 1917. (In Chemical news and journal of physical science, v.115, p.58.)

Concerned chiefly with occurrence, composition and exploitation.

Boswell, P. G. H.

Memoir on British resources of sands suitable for glass-making, with notes on certain crushed rocks and refractory materials. 92 p. 1916.

Published at the instruction of the Ministry of Munitions of War, by the Imperial College of Science and Technology.

Contains chapters on nature of sands, methods of study of sands, glass manufacture, requirements of a good glass sand, sands suitable for glass-making, special treatment of sands and rocks, and economical considerations. Shows mechanical and chemical analyses of many sands.

Boswell, P. G. H.

Properties and resources of refractory sands in this country [England]. 1917. (In Transactions of the Faraday Society, v.12, p.188-190.)

Discussion, p.191-192.

Condensed account.

Philippine Islands

Cox, Alvin J. and others.

Sand-lime brick and artificial sand stones in the Philippines. 1912. (In Philippine journal of science, v.7, pt.1, p.317-356.)

Foot-note references.

Considers available materials and commercial possibilities.

Transportation by Natural Agencies

General

Cleland, Herdman Fitzgerald.

Geology, physical and historical. 718 p. 1916. Am. Book Co.

Considers sand dunes, p.46-52; and sand-reefs, p.221-223.

Cornish, Vaughan.

On kumatology; the study of the waves and wave-structures of the atmosphere, hydrosphere and lithosphere. 1899. (In Geographical journal, v.13, p.624-626.)

Discussion, p.626-628.

Abstract of paper before Royal Geographical Society, March 27, 1899.

Includes information on waves occurring in sand.

Cornish, Vaughan.

Rippling of sand. 1896. (In Report of the 66th meeting of the British Association for the Advancement of Science, Liverpool, Sept. 1896, p.794-795.)

Brief abstract of paper, in which author distinguishes three principal kinds of sand-ripples: ripple-mark of sea, ripple-mark of streams, ripple-mark of dunes. Tells how each is formed.

Cornish, Vaughan.

Waves of sand and snow and the eddies which make them. 369 p.
1914. Unwin.

Includes chapters on desert sand dunes, æolian sand-ripples, ripple-marks and current-marks in subaqueous sand-waves, sand-waves in tidal currents, and the composition of quicksand.

Haltenberger, Michael.

On a genetic system of sand dunes, including two new types. 1913.
(In *Bulletin of the American Geographical Society*, v.45, p.513-515.)

Brief discussion of methods of classifying sand-dunes, with special reference to the proper distinction between sea-shore, river, and continental dunes.

Hedin, Sven, ed.

Scientific results of a journey in central Asia. 6v. 1899-1902.

Contains much information, especially in v.1 and v.2, on the sand dunes of the region—on dune formation, dimensions and travel; ripple-marks and waves; encroachment of sand on rivers; and relation between lakes and dunes.

Shaler, N. S.

Phenomena of beach and dune-sands. 1894. (In *Bulletin of the Geological Society of America*, v.5, p.207-212.)

Treats of sources, properties, value, and movements.

Water

Ayrton, Hertha.

Origin and growth of ripple-mark. 1911. (In *Proceedings of the Royal Society of London*, ser. A, v.84, p.285-310.)

Illustrated description of experiments in support of author's theories as to the formation of ripple-marks in sand.

Cornish, Vaughan.

Ocean waves, sea-beaches and sandbanks. 1912. (In *Journal of the Royal Society of Arts*, v.60, p.1105-1110, 1121-1126.)

Two Cantor lectures, the second of which is "On the principles which govern the transportation of sand and shingle by tides and waves, with a note on the Severn Bore."

Cornish, Vaughan.

On sand-waves in tidal currents. 1901. (In *Geographical journal*, v.18, p.170-200.)

Discussion, p.200-202.

Paper before Royal Geographical Society, June 10, 1901.

Principally concerned with an account of author's observations at several different places.

Cornish, Vaughan.

On sea-beaches and sandbanks. 1898. (In *Geographical journal*, v.11, p.528-543, 628-647.)

Discussion, p.647-657.

See also author's "On the formation of sand-dunes" (p.18 of this list).

Paper before Royal Geographical Society, March 16, 1898.

Includes sections on motions of bottom water of the sea, mud flats of the deep sea, sorting of sand from shingle and from mud, making of a shingle beach, ridge-and-furrow structure of a shingle ness, along-shore drift of beach shingle, travel of shingle across the bays of the English channel, growth and diminution of a shingle ness, grading of beach shingle, influence of specific gravity on behavior of beach material, sandy beaches, and making of sandbanks and sandy forelands.

Cornish, Vaughan.

On the formation of wave surfaces in sand. 1901. (In *Scottish geographical magazine*, v.17, p.1-11.)

Author gives his reasons for the causes of sand-ripples, based on his observations of sand-waves in many localities.

Cornish, Vaughan.

Waves of the sea and other water waves. 374 p. 1910. Unwin.

Pt.2, p.141-217, "On the action of sea waves to transport shingle, sand and mud."

Darwin, G. H.

On the formation of ripple-mark in sand. 1884. (In *Proceedings of the Royal Society of London*, v.36, p.18-43.)

The same, abstract. 1883. (In *Nature*, v.29, p.162-164.)

Gives results of experiments and observations on the formation of ripple-marks, and presents views of several other observers in this field.

Dent, Elliott J.

Preservation of sandy beaches in the vicinity of New York city. 1916. (In *Transactions of the American Society of Civil Engineers*, v.80, p.1786-1805.)

Discussion, p.1806-1829.

Concerned with the effect of wave action on sandy beaches.

Gilbert, Grove Karl.

Transportation of debris by running water. 1914. (In *United States — Geological survey. Professional papers no.86, 263 p.*)

Gives results of exhaustive experimental study. Sand of various sizes of grain was used as debris.

Graham, James C.

On a peculiar method of sand-transportation by rivers. 1890. (In *American journal of science*, ser. 3, v.40, p.476.)

Comments on the phenomenon of coarse sand floating on the surface of a river of low current velocity.

Hunt, Arthur Roope.

On the formation of ripplemark. 1883. (In *Proceedings of the Royal Society of London*, v.34, p.1-18.)

Observations and experiments of author in regard to ripples in sand, principally on beaches and under water.

Keller, H.

Studien über die gestaltung der sandküsten und die anlage der seehäfen im sandgebiet. 1881-82. (In *Zeitschrift für bauwesen*, v.31, text, p.189-210, 301-318, 411-422; v.32, p.19-36, 161-180.)

The same, abstract translation. 1882. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.67, p.455-464.)

The same, abstract translation. 1882. (In *Van Nostrand's engineering magazine*, v.27, p.71-77.)

Contains considerable on formation of sand-banks and on the influence of sandy coasts on harbor construction.

Lechalas.

Sur les rivières à fond de sable. 1871. (In *Annales des ponts et chaussées, mémoires*, ser. 5, v.1, p.381-431.)

Mathematical treatment of the subject of sand movements in rivers.

Man's war against the sands. 1913. (In Harper's weekly, v.57, pt.1, Jan. 25, 1913, p.30.)

Brief mention of the difficulty of controlling sand movements along sea-coasts.

Matthews, Ernest B.

Harbour projections and their effect upon the travel of sand and shingle. 1914. (In Report of the 83d meeting of the British Association for the Advancement of Science, Birmingham, 1913, p.610-611.)

The same. 1913. (In Journal of the Royal Society of Arts, v.61, p.1044-1045.)

Abstract of paper.

Osborne, Percy T.

Sand-bag embankment across Little Inlet, Brigantine Beach, N. J. 1885. (In Proceedings of the Engineers' Club of Philadelphia, v.5, p.117-120.)

Account of the use of bags of sand for changing the natural sand-transporting effect of the sea, and causing new land to be formed.

Owens, J. S.

Transport and settlement of sand in water, and a method of exploring sand bars. 1913. (In Engineer [London], v.116, p.343.)

The same, abstract. 1914. (In Report of the 83d meeting of the British Association for the Advancement of Science, Birmingham, 1913, p.611-612.)

Treats of movement of sand-ripples, formation of quicksands, erosion due to obstructions in a current, influence of suspended matter on the specific gravity of the liquid, tendency of bodies settling in water to choose the position of greatest resistance, and an instrument for exploring sand-banks and river-beds.

Owens, John S.

Experiments on the settlement of sand in running water. 1912. (In Geographical journal, v.39, p.247-257.)

Discussion, p.257-265.

Gives methods and test results to determine the rates of settlement of different grades of sand in a current of water. "The results obtained are contrary to what might have been expected."

Owens, John S.

Experiments on the settlement of solids in water. 1911. (In Geographical journal, v.37, p.59-77.)

Discussion, p.77-79.

Test methods and results are given. Covers research on seven different experiments, all in still water, two of which have a direct bearing on sand.

Reynolds, Osborne.

On model estuaries. 1890. (In Report of the 59th meeting of the British Association for the Advancement of Science, Newcastle-upon-Tyne, 1889, p.328-343.)

Report of work of a committee appointed to investigate the "action of waves and currents on the beds and foreshores of estuaries by means of working models." Apparatus is described and test results given as to the effect produced on sand by artificial waves set up by the apparatus.

Simonds, Frederick W.

Floating sand; an unusual mode of river transportation. 1896. (In American geologist, v.17, p.29-37.)

Author describes his observations of the floating of sand on the Llano river, Texas, and advances an explanation for the phenomenon.

Spring, Francis Joseph Edward.

Coastal sand-travel near Madras harbour. 1914. (In Minutes of proceedings of the Institution of Civil Engineers, v.194, p.153-171.)

Discussion and correspondence, p.171-239.

The same, abstract. 1913. (In Engineering, v.95, p.530.)

On the movement of sand along the southeast coast of India, which movement threatens to overwhelm Madras harbor.

Thomas, B. F. & Watt, D. A.

Improvement of rivers; a treatise on the methods employed for improving streams for open navigation, and for navigation by means of locks and dams. Ed.2, rewritten & enl. 2v. 1913. Wiley.

Considerable attention to sand in its relation to natural processes, such as erosion and transportation by water, and also in its relation to artificial work, such as levees and foundations.

Wheeler, William Henry.

Bars at the mouths of tidal estuaries. 1890. (In Minutes of proceedings of the Institution of Civil Engineers, v.100, p.116-143.)

Discussion and correspondence, p.144-216.

Includes much information on sand in regard to its tendency to form bars at the mouths of rivers.

Wheeler, William Henry.

Littoral drift, in its relation to the outfalls of rivers and to the construction and maintenance of harbours on sandy coasts. 1896. (In Minutes of proceedings of the Institution of Civil Engineers, v.125, p.2-32.)

Discussion and correspondence, p.33-87.

The same, abstract. 1897. (In Geographical journal, v.9, p.668-669.)

Includes much information on sand as it occurs in sand bars.

Wind

Dunes and their Control

Beadnell, H. J. Llewellyn.

Sand dunes of the Libyan desert. 1910. (In Geographical magazine, v.35, p.379-392.)

Discussion, p.392-395.

See also letter by David Comyn, p.605.

Discusses origin, form, rate of movement, and general geographical and economical aspects.

Botsford, Amelia H.

Ropes of sand. 1901. (In New England magazine, v.30, n. s. v.24, p.3-11.)

Illustrated account of methods used in various localities for preventing excessive drifting of sand.

Braine, Charles Dimond Horatio.

Reclamation of drift-sands in Cape Colony. 1902. (In Minutes of proceedings of the Institution of Civil Engineers, v.150, p.376-397.)

Gives description of the dunes of the region and of methods used in controlling them.

Brémontier, N. T.

Mémoire sur les dunes; et particulièrement sur celles qui se trouvent entre Bayonne et la pointe de Grave, à l'embouchure de la Gironde. 1833. (In *Annales des ponts et chaussées, mémoires, ser. I, v.5, p.145-186.*)

Causes of sand dunes and methods of preventing them and of retarding their travel.

Cornish, Vaughan.

On desert sand-dunes bordering the Nile delta. 1900. (In *Geographical journal, v.15, p.1-30.*)

Discussion, p.30-32.

Paper before Royal Geographical Society, Nov. 27, 1899.

Extensive account of results of author's investigations of causes and character of African desert dunes.

Cornish, Vaughan.

On the formation of sand-dunes. 1897. (In *Geographical journal, v.9, p.278-302.*)

Discussion, p.302-309.

See also author's "On sea-beaches and sandbanks" (p.14 of this list).

Paper before Royal Geographical Society, Jan. 19, 1897.

Includes sections on rippling of sand by wind, vertical section of dunes, ground-plan of dunes, and action of obstacles.

Cornish, Vaughan.

On the observation of desert sand-dunes. 1908. (In *Geographical journal, v.31, p.400-402.*)

Suggestions for those who intend to travel in dune country and who wish to study sand dunes.

Cornish, Vaughan.

Sand dunes. 1896. (In Report of the 66th meeting of the British Association for the Advancement of Science, Liverpool, Sept. 1896, p.857.)

Brief abstract of paper giving reasons for the peculiar forms of sand dunes.

Costaz.

Mémoire sur les sables du désert. 1833. (In *Annales des ponts et chaussées, mémoires, ser. I, v.5, p.383-388.*)

Concerned with the phenomena of the movements of desert sands.

Fighting the sand peril. 1916. (In *Popular science monthly, v.89, p.198-199.*)

The same, condensed. 1916. (In *Literary digest, v.53, p.403-404.*)

Short illustrated description of methods of fighting dunes.

Gillet-Laumont, and others.

Sur les différents mémoires de M. Brémontier, inspecteur général des ponts et chaussées, chargé de la dixième division, et sur les travaux faits pour fixer et cultiver les dunes du golfe de Gascogne, entre l'Adour et la Gironde. 1833. (In *Annales des ponts et chaussées, mémoires, ser. I, v.5, p.192-218.*)

Hitchcock, A. S.

Controlling sand dunes in the United States and Europe. 1904. (In *National geographic magazine, v.15, p.43-47.*)

Illustrated description of methods used in various localities in coping with sand dune travel.

Hitchcock, A. S.

Methods used for controlling and reclaiming sand dunes. 1904. (In United States—Plant industry bureau. Bulletin no.57, p.9-36.)

Treats of formation of dunes and of methods at home and abroad of fixation of drifting sands, principally by planting.

King, W. J. Harding.

Nature and formation of sand ripples and dunes. 1916. (In Geographical journal, v.47, p.189-207.)

Discussion, p.207-209.

Gives author's opinions, as formed after he had spent seven winters in the Algerian Sahara and the Libyan deserts, making observations and tests.

Marsh, George P.

The earth as modified by human action: a last revision of "Man and nature." 629 p. 1885. Scribner.

Chapter 5, "The sands," p.525-583, deals with the nature and distribution of sand and sand dunes.

Olsson-Seffer, Pehr.

Relation of wind to topography of coastal drift sands. 1908. (In Journal of geology, v.16, p.549-563.)

Gives results of observation and experiment as carried out in Europe, North and Central America, Australia and the South Sea islands.

Ries, Heinrich, & Watson, T. L.

Engineering geology. 672 p. 1914. Wiley.

Contains several references to sand and dunes, principally from the geologic standpoint.

Rolland, G.

Sur les grandes dunes de sable de Sahara. 1881. (In Comptes rendus hebdomadaires des séances de l'Académie des Sciences, v.92, p.968-971.)

Sand dunes; how they are reclaimed in Europe and in the United States. 1913. (In Scientific American, v.122, n. s. v.108, p.581.)

Illustrated description of various methods of preventing the drifting of sand.

Sanford, F. Hobart.

Michigan's shifting sands; their control and better utilization. 1916. 31 p. (In Michigan—Agricultural experiment station. Special bulletin no.79.)

Presents methods for coping with sand dunes.

Sanford, Samuel.

Rise of sea level shown by coastal dunes. 1916. (In Science, v.66, n. s. v.43, p.348-349.)

Directs attention to the value of the evidence shown by coastal dunes as indicating changes of sea level with respect to the land.

Vegetation for Control of Dunes

See also Dunes and their Control

Champion, H. V.

Marram grass as a sand-binder in Victoria, Australia. 1902. (In Engineering news, v.48, p.329.)

Abstract of paper before Victorian Institution of Engineers.

Gifford, John.

Control and fixation of shifting sands. 1898. (In Engineering magazine, v.14, p.603-614.)

On the utilization of trees to prevent shifting of loose sand.

Hall, William L.

Timber resources of Nebraska. 1902. (In United States—Agriculture, Department of. Yearbook for 1901, p.207-216.)

Brief reference to reclamation of waste sand-hills in Nebraska by the cultivation of pine-trees on them, p.215-216.

Lamson-Scribner, F.

Division of agrostology. 1898. (In United States—Agriculture, Department of. Yearbook for 1897, p.160-175.)

Sand-binding grasses for sand dunes, and their utilization in various localities, touched upon, p.173-175.

Lamson-Scribner, F.

Grasses as sand and soil binders. 1895. (In United States—Agriculture, Department of. Yearbook for 1894, p.421-436.)

See also appendix giving list of grasses suitable for use as sand-binders and soil-binders, p.580.

See also Locke, Thomas J.

The same, abstract. 1902. (In Engineering news, v.47, p.341-343.)

Excellent paper on a subject seldom touched upon. Gives information on varieties best suited to various conditions.

Lamson-Scribner, F.

Progress of economic and scientific agrostology. 1900. (In United States—Agriculture, Department of. Yearbook for 1899, p.346-366.)

Special investigation of grasses suitable as sand-binders mentioned, p.354. Mentions the discovery of a new variety of sand-binding grass.

Lamson-Scribner, F.

Sand-binding grasses. 1899. (In United States—Agriculture, Department of. Yearbook for 1898, p.405-420.)

Gives data on best varieties of grass to use under various conditions.

Locke, Thomas J.

Grasses as sand and soil-binders. 1902. (In Engineering news, v.47, p.333.)

Letter to editor asking information as to where seed for sand-binding grass may be obtained.

See also Lamson-Scribner, F.

Physical Properties

See also Economic Geology

Testing in General

Crosby, W. O.

Study of hard-packed sand and gravel. 1902. (In Technology quarterly, v.15, p.260-264.)

Gives results of tests made on sands containing various amounts of moisture, to determine their degree of firmness or "hard-packed" state, and reasons for same. Data applicable to the interpretation of wash-drill test borings in sand.

Elfreth, Harold D.

Effect of moisture on the bulk of dry sand. 1908. (In Engineering news, v.60, p.211.)

Letter to editor criticizing the explanation given in Taylor and Thompson's "Treatise on concrete" for the increase of bulk of sand when it is moistened. Author offers another theory for the phenomenon.

See also Stellohorn, A.

Hersam, Ernest A.

Flow of sands through orifices. 1914. (In Journal of the Franklin Institute, v.177, p.419-444.)

Experiments to determine flow of dry sands and like substances through orifices, under varied conditions and different sand heads. Results presented by means of charts and tables.

Murphy, E. C.

Density and draining capacity of artificial and natural mixtures of sand and gravel. 1909. (In Engineering news, v.62, p.335.)

Test data presented by tables and charts to show characteristics of sample sands and gravels from California sources.

Rea, A. S.

Apparent specific gravity of non-homogeneous fine aggregates. 1917. (In Proceedings of the American Society for Testing Materials, v.17, pt.2, p.256-260.)

Describes a relatively accurate method for determining apparent specific gravity of fine materials having porous grains. Method claimed to be especially useful in testing sands for concrete.

Richards, R. H. & Dudley, Boyd, jr

Experiments on the flow of sand and water through spigots. 1915. (In Transactions of the American Institute of Mining Engineers, v.51, p.398-403.)

Discussion, p.403-404.

The same, abstract. 1915. (In Metallurgical and chemical engineer, v.13, p.120.)

Considers rate of discharge, through spigots, of mixtures of sand and water, especially such mixtures as are common in ore-dressing operations.

Standard terminology for filter and concrete sands. (In Engineering record, v.71, p.671.)

Editorial advocating the adoption of a single system and terminology for the analysis of sands for any purpose.

Stellohorn, A.

Effect of moisture on the bulk of dry sand. 1908. (In Engineering news, v.60, p.310.)

Letter to editor concerning Harold D. Elfreth's contribution of same title. Author presents test data showing actual effect of moisture on the bulk of dry sand.

Test procedure for obtaining weight per cubic foot of sand. 1917. (In Engineering record, v.75, p.384.)

Results of experiments to determine size and shape of measure, method of filling, degree of moisture, etc. under which the most uniform results may be obtained by different operators.

Whinery, S.

Table giving voids in sand, based on weight method. 1914. (In Engineering news, v.71, p.572.)

This method is said to be simpler and more nearly accurate than the method of filling a measured volume of sand with water.

Whited, Willis.

Flow of semi-fluids through orifices. 1901. (In Proceedings of Engineers' Society of Western Pennsylvania, v.17, p.113-123.)

Discussion, p.123-129.

Applicable to sand flow.

Bearing Value, Pressure and Related Properties

American Society of Civil Engineers.

Progress report of the Special committee to codify present practice on the bearing value of soils for foundations, 1917. (In its Proceedings, v.43, p.1171-1248.)

Appears in "Proceedings," no.6, for Aug. 1917, in portion called "Papers and discussions," which will later appear with changed pagination as "Transactions."

Appendix B, p.1192-1240, gives "Bibliography of physical properties and bearing value of soils," which has section on "Sand and gravel" and one on "Quicksand." These sections contain a total of 32 references.

Boussinesq, J.

Equilibrium of pulverulent bodies. 1878. (In Minutes of proceedings of the Institution of Civil Engineers, v.51, p.277-283.)

Abstract of paper on the theory of equilibrium of sand, earth and similar granular substances.

Boussinesq, J.

Note on Mr G. H. Darwin's paper "On the horizontal thrust of a mass of sand." 1883. (In Minutes of proceedings of the Institution of Civil Engineers, v.72, p.262-271.)

Brunlees, James.

Description of the iron viaducts erected across the tidal estuaries of the rivers Leven and Kent, in Morecambe bay, for the Ulverstone and Lancaster railway. 1858. (In Minutes of proceedings of the Institution of Civil Engineers, v.17, p.442-447.)

Discussion, p.448.

Account of the building of bridge foundations in a peculiar quicksand.

Building and machinery foundations in quicksand. 1906. (In Engineering record, v.53, p.247-248.)

Fourteen-story office building with pile foundation.

Concrete mat on confined sand supports boiler plant. 1917. (In Engineering news, v.77, p.508-509.)

Wet-flowing sand converted into stable foundation by confining it with interlocking sheet-piling, and covering it with reinforced concrete.

Curtis, W. W.

Sand as a foundation. 1886. (In Engineering news and American contract journal, v.15, p.314-316, 340-342.)

Presents data obtained by several French investigators on the physical and mechanical properties of sand.

Darwin, George Howard.

On the horizontal thrust of a mass of sand. 1883. (In Minutes of proceedings of the Institution of Civil Engineers, v.71, p.350-378.)

Describes tests performed and gives theoretical explanation of results observed.

See also Boussinesq, J.

Gaudard, Jules.

Enger, Melvin.

Experiments on the distribution of vertical pressure through sand. 1916. (In *Railway review*, v.58, p.129-132.)

Illustrated description of tests and of results obtained. Action of sand under load is shown photographically. Author concludes that the tests and photographs prove that certain common assumptions regarding earth pressures are not true.

Forchheimer, Ph.

Ueber sanddruck und bewegungserscheinungen im innern trockenen sandes. 1882. (In *Zeitschrift des Oesterreichischen Ingenieur- und Architekten-Vereins*, v.34, p.111-126.)

See also author's supplementary paper of same title.

The same, abstract translation. 1883. (In *Engineering news and American contract journal*, v.10, p.97-98.)

The same, abstract translation. 1883. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.72, p.331-332.)

Results of experiments on sand pressures and sand movements. Mathematical treatment.

Forchheimer, Ph.

Ueber sanddruck und bewegungserscheinungen im innern trockenen sandes. 1883. (In *Zeitschrift des Oesterreichischen Ingenieur- und Architekten-Vereins*, v.35, p.103-108.)

The same, abstract translation. 1884. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.75, p.331-332.)

Supplement to author's previous paper of same title.

Gaudard, Jules.

Note on Mr G. H. Darwin's paper "On the horizontal thrust of a mass of sand." 1883. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.72, p.272-274.)

Hagen.

Untersuchung über den druck und die reibung des sandes. 1833. (In *Annalen der physik und chemie*, v.116, n. s. v.28, p.17-48, 297-323.)
Mathematical treatment.

Kick, Fr.

Das gesetz der proportionalen widerstände und seine anwendung auf sanddruck und sprengen. 1883. (In *Dingler's polytechnisches journal*, v.250, p.141-145.)

Theoretical.

Landreth, William B.

Improvement of a portion of the Jordan level of the Erie canal. 1900. (In *Transactions of the American Society of Civil Engineers*, v.43, p.566-581.)

Discussion, p.582-602.

The same, abstract. 1900. (In *Engineering record*, v.41, p.137.)

Valuable information on quicksand and its bearing value.

Merriman, Mansfield.

On the theories of the lateral pressure of sand against retaining walls. 1887. (In *School of Mines quarterly*, v.9, p.109-112.)

The same, abstract. 1888. (In *Engineering news*, v.19, p.152.)

The same, abstract. 1887. (In *Proceedings of the American Association for the Advancement of Science*, v.36, p.166.)

Moreau, and others.

Emploi du sable dans les fondations sur sol compressible. 1835. (In *Annales des ponts et chaussées, mémoires, ser. 1, v.10, p.171-214.*)

Moyer, J. A.

Distribution of vertical soil pressures. 1914. (In *Engineering record, v.69, p.608-609.*)

Dry-sand tests conducted at Engineering Experiment Station of Pennsylvania State College to determine the vertical pressures transmitted from external loads through various depths of soil. Records only the initial tests, which are for sand only. Tests on other types of soil contemplated.

Sand foundations for high buildings. 1912. (In *Engineering record, v.66, p.310.*)

Gives various loads on sand.

Siégler.

Expériences nouvelles sur la poussée du sable. 1887. (In *Annales des ponts et chaussées, mémoires, ser. 6, v.13, pt.1, p.488-505.*)

The same, abstract translation. 1887. (In *Minutes of proceedings of the Institution of Civil Engineers, v.90, p.465-467.*)

The same, abstract translation. 1887. (In *Scientific American supplement, v.24, p.9724-9725.*)

Describes new scheme for experimentally determining, by the use of a friction-dynamometer, the thrust of a mass of sand.

Singular phenomenon in sand. 1884. (In *Engineering news, v.11, p.65.*)

Short note. Pile embedded upright in sand has been seen to move bodily down stream.

Sinking machinery foundations in quicksand without excavation. 1905. (In *Engineering record, v.52, p.526.*)

Erection of boring-mill in General Electric Company's plant, Schenectady, N. Y.

Steel pile foundation in a quicksand pocket. 1908. (In *Engineering record, v.57, p.203.*)

Details of work on foundation of 16-story building in New York.

Substructure of the New York Municipal building. 1910. (In *Engineering record, v.62, p.57-58.*)

Editorial chiefly discussing the tests performed on the bearing value of sand.

Wilson, George.

Some experiments on conjugate pressures in fine sand and their variation with the presence of water. 1902. (In *Minutes of proceedings of the Institution of Civil Engineers, v.149, p.208-222.*)

Gives results of experiments performed in order to determine the relation between theoretical and actual earth pressures.

Miscellaneous

Condit, D. Dale.

Petrographic character of Ohio sands with relation to their origin. 1912. (In *Journal of geology, v.20, p.152-163.*)

Presents results of examinations of about 90 rock samples and of 40 uncemented recent sands.

Diller, Joseph Silas.

Educational series of rock specimens collected and distributed by the United States geological survey. 1898. (In United States—Geological survey. Bulletin no.150.)

Description of geological specimens from various states, collected by the survey since 1882. Includes considerable on sand, especially beach, dune, marine, oölitic, residual and volcanic sands.

Grabau, A. W.

On the classification of sand grains. 1911. (In Science, v.56, n. s. v.33, p.1005-1007.)

Criticism of paper by William H. Sherzer in Bulletin of the Geological Society of America, v.21, p.625-662.

Grabau, Amadeus W.

On the classification of sedimentary rocks. 1904. (In American geologist, v.33, p.228-247.)

Includes reference to certain purely geological features of various sands.

Hatch, Frederick Henry, & Rastall, R. H.

Petrology of the sedimentary rocks, with appendix on The systematic examination of loose detrital sediments, by T. Crook. 425 p. 1913. Allen.

Contains considerable material on sand, especially in the section "Sand deposits," p.39-57.

Hübbe.

Von der beschaffenheit und dem verhalten des sandes. 1861. (In Zeitschrift für bauwesen, v.11, p.19-42, 183-226.)

Rather technical study of the properties and classification of sands and of the action of flowing water on sand. Special reference to German sand deposits. Many diagrams.

King, Franklin Hiram.

Principles and conditions of the movements of ground water. 1899. (In United States—Geological survey. Annual report (19th), 1897-98, pt.2, p.59-294.)

Contains much information as to the influence of sand on the flow of ground water.

King, W. J. Harding.

Travels in the Libyan desert. 1912. (In Geographical journal, v.39, p.133-137.)

Describes the curious "song of the sands." Gives no theory as to its cause.

Le Chatelier, Henry.

La silice et les silicates. 574 p. 1914. Hermann, Paris.

Theoretical treatise on silica and the silicates in general.

Mason, W. P.

Water supply of Amsterdam, Holland. 1905. (In Engineering news, v.53, p.437-438.)

Illustrated description of Amsterdam's water-supply system, which depends upon the sand dunes of the region. Gives various theories to explain how the dunes obtain and hold water.

Merrill, George P.

Guide to the study of the collections in the section of applied geology; nonmetallic minerals. [United States National Museum.] 1901. (In Smithsonian Institution. Annual report (54th), 1899, pt.2, p.155-483.)

Molding-sand briefly considered, p.474-477. Includes a few bibliographical footnotes.

Phillips, Charles E. S.

Electrical and other properties of sand. 1910. (In Nature, v.84, p.255-261.)

Describes several peculiar physical properties of sand.

Sanford, Samuel.

Topography and geology of southern Florida. 1909. (In Florida—Geological survey. Second annual report, p.177-231.)

Considers dunes, p.182-185; rolling sand plains, p.185; sands, p.226-227.

Sherzer, William H.

Criteria for the recognition of the various types of sand grains. 1910. (In Bulletin of the Geological Society of America, v.21, p.625-662.)

Discussion, p.775-776.

Technical treatment. Many foot-note references.

See also Grabau, A. W.

Thoulet.

Expériences synthétiques sur l'abrasion. 1887. (In Annales des mines, mémoires, v.170, ser. 8, v.11, p.199-224.)

The same, abstract translation. 1888. (In Minutes of proceedings of the Institution of Civil Engineers, v.91, p.472-474.)

Author sought to determine experimentally, by means of a model, the abrading action of sand carried by the wind. Gives many test results.

Ziegler, Victor.

Factors influencing the rounding of sand grains. 1911. (In Journal of geology, v.19, p.645-654.)

Technical presentation of author's explanation of the rounding of sand grains.

Exploitation

Quarrying and Handling in General

Methods and Machinery

Boehringer, R. A.

Hydraulic sand-mining plant. 1914. (In Engineering news, v.72, p.372-374.)

Describes plant of Pennsylvania Glass Sand Co., near Vineyard, Pa. Sand rock is mined and crushed, in addition to the mining of naturally fine-grained sand.

Brigden, W. W.

Quicksand excavation at Battle Creek [Mich.]. 1914. (In Engineering record, v.69, p.163-164.)

Paper before Michigan Engineering Society.

Describes difficult piece of excavation work in quicksand, in constructing a pumping station for an artesian-well water-supply.

Centrifugal dredging pump applied to production of sand and gravel. 1915. (In *Concrete-cement age*, v.7, p.191-192.)

Brief reference to the application of centrifugal pumps to sand and gravel mining.

Cirkel, Chr.

Sandbaggerei in kalksandsteinfabriken. 1914. (In *Tonindustriezeitung*, v.38, pt.1, p.811-812.)

Describes construction and operation of sand-digging apparatus.

Dana, Edward.

Sand from tidewater to rail in Boston. 1914. (In *Electric railway journal*, v.43, p.346-348.)

Illustrated description of method of obtaining and handling sand for the Boston elevated railway. Includes data on report cards used in same connection.

Dull, Raymond W.

Preparation of rock products. 1917. (In *Journal of the Western Society of Engineers*, v.22, p.479-485.)

Discussion, p.485-490.

Describes modern methods of mining, handling and preparing sand and gravel.

Dumping conveyor at the Brakpan gold mines. 1914. (In *Scientific American*, v.124, n. s. v.110, p.243.)

Illustrated description of plant used in Johannesburg, South Africa, gold mines for conveying sand

Efficient truck loader. 1917. (In *Rock products and building materials*, v.19, April 7, 1917, p.28.)

Describes the Jeffrey self-propelled loader for loading sand, crushed stone, gravel, etc. from the ground into wagons or trucks. Manufactured by Jeffrey Manufacturing Co., Columbus, Ohio.

Electricity in sand and gravel plants. 1915. (In *Electrical review and western electrician*, v.67, p.599-602.)

Illustrated description of electrically operated sand and gravel mining plants of the Hugh Nawn Contracting Company, Boston, and of the Boston Sand and Gravel Company, Scituate, Mass. Gives tabulated data on motors used.

Hauling sand and gravel with a motor truck. 1912. (In *Engineering record*, v.66, p.473.)

Brief description of system used by contracting firm in concrete work.

Hydraulic hopper dredge with unloading machinery. 1916. (In *Engineering news*, v.76, p.1211.)

Description of suction dredge of Hydraulic Sand and Transit Co., Chicago. Used for dredging and transporting sand for concrete and building construction, and for filling.

Hydraulic sand plant. 1899. (In *Engineering record*, v.39, p.166-167.)

Sand is excavated by suction dredge, transported by water carriage and automatically loaded on barges.

Le Mesurier, William Henry.

On the removal of sand from underneath the Liverpool landing stage. 1887. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.90, p.308-318.)

Removal of sand obstruction from the River Mersey by a scheme of sluicing.

Low, Emile.

Materials for the concrete of the Buffalo breakwater. 1902. (In *Engineering news*, v.48, p.182-184.)

Illustrated description of sand, gravel and stone excavating and handling equipment used. Also gives some of the physical characteristics of the sand, gravel and stone.

Maltby, F. B.

Dredges; their construction and performance; Hydraulic dredging on the Mississippi river. 1905. (In Transactions of the American Society of Civil Engineers, v.54, pt.3, p.391-478.)

Discussion, p.479-521.

Exhaustive description of dredges used by Mississippi river commission in the removal of sand bars. Description of centrifugal sand pumps, with data and tables showing their performance, p.438-462.

Maltby, F. B.

Report on efficiency tests of hydraulic dredges. 1903. (In United States—Engineers corps. Annual report of chief of engineers for 1903 [Report of Mississippi river commission], appendix 1-F, p.136-159.)

Supplement to same. 1904. (In United States—Engineers corps. Annual report of chief of engineers for 1904 [Report of Mississippi river commission], appendix 1-D, p.98-102.)

Includes data on tests of pumps for sand dredging.

Mazoyer.

Sur l'extraction mécanique du sable et des pierres à casser. 1886. (In Annales des ponts et chaussées, mémoires, ser. 6, v.11, p.363-368.)

Describes operation of apparatus.

Moderne sandaufbereitungsanlagen. 1908. (In Stahl und eisen, v.28, pt.2, p.1146-1147, 1174-1176.)

Illustrated description of plant.

Moving sand by pumping. 1914. (In Engineering news, v.72, p.384-385.)

Sand or other similar fine-grained material is moved by means of a steam-operated pump having neither pistons nor plungers. It is said to be capable of pumping a fluid mixture containing 35 to 40 per cent. of sand.

New portable excavator for light excavation, and sand and gravel handling. 1915. (In Concrete-cement age, v.6, p.106.)

Brief description.

Notable floating sand and gravel plant. 1915. (In Engineering and contracting, v.43, p.476-477.)

Describes a dredge boat equipped with a sand and gravel handling plant.

Plant of the Atwood Davis Sand Co., Beloit, Wis. 1915. (In Excavating engineer, v.11, p.409-412.)

Illustrated description of plant.

Portable gravel digging and screening plant. 1912. (In Engineering and contracting, v.37, p.600.)

Used by Superior Sand & Gravel Co., of Utica, Mich., for loading gondola cars directly from the bank. Manufactured by Shoemaker & Casparis, Newcomerstown, Ohio.

Prelini, Charles.

Dredges and dredging. 279 p. 1911. Van Nostrand.

Book dealing with equipment and methods of dredging for all purposes. Chapter 26 deals largely with sand dredging.

Producing sand and gravel in South Dakota. 1915. (In Rock products and building materials, v.17, Dec. 22, 1915, p.33.)

Illustrated description of excavating and screening plant at Watertown, S. D. Excerpts from reports as to the value of the deposit are also given.

Reeder, E. C.

Sand-handling plant for variable-tide levels. 1914. (In Engineering record, v.70, p.301.)

Describes plant of Mississippi Sand Company, Alton, Ill.

A sand blast and steel molding sand plant. 1915. (In Foundry, v.43, p.36-37, 41.)

Illustrated account of how the Portage Silica Company, Youngstown, Ohio, prepares sand to meet the requirements of the foundry trade.

65-ft. wheel for raising stamp sand. 1901. (In Engineering news, v.46, p.396-397.)

Illustrated description of large wheel for elevating waste sand from the stamp mills of the Calumet & Hecla Mining Co., Lake Linden, Mich.

Smith, A. E.

Pumping and loading sand. 1915. (In Electrical world, v.66, pt.1, p.467-468.)

Describes electrically driven equipment for pumping sand from Arkansas river. Compares cost of operating by steam and by electricity.

Very successful redesign of plant. 1916. (In Rock products and building materials, v.18, June 22, 1916, p.48.)

Account of new arrangement of sand and gravel plant of the Atwood-Davis Sand Co., Beloit, Wis. Change was necessary owing to the exhaustion of the deposit of sand and gravel on one side of a railway track, necessitating tunneling to the other side.

Wilms, W. H.

Development of sand and gravel deposits. 1914. (In Engineering news, v.72, p.908-911.)

Preliminary steps in developing sand and gravel deposits are discussed in detail, including type of steam-shovel, essential points in stripping overburden by hydrauliclicking, the lay-out, grades and construction features.

Costs

Borhek, R. J.

Cost of hydraulic sand and gravel mining. 1915. (In Engineering and contracting, v.43, p.573-574.)

Gives cost figures, which are influenced considerably by the character of the deposit.

By the ton basis. 1916. (In Rock products and building materials, v.17, April 7, 1916, p.30-31.)

Excerpts from letters from many dealers in sand in regard to their opinions as to whether sand should be bought and sold by weight or by volume.

Neal, B. E.

Costs of producing wash sand and gravel. 1917. (In Rock products and building materials, v.19, Feb. 7, 1917, p.47.)

Author gives his opinion as to costs of the various processes entailed in producing sand and gravel for the market.

Washing, Screening, Storing and Similar Treatment

See also Methods and Machinery

Compact sand and gravel washing plant. 1913. (In Engineering news, v.69, p.514-515.)

Detailed description of a plant on the Hudson river, near Peekskill, N. Y.

Continuous washer cleans 250 yards of sand a day. 1915. (In Engineering record, v.72, p.611.)

Describes apparatus of the Bridgeport Hydraulic Company. Water enters at bottom of washer, thereby aiding the cleansing action by agitating the sand.

Crain, G. D. jr.

Design and construction features of a sand and gravel storage plant. 1916. (In Concrete, v.8, p.219-221.)

Illustrated description of plant of Ohio River Sand Co., Louisville, Ky.

Dull, Raymond W.

Sand and gravel washing plants. 1913. (In Concrete-cement age, v.2, p.129-131.)

The same, condensed. 1913. (In Railway and engineering review, v.53, p.202-203.)

Describes and illustrates apparatus for handling and cleaning sand and gravel.

Harlé.

Lavage du sable. 1886. (In Annales des ponts et chaussées, mémoires, ser. 6, v.11, p.645-649.)

Describes operation of apparatus.

Improved sand-washer. 1912. (In Engineer [London], v.113, p. 180.)

Illustrates and describes an apparatus for cleaning filter-bed sand.

Large capacity sand and gravel washing plant. 1915. (In Engineering and contracting, v.43, p.526.)

Describes plant of Akron Gravel and Sand Co., Akron, Ohio.

Low cost device for washing sand. 1916. (In Brick and clay record, v.48, p.845-846.)

Brief illustrated description of simple device.

New improved material washer. 1914. (In Concrete-cement age, v.5, p.226-227.)

Description of operation of apparatus for washing sand, gravel, or crushed rock, and separating it into three sizes. Manufactured by Stocker Concrete Material Washer Co., Highland, Ill.

Osier, Claude A.

Municipal sand and gravel washing plant. 1914. (In Municipal journal, v.36, p.131-133.)

Illustrated description of plant owned and operated by the city of Seattle, Wash. "Eight hundred cubic yards of gravel can be removed by hydraulic jets, screened and washed in eight hours."

Portable sand and gravel washer for concrete construction and road work. 1914. (In Concrete-cement age, v.5, p.134-135.)

The same. 1914. (In Engineering and contracting, v.42, p.70-71.)

Illustrated description of apparatus and its operation. Manufactured by American Concentrator Co., Springfield, Ohio.

Portable sand and gravel washer for contractor's use. 1914. (In Engineering and contracting, v.41, p.709.)

Illustrated description of apparatus and its operation. Manufactured by the Raymond W. Dull Co., Chicago.

Portable screening plants for sand and gravel. 1914. (In Concrete-cement age, v.5, p.263-264.)

Illustrated description.

Roper, W. H.

New sand washing machine. 1899. (In *Engineering news*, v.41, p.III.)

Describes apparatus devised by contractors using river and bank sands in the Pittsburgh district. Water was forced up from below, to cause impurities to overflow at the top.

Simple sand and gravel washing device. 1917. (In *Brick and clay record*, v.51, p.137-138.)

Brief illustrated description.

Stephenson, F. H.

Simple sand washer. 1904. (In *Engineering news*, v.52, p.28-29.)

Description and design of apparatus for washing out the excess of fine material from sand for filter-beds.

Washer for concrete aggregates. 1909. (In *Engineering record*, v.59, p.805.)

Description of plant.

Welch, Frank M.

Importance of location to the success of sand and gravel washing plants. 1916. (In *Rock products and building materials*, v.18, Sept. 22, 1916, p.40.)

States that the location should be determined by quality of material, market conditions and shipping facilities.

Welch, Frank M.

Problems and progress in sand and gravel washing. 1916. (In *Rock products and building materials*, v.17, Jan. 7, 1916, p.33-35.)

Gives outline of prevailing practice in regard to screening and washing of sand and gravel.

Wilms, W. H.

Operation of sand and gravel plants. 1914. (In *Engineering news*, v.72, p.962-966.)

Discusses necessary equipment for screening, washing and crushing plant; method of operation, and necessary facilities for a successful plant.

Wilms, W. H.

Operation of sand and gravel plants. 1914. (In *Engineering news*, v.72, p.1008-1012.)

Describes crushing, storage and power equipment in sand and gravel plants.

Statistics of Production, Imports, Exports, Uses, Etc.

See also Occurrence and Properties, Economic Geology

Burchard, Ernest F.

Glass sand, other sand, and gravel. 1911. (In *United States—Geological survey. Mineral resources, calendar year 1909, pt.2, p.519-542.*)

"Bibliography," p.541-542.

Statistics of production and imports; several tables of analyses of various sands; material on washing of sand and gravel for concrete and mortar.

Burchard, Ernest F.

Glass sand, other sand, and gravel. 1912. (In *United States—Geological survey. Mineral resources, calendar year 1911, pt.2, p.585-638.*)

"Publications," p.637-638.

Treats of production, requirements for glass-making, methods of preparation, description of deposits and analyses.

Similar material may be found in reports for previous years.

Burchard, Ernest F.

Glass sand, sand, and gravel. 1907. (In United States—Geological survey. Mineral resources, calendar year 1906, p.993-1000.)

Glass sand; developments, character, prices, and "literature." Molding sand; use and character, composition, "literature."

Statistics and tables, on production and imports of sand and gravel.

Coons, A. T.

Glass sand. 1904. (In United States—Geological survey. Mineral resources, calendar year 1902, p.1007-1016.)

Statistics on production, occurrence, requirements, and analyses of glass sands.

Glass [and molding] sand. 1913. (In Mineral industry, calendar year 1912, v.21, p.322-327.)

Bibliography on sands, p.327.

Statistics on glass industry in general, and on glass sand, with a little on molding sand.

Similar statistics in previous volumes.

Katz, Frank J.

Silica (quartz). 1916. (In United States—Geological survey. Mineral resources, calendar year 1914, pt.2, p.443-448.)

Statistics on production of quartz, flint, sand and sandstone, tripoli and diatomaceous earth.

Similar statistics in volumes for previous years.

Kümmel, Henry B.

Glass sand. 1914. (In Mineral industry, calendar year 1913, v.22, p.666-672.)

Bibliography of silica, p.674-675, contains several references to sands.

Distribution, composition and general statistics on glass sands from the more important producing states.

Loughlin, G. F.

Sand and gravel. 1916. (In United States—Geological survey. Mineral resources, calendar year 1914, pt.2, p.271-283.)

Statistics on production and importation of gravel, and of sands for building, molding, glass-making, grinding, paving, and refractory uses.

Similar statistics in volumes for previous years.

McLeish, John.

Sands and gravels. 1909. (In Canada—Mines branch. (Department of mines.) Annual report on the mineral production of Canada for calendar years 1907 and 1908, p.278.)

Statistics on annual imports and exports of sand and gravel in Canada, 1893 to 1900 inclusive.

Production of glass sand in 1902. 1904. (In Scientific American supplement, v.57, p.23583-23584.)

Statistics of output.

Stone, Ralph W.

Sand and gravel. 1913. (In United States—Geological survey. Mineral resources, calendar year 1912, pt.2, p.621-636.)

"Publications" on sand, p.634-636.

Statistics on production, imports, uses and definitions of sand and of molding sand.

Stone, Ralph W.

Sand and gravel. 1914. (In United States—Geological survey. Mineral resources, calendar year 1913, pt.2, p.325-337.)

Statistics on production, imports, sand for steel molding, and sand and gravel for filtration plants.

Sand for Concrete, Mortar and other Structural Purposes

Properties and Specifications

Aiken, W. A.

A sand specification and its specific application. 1910. (In Proceedings of American Society for Testing Materials, v.10, p.341-348.)

Discussion, p.349-350.

Submits new specification for sand for concrete, and gives tables showing results of various sands tested according to it.

American Railway Engineering and Maintenance of Way Association.

Report of Committee no.VIII: On Masonry. 1904. (In its Proceedings, v.5, p.601-666.)

Includes, p.607, 609, 610, data on sand requirements in connection with specifications for natural and Portland cement and concrete.

Baker, Ira O.

Sand for mortar. 1899. (In Brickbuilder, v.8, p.116-117.)

Emphasizes the importance of the quality of sand used in making mortar. Test results are given to show the effect of fineness, voids, weight, etc.

Baker, Ira Osborn.

Treatise on masonry construction. Ed.10. 745 p. 1909. Wiley.

Contains data on properties and uses of sand in connection with masonry construction.

Boardman, H. P.

Concrete materials and proportions. 1902. (In Engineering news, v.47, p.32-33.)

Letter to editor giving opinions in regard to specifications for proportions in concrete work. Includes test data on variations between volume and weight of sand under various conditions.

Brown, Charles Carroll, ed.

Hand-book for cement users. Ed.2, rev. & enl. 378 p. 1902. Municipal Engineering Co.

Contains considerable material on sands used for mortar and for concrete.

Byrne, Austin T.

Inspection of the materials and workmanship employed in construction. 539 p. 1902. Wiley.

Contains data on properties and uses of sand, especially in relation to the inspection of building materials.

Cement and sand for concrete. 1909. (In Journal of the Association of Engineering Societies, v.43, p.185-213.)

Discussion, v.44, p.94.

The same, abstract. 1910. (In Engineering record, v.61, p.125-126.)

Informal discussion before Boston Society of Civil Engineers, by several participants, on the requirements of sand and cement.

Chapman, Cloyd M.

New form of specifications for concrete aggregates. 1916. (In Proceedings of American Society for Testing Materials, v.16, pt.2, p.180-187.)

Discussion, p.188-193.

Proposes that concrete aggregates, particularly sand, shall be purchased under a new scheme of specifications, whereby they must be of such quality that they will produce a concrete of a certain minimum strength.

Cochran, Jerome.

Directions and suggestions for the inspection of concrete materials. 1912. (In *Engineering and contracting*, v.37, p.115-118.)

Contains information relating to the selection of sand for use in concrete. Covers size and shape of grain, color, sea sand, foreign matter, stone screenings, testing, etc.

Cochran, Jerome.

General specifications for concrete and reinforced concrete, including finishing and waterproofing. 274 p. 1913. Van Nostrand.

"Bibliography of specifications for sand, broken stone and gravel," p.24-25.

Considerable attention to properties and uses of sand in connection with concrete work.

Cochran, Jerome.

Treatise on the inspection of concrete construction. 595 p. 1913. Clark.

Contains data on properties and uses of sand in connection with the inspection of concrete work.

Colby, Albert Ladd.

Reinforced concrete in Europe. 260 p. 1909. Chemical Pub. Co.

Contains data on specifications for sand for concrete.

Dancaster, Ernest A.

Limes & cements; their nature, manufacture and use. 212 p. 1915. Appleton.

Contains considerable material on sands used for mortar and for concrete.

Emley, Warren E. & Young, S. E.

Strength of lime mortar. 1914. (In *Proceedings of the American Society for Testing Materials*, v.14, pt.2, p.338-358.)

Includes data on the influence of the kind and amount of sand on the physical properties of lime mortar made from that sand.

Eno, Frank Harvey.

Uses of hydraulic cements. 1904. (In *Ohio—Geological survey*. (4th survey.) Bulletin no.2.)

Effect of different kinds of sands upon the strength of mortar, p.27-30.

Specifications for sand used in mortar, p.190.

Frye, Albert I.

Civil engineers' pocket-book. 1913. Van Nostrand.

Contains considerable amount of information on the general properties of sand.

Fuller, William B. & Thompson, S. E.

Laws of proportioning concrete. 1907. (In *Transactions of the American Society of Civil Engineers*, v.59, p.67-143.)

Discussion, p.144-172.

Much attention to analysis, use and properties of sands for concrete.

Gillette, Halbert P. & Hill, C. S.

Concrete construction; methods and cost. 690 p. 1908. Clark.

Contains considerable information on properties, uses and costs of sand for various construction purposes.

Gillmore, Q. A.

Practical treatise on limes, hydraulic cements, and mortars. Ed.10. 334 p. 1890. Van Nostrand.

Presents data on sand in relation to its use in mortar and concrete.

Jameson, Charles D.

Portland cement; its manufacture and use. 192 p. 1898. Van Nostrand.

Sand for concrete considered briefly.

Kidder, Frank Eugene.

Architect's and builder's pocket-book. Ed.16, rewritten. 1816 p. 1916. Wiley.

Contains considerable material on properties and uses of sand in building construction.

McCullough, F. M.

Local sands and gravels as aggregates in concrete. 1915. (In Proceedings of the Engineers' Society of Western Pennsylvania, v.30, p.334-367.)

Discussion, p.368-379.

Concerned mainly with behavior of sand and gravel in concrete, but discusses briefly the mechanical and physical properties of sands and gravels of the Pittsburgh region.

McCullough, F. M.

Relative strengths of mortar and of concrete containing Ohio and Allegheny river sands and gravels and relation between proportions of aggregates and the strength of concrete. 1915. (In Engineering and contracting, v.44, p.194-196.)

Abstract of a portion of author's paper on "Local sands and gravels as aggregates in concrete."

Macey, Frank W.

Specifications in detail. Ed.2, rev. & enl. 620 p. 1904. Crosby Lockwood.

Contains data on specifications for sand for various uses in building construction.

McNeilly, Robert H.

Sand for concrete and cement mortar should have "jump" in grading. 1915. (In Engineering record, v.72, p.659-662.)

New view, based on theoretical grounds and verified by tests, runs counter to theory that particles should be uniformly graded.

Marsh, Charles F. & Dunn, William.

Reinforced concrete. Ed.3, rev. & enl. 654 p. 1906. Van Nostrand.

Contains data on properties and uses of sand for concrete work.

Moyer, Albert.

Economical selection and proportion of aggregates for Portland cement concrete. 1910. (In Engineering-contracting, v.33, p.52-55.)

Includes material on the selection and use of sand.

Okey, Frank M.

Good concrete and how to get it. 1909. (In Municipal engineering, v.36, p.293-296.)

Concerned with the quality of the constituents of concretes. Enumerates the essential qualities of a good sand for concrete.

Owens, John S.

Concrete aggregates. 1909. (In Concrete and constructional engineering, v.4, p.40-46.)

Considers general properties, impurities, voids, proportions, moisture, and selection of aggregates, including sand.

Patton, W. M.

Treatise on civil engineering. Ed.2, rev. 1654 p. 1907. Wiley.

Contains data on properties and uses of sand for concrete work.

Plain account of the characteristics required of cement, sand and stone for concrete. 1909. (In *Engineering-contracting*, v.32, p.465-467.)

Non-technical treatment, intended for the small concrete worker, the contractor's foreman and others for whom the usual concrete literature is not sufficiently elementary.

Quality of sand required for cement mortar. 1904. (In *Engineering and mining journal*, v.77, p.968-969.)

The same, abstract. 1905. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.159, p.454-455.)

Seeks to prove that too much importance is attached to the presence of "dirt" in sand to be used with cement.

Redgrave, Gilbert R. & Spackman, Charles.

Calcareous cements; their nature, manufacture and uses, with some observations on cement testing. Ed.2. 310 p. 1905. Griffin.

Contains considerable material on sands for use in mortar and concrete.

Richey, H. G.

Building foreman's pocket book and ready reference. 1118 p. 1909. Wiley.

Considerable attention to sand in its relation to building construction.

Sabin, Louis Carlton.

Cement and concrete. 507 p. 1905. McGraw.

Considerable attention to properties and uses of sand in connection with concrete work. Chapter 11, p.154-171, on "Sand for mortar."

Sand specifications. 1914. (In *Canadian engineer*, v.27, p.246.)

Specifications for mortar-making sands. Extract from Bulletin no.70, University of Illinois Experiment Station.

See also Wiley, C. C.

Searle, Alfred B.

Cement, concrete and bricks. 412 p. 1913. Constable.

Contains considerable material on sand.

Sherman, C. E.

Effect of clay and loam on cement mortar. 1903. (In *Engineering news*, v.50, p.443-444.)

Contains data applicable to the problem of the effect of impurities in sand on the quality of mortar made from such sand.

Spalding, Frederick P.

Hydraulic cement; its properties, testing and use. Ed.2. 300 p. 1906. Wiley.

Contains information on quality of sand for use in mortar.

Specifications for sand and stone for concrete. 1909. (In *Engineering record*, v.59, p.587.)

Abstract of paper by William Challoner before the Association of Municipal and County Engineers, in London.

Shows how rigid are the specifications as to voids in sand and stone for concrete work in Belgium and Germany.

Taylor, Frederick W. & Thompson, S. E.

Concrete costs. 709 p. 1912. Wiley.

Considerable attention to properties, uses and costs of sand for various construction purposes.

Taylor, Frederick W. & Thompson, S. E.

Treatise on concrete, plain and reinforced. Ed.3. 885 p. 1916. Wiley.

Includes much information on chemical and physical properties of sand, especially in relation to concrete. Brief bibliography on "Sand and stone—their physical characteristics," p.841.

Thompson, Sanford E.

Concrete aggregates. 1906. (In Proceedings of the National Association of Cement Users, v.2, p.27-37.)

Discussion, p.38-45.

The same, condensed. 1906. (In Engineering record, v.53, p.108-110.)

Includes information on sand for concrete, as regards its selection, quality, tests, etc.

Thompson, Sanford E.

Sand for mortar and concrete. 1906(?) (In Association of Portland Cement Manufacturers. Bulletin no.3, p.1-14.)

Considers the necessary qualifications of a good sand, and outlines test methods.

What percentage of clay is it safe to permit in sand for cement mortar? 1907. (In Engineering news, v.57, p.620.)

Collection of letters between E. S. Larned and L. L. Bingham, Clifford Richardson, Sanford E. Thompson, W. Purves Taylor and H. L. Sherman, giving their views on the question of the harm done by clay in concrete sand.

Wig, R. J. and others.

Strength and other properties of concretes as affected by materials and methods of preparation. 172 p. 1916. (In United States—Standards, Bureau of. Technologic paper no.58.)

Includes some data on the effect of sand on the properties of concrete.

Wiley, C. C.

Mortar-making qualities of Illinois sands. 1913. (In Illinois University—Experiment station. Bulletin no.70, p.1-38.)

Contents: Description of tests.—Description of sands.—Discussion of tests.—Specifications for sand.

The same, abstract. 1914. (In Engineering and contracting, v.41, p.603-607.)

The same, abstract. 1914. (In Engineering record, v.69, p.406, 418.)

The same, abstract. 1914. (In Municipal journal, v.36, p.429-432, 472-474.)

Tests

See also Properties and Specifications

Alexandre, Paul.

Recherches expérimentales sur les mortiers hydrauliques. 1890. (In Annales des ponts et chaussées, mémoires, ser. 6, v.20, p.277-428.)

Includes considerable material on sand in its relation to the physical properties of mortar.

American Railway Engineering and Maintenance of Way Association.

Report of Committee no. VIII: On Masonry. 1905. (In its Proceedings, v.6, p.697-729.)

Includes specifications recommended for standard sand for use in cement testing, p.714.

American Society for Testing Materials.

Proposed provisional method for making a mechanical analysis of mixtures of sand or other fine material with broken stone or broken slag. 1914. (In its Proceedings, v.14, pt.1, p.382.)

Gives a method provisionally proposed by the society.

American Society for Testing Materials.

Report of Committee C-9 on concrete and concrete aggregates. 1916. (In its Proceedings, v.16, pt.1, p.264-267.)

Includes data on sand, especially with regard to impurities in sand, and their measurement, and methods of testing for voids, weights, density, specific gravity, etc. Similar data may be found in volumes for previous years.

American Society for Testing Materials.

Standard method for making a mechanical analysis of sand or other fine highway material, except for fine aggregates used in cement concrete. 1916. (In A. S. T. M. standards of the American Society for Testing Materials, 1916 issue, p.535-536.)

American Society for Testing Materials.

Standard specifications for cement. 1915. (In its Year-book for 1915, p.350-377.)

The same. 1912. (In Transactions of the American Society of Civil Engineers, v.75, p.682.)

"Standard sand" for use in cement tests, defined, p.361.

Similar data will be found in previous year-books of the same society.

American Society for Testing Materials.

Suggested colorimetric tests for organic impurities in sand. 1917. (In its Proceedings, v.17, pt.1, p.327-333.)

The same, abstract. 1917. (In Engineering and contracting, v.47, p.273.)

Being Appendix II of Report of Committee C-9 on Concrete and concrete aggregates.

A sample of the sand is digested at ordinary temperature in a solution of sodium hydroxide. The filtered solution resulting from this treatment will vary in depth of color according to the degree of impurity of the sand.

Association of American Portland Cement Manufacturers.

Results of tests made in the collective Portland cement exhibit and model testing laboratory of the Association of American Portland Cement Manufacturers, Louisiana Purchase Exposition, St. Louis, 1904 [Richard L. Humphrey in charge]. 36 p. 1904.

The same, condensed. 1905. (In Engineering news, v.54, p.300-305.)

See also editorial, p.309.

Presents test data on concrete made from various cements and sands. Gives specific gravity, percentage of voids and granulometric composition of several sands, and tensile and compressive strength of mortars made from them.

Black, A.

Comparative tests of cement mortar, showing the relative effects of three different sands. 1906. (In Engineering news, v.56, p.236.)

Presents test data in the form of charts and tables. The three sands used were crushed gneiss rock screened through half-inch mesh, Cow Bay sand from New York city district, and fine, clean silicious sand. Giant and Atlas cements were used.

Brown, L. R.

Seven-day sand tests no criterion for six-month test. 1917. (In Engineering news-record, v.78, p.504-505.)

Record of tests which seemed to indicate that a concrete sand that appears unacceptable by virtue of results shown with different brands of cement in short-time tests may make an acceptable showing in a six-month test.

Burchard, Ernest F.

Field investigations of structural materials. 1910. (In United States—Geological survey. Bulletin no.430: Contributions to economic geology, 1909, p.275-279.)

Short outline of methods used in investigations conducted by United States government laboratories in St. Louis. Investigations included sand for concrete and for mortar, but no specific information is given for any material investigated.

Campbell, J. L.

More concerning specifications for sand. 1905. (In Engineering news, v.53, p.286.)

Letter to editor commenting on latter's editorial, "Concerning specifications for sand." Also presents answer.

Chapman, Cloyd M.

Importance of testing sands. 1912. (In Engineering record, v.66, p.401-402.)

Author recommends more care in the testing of sand for mortar or concrete, and presents his views as to which properties of a sand should be investigated and how.

Chapman, Cloyd M.

Results of experiments upon effect of sea water on the tensile strength of various mixtures of cement and sand. 1910. (In Proceedings of National Association of Cement Users, v.6, p.172-174.)

Discussion, p.175-179.

The same, abstract. 1910. (In Engineering news, v.63, p.291.)

Brief description of tests, together with graphs showing test results.

Chapman, Cloyd M.

Testing of sand for use in concrete: I, field and laboratory practice; II, computing and using results. 1914. (In Engineering news, v.71, p.306-310, 554-558.)

Illustrated article giving extensive outline of test procedure. Covers sampling, testing of samples, methods of computation of test results, and interpretation of data.

See also Montgomery, Charles M. "Testing of sand for concrete."

Chapman, Cloyd M.

Testing sand for use in concrete and cement mortar. 1912. (In Engineering record, v.65, p.465-466.)

Outlines test procedure.

Chapman, Cloyd M.

Use of the universal sand tester. 1916. (In Proceedings of the American Concrete Institute, v.12, p.481-490.)

Emphasizes the necessity for testing concrete sands for grain size, and gives description of the use of a special testing device.

Chapman, Cloyd M. & Johnson, N. C.

Economic side of sand testing. 1915. (In *Engineering record*, v.71, p.734-737.)

Letter containing correction to above, p.813.

The same. 1915. (In *Sibley journal of engineering*, v.30, p.65-70.)

Emphasizes the importance and the practical nature of the testing of sand that is to be used in concrete. Outlines methods and cites examples, showing saving effected.

Chapman, Cloyd M. & Johnson, N. C.

Quality of concrete controlled by tests of sand. 1915. (In *Engineering record*, v.71, p.801-804.)

The same. 1916. (In *Sibley journal of engineering*, v.30, p.142-148.)

Discusses existing methods for testing sand for use in concrete. Proposes check on materials by means of portable device which simplifies the usual analysis routine and gives direct graphical records.

Chapman, Cloyd M. & Johnson, N. C.

Safe concrete demands knowledge of nature of sands. 1915. (In *Engineering record*, v.71, p.771-774.)

The same. 1915. (In *Sibley journal of engineering*, v.30, p.105-111.)

Discusses origin and structure of the sand grain, and the value of tests for detecting impurities which might impair the strength of the finished concrete.

Clarke, Eliot C.

Record of tests of cement made for Boston main drainage works, 1878-84. 1885. (In *Transactions of the American Society of Civil Engineers*, v.14, p.141-170.)

Includes data on the effect of "dirty" sand on cement mortar made from such sand.

Coe, Edward K.

Effect of clay in sand on lean mortar mixtures. 1905. (In *Engineering news*, v.53, p.206.)

Letter to editor commenting on paper by J. C. Hain in regard to tests of the effect of unclean sand on mortar.

Concerning specifications for sand. 1905. (In *Engineering news*, v.53, p.125-126.)

Editorial pertaining to the importance of definite sand specifications and commenting on test results of J. C. Hain.

See also Campbell, J. L.

Conway, George Robert Graham.

Water-works and sewage of Monterrey, N. L., Mexico. 1911. (In *Transactions of the American Society of Civil Engineers*, v.72, p.475-556.)

Discussion, p.557-585.

Gives (p.492-493) a table of analyses of concrete sand available in this district, and a table showing test results of cement made with these sands.

Defective sands for concrete aggregate. 1912. (In *Engineering news*, v.67, p.1045-1046.)

Editorial comment on the necessity for more careful testing of sand that is to be used in concrete.

Desch, Cecil H.

Chemistry and testing of cement. 267 p. 1911. Arnold.

Standard sand for cement tests considered briefly, p.185-186.

Dibdin, W. J.

Composition and strength of mortars. 54 p. 1911. Royal Institute of British Architects.

Gives results of many tests, with numerous diagrams, and includes material on the influence of quality of sand on the strength of mortars.

Dieckman, George P.

Mechanical grading of concrete sand. 1915. (In *Concrete-cement age*, v.7, p.68-69.)

Summary of experiments showing effect of grading as indicated by tensile strength and absorption tests. Several tables and graphs are used to present data.

Feret.

Sur la capacité des mortiers hydrauliques. 1892. (In *Annales des ponts et chaussées, mémoires*, ser. 7, v.4, p.5-164.)

"Errata," p.550.

Includes much information on sand for use in making hydraulic mortars. Theoretical.

Feret, R.

Essais de divers sables pour mortiers. 1896. (In *Annales des ponts et chaussées, mémoires*, ser. 7, v.12, p.174-197.)

Includes two plates and 14 tables giving data on sands for mortar.

The same, abstract. 1896. (In *Engineering record*, v.34, p.311.)

Feret, R.

Essais de divers sables pour mortiers (vingt ans après). 1916. (In *Annales des ponts et chaussées, mémoires*, ser. 9, v.34, p.70-80.)

Gives results of tests on mortar sands that had been immersed in sea-water for a very long period. Author concludes that the best mortar for use in sea-water is made from sand that is not too fine and not too uniform in size.

Feret, R.

Étude expérimental du ciment armé. 777 p. 1906. Gauthier-Villars.

Theoretical and experimental treatise, including data on sand in its relation to reinforced concrete.

Feret, R.

Études sur la constitution intime des mortiers hydrauliques. 1897. (In *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, v.96, pt.2, p.1591-1625.)

Includes much information on sand in its relation to the quality of the hydraulic mortar in which it is used. Theoretical.

Forrest, Charles N.

New device for the mechanical analysis of concrete aggregates. 1906. (In *Proceedings of American Society for Testing Materials*, v.6, p.458-461.)

Describes automatic mechanical device for sifting of sand and other concrete aggregates. Gives table showing how closely the device approximates hand sifting in its results.

Free, E. E.

Proposed study of concrete sands; possible explanation of the defective sands. 1912. (In *Engineering news*, v.67, p.1024-1025.)

Author attempts to explain the defects mentioned by John R. Freeman by the theory that adhering organic matter reduces the bonding power of the sand grains.

Freeman, John R.

Proposed study of concrete sands; defective concrete sands. 1912. (In *Engineering news*, v.67, p.1022-1024.)

The same, abstract. 1912. (In *Concrete-cement age*, v.1, p.44.)

Author calls attention to the peculiar behavior of certain sands which pass all ocular and manual tests for a good concrete sand, but which fail to make a strong concrete.

See also Free, E. E.

Gaines, Richard H.

Gaines, Richard H.

Proposed study of concrete sands; further thoughts on the physical chemistry of the defective sands. 1912. (In *Engineering news*, v.67, p.1025-1026.)

Author advances two possible explanations for the defects mentioned by John R. Freeman. These he terms "catalytic action" and "sterical hindrance."

Gary, M.

Der deutsche normalsand. 1903. (In *Mitteilungen aus den Königlichen Technischen Versuchsanstalten zu Berlin*, v.21, p.2-48.)

The same, abstract translation. 1904. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.155, p.491-492.)

Extensive paper describing operation of quarry of standard sand in Freienwalde, Germany.

Gary, M.

Normal-sande. 1898. (In *Mitteilungen aus den Königlichen Technischen Versuchsanstalten zu Berlin*, v.16, p.121-143.)

The same, abstract translation. 1899. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.135, p.372.)

Investigation of standard sands for cements.

Gassier.

Note on the comparative mechanical strengths and the stabilities in sea-water of crushed sand mortars and sea-sand mortars. 1912. (In *Proceedings of International Association for Testing Materials*, 6th congress, section 2, paper XVII 5, p.1-9.)

Presents results of tests conducted in France.

Goslich, C.

German normal sand. 1911. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.183, p.367-368.)

Abstract of article on the discovery of a new deposit of quartz sand suitable for use as the German normal sand for cement testing.

Greenman, R. S.

Practical tests of sand and gravel proposed for use in concrete. 1911. (In *Proceedings of American Society for Testing Materials*, v.11, p.515-520.)

Discussion, p.521-530.

The same. 1911. (In *Engineering record*, v.64, p.66-67.)

Covers sampling, laboratory tests and field tests. Gives tables of test results.

Greenman, R. S.

Tests of natural concrete aggregates. 1913. (In *Proceedings of American Society for Testing Materials*, v.13, p.828-833.)

Includes data on the effect of various kinds of sand on the strength of concrete.

Griesenauer, G. J.

Loam and clay in sand for concrete. 1904. (In *Engineering news*, v.51, p.413.)

The same, abstract. 1904. (In *Le Génie civil*, v.45, p.115-116.)

Gives tables and graphs of test data compiled in an effort to determine the effect of impurities in sand on the concrete made from it.

Hain, J. C.

Mortar sand. 1905. (In *Proceedings of the National Association of Cement Users*, v.1, p.42-50.)

The same. 1905. (In *Engineering news*, v.53, p.127-129.)

The same. 1905. (In *Municipal engineering*, v.28, p.146-152.)

The same. 1905. (In *Railway and engineering review*, v.45, p.40-41, 43-44.)

The same, abstract. 1905. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.161, p.396-397.)

See also editorial "Concerning specifications for sand."

Gives requirements of sand for mortar and describes tests performed on several sands.

See also Coe, Edward K.

Huestis, Charles C.

How consistency and age affect strength of mortar; natural-sand vs. Ottawa-sand tests discussed in connection with standard requirements for equal strength. (In *Engineering record*, v.72, p.484.)

Shows different results of strength-tests when natural sand and Ottawa sand are used.

Huestis, Charles C.

Experience with impure sand for concrete. 1905. (In *Engineering news*, v.53, p.231.)

Letter to editor commenting on paper by J. C. Hain in regard to the effect of unclean sand on mortar.

Humphrey, Richard L.

Cement and concrete tests at the St. Louis exposition. 1905. (In *Engineering news*, v.54, p.300-305.)

See also editorial, p.309.

Presents test data on concrete made from various cements and sands. Gives specific gravity, percentage of voids, and granulometric composition of several sands, and tensile and compressive strengths of mortars made from them.

Humphrey, Richard L.

Organization, equipment and operation of the Structural-materials Testing Laboratories at St. Louis, Mo. 84 p. 1908. (In *United States—Geological survey. Bulletin no.329.*)

Contains information on facilities of this laboratory for testing sands.

Humphrey, Richard L.

Strength of concrete beams. 1908. (In *United States—Geological survey. Bulletin no.344*, p.1-58.)

Results of tests of 108 beams (first series) made at the Structural-materials Testing Laboratories.

Section on "Tests of constituent materials" has subsection "Sand," p.16-18. Meramec river sand was used in all aggregates. Tables given, showing tests of mortars, physical properties of sand, tests of cement.

Humphrey, Richard L.

Work done in the structural materials testing laboratories, United States geological survey, during the year ending June 30, 1906. 1906. (In Proceedings of American Society for Testing Materials, v.6, p.342-345.)

Gives summary of tests of the constituent materials of mortar and concrete. Includes sand.

Humphrey, Richard L.

See also Association of American Portland Cement Manufacturers.

Humphrey, Richard L. & Jordan, William, jr.

Portland cement mortars and their constituent materials. 1908. (In United States—Geological survey. Bulletin no.331, p.1-130.)

Results of tests made at the Structural-materials Testing Laboratories, Forest Park, St. Louis, 1905-07.

Section on "Sand and sand mortars," p.42-79. Covers method of collection, description of sands, physical tests of sands, physical tests of sand mortars.

Jewett, J. Y.

Some sand experiments relating to per cent. of voids and tensile strength. 1906. (In Proceedings of American Society for Testing Materials, v.6, p.405-411.)

Discussion, p.412-415.

Methods of testing described and tables of test data shown. Tests aimed to determine relation between per cent. of voids in sand and strength of mortar.

Johnson, J. B.

Materials of construction. Ed.4, rev. & enl. 795 p. 1912. Wiley.

"Normal or standard sand" discussed, p.424-429. Chapter 30, p.568-629, on "Results of tests on cements, cement-mortars, and concretes," includes considerable information on sand for concrete.

Kitts, J. A.

Economical proportions for Portland-cement mortars and concretes. 1917. (In Proceedings of the American Society for Testing Materials, v.17, p.279-294.)

Discussion, p.295-300.

Author shows how to compute, mathematically, the best proportions. Considerable attention to the influence of the sand in mortars and concretes.

Kitts, J. A.

Weight-volumetric proportioning of concrete aggregates in testing. 1915. (In Proceedings of the American Society for Testing Materials, v.15, pt.2, p.153-160.)

Discussion, p.161-170.

Includes considerable information on sand in its relation to the quality of concrete.

Laclotre.

Influence de l'argile contenue dans les sables sur la résistance des mortiers. 1916. (In Annales des ponts et chaussées, mémoires, ser. 9, v.36, p.257-270.)

Cites results and shows graphs of tests conducted in an effort to determine what benefits, if any, result from the washing of sand for use in mortars.

Larned, E. S.

Some observations on the effect of water and combinations of sand upon the setting properties and tensile strength of Portland and natural cements. 1903. (In Proceedings of American Society for Testing Materials, v.3, p.401-410.)

Discussion, p.411-413.

Explains methods of testing, and shows results by tables and diagrams.

Larned, E. S.

Study of sand for use in cement mortar and concrete. 1912. (In Journal of the Association of Engineering Societies, v.48, p.189-204.)

Discussion, p.204, 207, 337-338.

The same, abstract. 1912. (In Minutes of proceedings of the Institution of Civil Engineers, v.190, p.377.)

Larned, E. S.

Value of sand in concrete construction. 1908. (In Proceedings of the National Association of Cement Users, v.4, p.205-210.)

Discusses the importance of definite knowledge regarding the sand which is to be used in concrete, and presents in tabulated form, test data on several samples.

Lazell, E. W.

Comparative tests of lime mortar, both in tension and compression: hydrated lime and sand; lump lime and sand; cement-lime and sand. 1910. (In Proceedings of American Society for Testing Materials, v.10, p.328-340.)

Description of tests, and test results presented in graphical form.

Meade, Richard K.

Portland cement; its composition, raw materials, manufacture, testing and analysis. 512 p. 1911. Chemical.

Standard sand for cement tests considered briefly, p.426, 432.

Montgomery, Charles M.

Sand testing at New York. 1915. (In Engineering record, v.71, p.551-552.)

Discusses test requirements for acceptance of sand used in concrete construction by Board of water supply of New York.

Montgomery, Charles M.

Testing of sand for concrete. 1914. (In Engineering news, v.71, p.804-805.)

Criticism of certain of the laboratory methods of sand testing as shown in Cloyd M. Chapman's paper on "Testing of sand for use in concrete."

See also Cloyd M. Chapman's reply, p.805.

National Association of Cement Users.

Report of Committee on specifications and methods of tests for concrete materials. 1912. (In its Proceedings, v.8, p.473-485.)

The same, condensed. 1912. (In Engineering record, v.65, p.349-350.)

Includes data on tests of sand for concrete.

National Association of Cement Users.

Request for laboratory methods of testing sand. 1912. (In Engineering news, v.67, p.1043.)

Letter to editor from Committee on specifications and methods of tests for concrete materials [of National Association of Cement Users] asking for communications from those willing to furnish laboratory data on cement tests.

New instrument tests sands quickly in the field. 1915. (In Engineering record, v.71, p.821-822.)

Describes construction and operation of a new sand-testing device for use in the field.

Query! what was the percentage of voids in this sand? 1902. (In Engineering news, v.48, p.34.)

See also letters by W. F. Mann, p.65, and by W. B. Fuller and C. W. L. Filkins, p.81, in explanation.

Letter to editor asking an explanation of an apparent discrepancy between experimental results on voids in sand and the usual theoretical figures for those voids.

Rapid sand testing device. 1915. (In Concrete-cement age, v.7, p.189-190.)

Describes a small device for use in the field in testing quality of sands.

Reinhart, M. J.

Standard sand for cement work. 1907. (In Engineering record, v.56, p.64.)

Abstract of paper before Iowa Cement Users' Association giving an account of tests conducted to determine how ordinary sands can be improved by screening or by adding the proper material to give the mixture the least percentage of voids.

Reinke, W. B.

Observations on the testing of sand. 1913. (In Proceedings of American Society for Testing Materials, v.13, p.797-806.)

Discussion, p.807-812.

The same, abstract. 1913. (In Concrete-cement age, v.3, p.84-86.)

The same, abstract. 1913. (In Engineering record, v.68, p.202.)

The same, abstract. 1913. (In Railway and engineering review, v.53, p.740-741.)

Advocates more attention to testing of sands for concrete. Suggests tests that should be applied, and gives tables and graphical data showing test results.

Roman, F. L.

Effect of fineness of sand and of clay and loam on the strength of mortar. 1915. (In Engineering and contracting, v.43, p.403-406.)

Summary of tests conducted by Illinois highway department. Results shown by numerous graphs.

[Sand tests.] 1894. (In Annual report of the chief of engineers, United States Army, for the year 1894, pt.4.)

Appendix MM, p.2261-2381, contains many tables of test data, among which are several on sand for concrete.

[Sand tests.] 1895. (In Annual report of the chief of engineers, United States Army, for the year 1895, pt.4.)

Appendix LL, p.2859-3070, contains many tables of test data, among which are several on sand for concrete.

Schüle, F.

Standardised tests for hydraulic binding media by the use of standard sand prisms. 1912. (In Proceedings of International Association for Testing Materials, 6th congress, section 2, paper XIII, p.1-14.)

Suggestions in regard to the use of standard sands of various countries in making cement tests.

Scotfield, H. H.

Need for testing commercial sands for use in concrete. 1914. (In Engineering record, v.69, p.170.)

Abstract of paper presented to Indiana Engineering Society.

Spackman, Henry S. & Lesley, R. W.

Sands; their relation to mortar and concrete. 1908. (In Proceedings of American Society for Testing Materials, v.8, p.429-448.)

Discussion, p.449-453.

The same, abstract. 1908. (In Scientific American supplement, v.66, p.394-395.)

Emphasizes the importance of the quality of sand for mortar and concrete and of its testing and inspection; and suggests the desirability of standard specifications and standard test methods. Numerous tables of test results.

Taylor, Harry.

Tests to show suitability of various kinds of sand for use in concrete. 1903. (In Engineering news, v.49, p.306.)

Gives test results of mortar briquettes made of three kinds of sand: standard crushed quartz, Plum Island sand from Massachusetts, and crusher dust.

Thompson, Sanford E.

Sand for mortar and concrete. 14 p. 1906. (In Association of American Portland Cement Manufacturers. Bulletin no.3.)

The same. 1906. (In Scientific American supplement, v.62, p.25550-25551, 25571.)

Urges the necessity of more careful tests of sands and suggests procedures for carrying out certain tests.

Thompson, Sanford E. and others.

Field examination of concrete sand. 1915. (In Concrete-cement age, v.6, p.303-305; v.7, p.73-75, 156-157.)

Short discussions by several authors on value and methods of field tests of concrete sands.

Thompson, Sanford E. and others.

Impurities in sand for concrete. 1909. (In Transactions of the American Institute of Civil Engineers, v.65, p.250-273.)

Informal discussion at annual convention, July 8, 1909.

Tests on, and observations of, the effect of impurities in sand for concrete.

Tomlinson, C. W.

Method of making mineralogical analysis of sand. 1915. (In Bulletin 101 of the American Institute of Mining Engineers, May 1915, p.947-956.)

The same, abstract. 1916. (In Revue de métallurgie, v.13, p.195-198.)

Gives methods of analysis to determine the influence of the mineralogical constitution of sand upon the properties of concrete and mortar in which it is used.

Unwin, William Cawthorne.

Testing of materials of construction. 480 p. 1910. Longmans.

Chapter 19, "Limes and cements," contains considerable information on the effect of quality and proportion of sand on cement mortars.

Van de Greyn, E. B.

Sand testing at Denver. 1915. (In Engineering record, v.71, p.551.)

Discusses test requirements for acceptance of sand used by the city of Denver.

Webb, Dewitt C.

Tests of coral sand and rock with reference to their use in concrete. 1908. (In Engineering news, v.59, p.524.)

Gives test results of concrete made from coral sand and rock as found in the Key West district.

Withey, M. O.

Survey of the concrete aggregates of Wisconsin. 1912. (In *Concrete*, v.12, p.55-60.)

Includes a description of methods used at University of Wisconsin for testing sand for concrete.

Withey, M. O.

Tests of mortars made from Wisconsin aggregates. 1913. (In *Proceedings of the American Society for Testing Materials*, v.13, p.834-857.)

Includes considerable material on the influence of the sand on the properties of mortars.

Treatment

Candlot.

Liability to error in mixing cement with wet and dry sand. 1890. (In *Journal of the Society of Chemical Industry*, v.9, p.1037.)

The same. 1891. (In *Engineering news and American railway journal*, v.25, p.173.)

Brief abstract of article on variations that might occur in the strength of mortars, on account of errors in mixing caused by wet sand.

Cochran, Jerome.

Proportioning and mixing concrete. 1912. (In *Engineering and contracting*, v.37, p.147-152.)

Includes material on grading, proportioning, measuring and mixing the sand that is to be used in concrete.

Duryee, Edward.

Cement investigations in Arizona. 1903. (In *United States—Geological survey*. Bulletin no.213, p.372-380.)

The same, abstract. 1903. (In *Engineering news*, v.49, p.487-488.)

Includes material on methods and advantages of grinding sand and cement together and using the mixture in place of pure cement. The product is known as sand cement.

Edwards, L. N.

Effects of grading of sands and consistency of mix upon the strength of plain and reinforced concrete. 1917. (In *Proceedings of the American Society for Testing Materials*, v.17, pt.2, p.301-357.)

Discussion, p.358-363.

Contains much information on the effect of quality and treatment of sand on the properties of concrete.

Emley, Warren E.

Effect of consistency and amount of sand on the properties of lime mortars. 1914. (In *Transactions of the American Ceramic Society*, v.16, p.151-161.)

Emley, Warren E.

Properties of cement-lime-sand mortars. 1917. (In *Proceedings of the American Society for Testing Materials*, v.17, pt.2, p.261-272.)

Discussion, p.273-278.

Shows, by means of tri-axial diagrams, the more important properties of cement-lime-sand mortars. Includes data on the manner in which these properties are effected by changes in the proportion of sand.

Hervieu, P.

Use of wet sand in the making of mortars. 1897. (In Brickbuilder, v.6, p.229-230.)

Treats of the difference of weight and of volume of dry sand and wet sand, together with the effect that these discrepancies may have on mixing-formulas for mortars.

Use in Pavements

Cross, Walter M.

Poor sand the cause of the rapid disintegration of a sheet-asphalt pavement. 1915. (In Engineering news, v.73, p.621.)

Trouble encountered in a Kansas City pavement, thought to be due to peculiar properties of the sand used.

Green, P. E.

Brick pavement on two-inch mortar base laid for \$1.45½ per square yard. 1916. (In Engineering record, v.74, p.797-799.)

Thin mortar base used instead of the usual thicker concrete base. Tests were made to determine the best size of sand for use in the mortar base.

Homberg & L'Éveillé.

Sur la construction et l'entretien des chaussées pavées. 1841. (In Annales des ponts et chaussées, mémoires, ser. 2, v.1, p.83-128.)

Includes data on use of sand in the joints between paving-blocks, and on use of sand as a foundation material for pavements.

Hubbard, Prevost.

Impact tests of the efficiency of sand cushions in brick pavements. 1917. (In Engineering news, v.77, p.206-207.)

Tests show effect of cushion of sand as used in various types of brick pavements. See also Impact tests on brick paving slabs variously construed.

Impact tests on brick paving slabs variously construed. 1917. (In Engineering news, v.77, p.506-508.)

Discussion by several authors on paper by Prevost Hubbard relating to the efficiency of sand cushions for brick pavements.

Mandigo, Clark R.

Cement-sand bed best for woodblock paving. 1915. (In Engineering record, v.71, p.647-648.)

Gives reasons why a mixture of Portland cement and sand should be used as a bedding course for wood-block paving.

Sand spreader for pavements. 1917. (In Municipal engineering, v.48, p.147.)

Brief trade notice, mentioning apparatus, its capacity and manufacturers.

Smith, Francis P.

Essential physical properties of sand, gravel, slag and broken stone for use in bituminous pavements. 1916. (In Better roads and streets, v.6, p.18-21.)

The same. 1916. (In Canadian engineer, v.30, p.224-227.)

Lecture before the graduate course in highway engineering at Columbia University, Jan. 26, 1916.

Includes data on requirements as to shape, character of surface, wear resisting quality, size and cleanliness.

Molding-Sand

Properties and Specifications

Bale, George R.

Modern iron foundry practice. 2v. 1902-05. Technical Publishing Co., London.

v.1 contains considerable information on molding-sands, their properties and uses.

Boiteux, Jules.

Notes sur la fonderie de fer. 83 p. 1903.

Contains considerable information on molding-sands, especially in chapter 3, p.50-69.

Bolland, Simpson

The iron-founder; a comprehensive treatise on the art of moulding. 382 p. 1892. Wiley.

Contains data on molding-sand.

Buchanan, Robert.

Foundry management in the new century; moulding by hand and by machine. 1903. (In Engineering magazine, v.24, p.695-713.)

Facing-sands considered, p.708-713.

Buchanan, Robert.

Foundry management in the new century; specification and purchase of coke, iron and sand. 1903. (In Engineering magazine, v.24, p.879-895.)

Touches briefly on "sand allowance" in purchase of pig-iron, and on the essential qualities of molding-sand.

Charnock, G. F.

Mechanical technology. 635 p. 1916. Van Nostrand.

Chapter 22, "Methods of moulding," includes a little material on sand for molding.

Duponchelle, J.

Manuel pratique de fonderie. 258 p. 1914. Dunod and Pinat, Paris.

Chapter 3, p.136-163, is on molding-sands and their uses.

Eckel, Edwin C.

Molding sand; its uses, properties and occurrence. 1901. (In New York (state)—Museum. Annual report (55th), for 1901, p.r 91-r 96.)

Concise treatment.

Short bibliography appended.

Field, H. E.

Molding sands. 1906. (In American manufacturer, v.78, p.271-275.)

The same. 1906. (In Iron trade review, v.39, pt.1, March 15, 1906, p.19-22.)

The same. 1906. (In Scientific American supplement, v.61, p.25346-25347.)

The same, abstract. 1906. (In Iron age, v.77, p.951-952.)

Paper before Pittsburgh Foundrymen's Association, March 5, 1906.

Covers composition, ingredients, analysis, refractoriness, porosity, strength, size of grain, etc.

Die formmaterialien für stahlformguss. 1904. (In Stahl und eisen, v.24, pt.2, p.958-962.)

The same, abstract translation. 1904. (In Foundry, v.25, p.89-90.)

Considers the differences between the molding-sands used for gray iron and those used for steel castings.

- French sand.** 1917. (In *Brass world and platers' guide*, v.13, p.307.)
Brief reference to the characteristics of French sand for molding.
- Frohman, E. D.**
Core sands and core binders. 1906. (In *Foundry*, v.28, p.216-219.)
Treats of the desired qualities of sand for cores. Shows table of test results of strength of cores made from sands containing various proportions of clay.
- Geiger, C. ed.**
Handbuch der eisen- und stahlgiesserei. 2v. 471 p., 772 p. 1911-16.
Julius Springer, Berlin.
Bibliographical foot-notes.
Contains a large amount of material on molding-sands and their uses.
- Gray, Burton L. ed.**
Foundry work; a practical handbook on standard foundry practice, including hand and machine molding, cast iron, malleable iron, steel and brass castings, foundry management, etc.; revised. 196 p. 1916.
Amer. Technical Soc.
Contains considerable information on molding-sand.
- International Correspondence Schools, Scranton, Pa.**
Foundry appliances. pt.1-2. 43+46 p. [1916?] (In *International library of technology*, v.142, section 76-77.)
Includes information on the treatment of molding-sand in the foundry.
Similar information in v.3B, 4B, 4C of same set.
- Kampmann.**
Composition des sables employés pour la fabrication des moules dans les fonderies. 1845. (In *Annales des mines, mémoires*, ser. 4, v.8, p.689-690.)
Brief abstract of article in "Revue scient., t.XXI, p.215."
- Karr, C. P.**
Preliminary report on molding sands. 1916. (In *Transactions of the American Foundrymen's Association*, v.24, p.143-156.)
Discussion, p.156-160.
Same, without discussion. 1915. (In *Transactions of the American Institute of Metals*, v.9, p.409-423.)
Treats of porosity and permeability, refractoriness, cohesiveness, texture, durability, tests.
- Kent, William.**
Mechanical engineers' pocket-book. Ed.9, rev. 1916. Wiley.
Contains information on molding-sand, its necessary qualities and its uses.
- Lane, H. M.**
How to get high core efficiency. 1915. (In *Iron age*, v.96, pt.1, p.684-686.)
Includes material on the quality of sand demanded for cores.
- Lane, Henry M.**
The core room; its equipment and management. 1911. (In *Transactions of the American Society of Mechanical Engineers*, v.33, p.735-813.)
Discussion, p.814-820.
The same, abstract. 1912. (In *Mechanical engineer*, v.29, p.802-805; v.30, p.16-19, 46-49, 82-85.)
Contains much on properties, treatment, uses and tests of molding-sands.

Ledebur, A.

Handbuch der eisen- und stahlgiesserei. 478 p. 1901. Voigt, Leipzig.
Contains considerable on molding-sands, especially p.195-201.

Longmuir, Percy.

Fireclays and molding sands; the nature and properties of refractory materials in practical use in foundry operations. 1906. (In Engineering magazine, v.30, p.909-911.)

Abstract from British Foundrymen's Association. Latter part briefly considers certain desirable qualities in molding-sands.

Machinery.

Machinery's handbook. Ed.3. 1914. Industrial Press.
Contains data on sands for iron molding.

McWilliam, Andrew, & Longmuir, Percy.

General foundry practice. 383 p. 1907. Griffin, London.
Presents data on properties and uses of molding-sands.

May, Walter J.

Facings and facing sands in the foundry. 1908. (In Practical engineer, v.37, p.528-529.)

Outlines the requirements of facing sands for various types of castings.

Merrill, F. J. H.

Molding sand. 1904. (In Engineering and mining journal, v.78, p.341.)

General data as to requirements of a good sand.

Messerschmitt, A.

Calculation und technik der eisen-giesserei. 2v. 1903-04. Baedeker, Essen.

v.2 presents considerable information on molding-sand.

Moldenke, Richard.

Molding sand problem is important. 1914. (In Iron age, v.94, pt.1, p.544-546.)

Characteristics best for various classes of work; bonding; tempering; size of grain; strength; effects of high temperature.

Moldenke, Richard.

Moulding sand. 1915. (In Journal of the Institute of Metals, v.13, p.367.)

Abstract of paper appearing in "Mechanical world," 1914, v.56, p.248.
Discusses the qualifications of a good molding-sand.

Moldenke, Richard.

Principles of iron founding. 517 p. 1917. McGraw.
Contains considerable material on foundry sand in general.

Moldenke, Richard.

Some latter-day problems of the foundry. 1917. (In Scientific American supplement, v.84, p.246-247.)

Includes brief consideration of the molding-sand situation as influenced by war conditions. Primarily concerned with quality of the sand.

Morgan, J. J.

Notes on foundry practice. 108 p. 1912. Griffin, London.
Section 8, p.27-36, covers "Moulding-sands."

Moulding sand and moulding machines. 1910. (In *Mechanical engineer*, v.25, p.522.)

Abstract of paper by H. S. Green before the Sheffield branch of the British Foundrymen's Association, on "Modern foundry appliances."

Touches on the subject of quality of molding-sands.

Muntz, G. & Roubieu, E.

Steel foundry sand. 1917. (In *Steel castings* (house organ of Tropenas Converter Co., 2243 Nostrand Ave., Brooklyn, N. Y.) 2d year, no.6, March 1917, p.81-94.)

The same. 1917. (In *Foundry*, v.45, p.312-315.)

Covers physical and chemical composition, permeability, size and shape of grain, natural sands, clay bond, mechanical treatment, specifications, and reclaiming of old sand.

Osann, Bernhard.

Lehrbuch der eisen- und stahlgiesserei. 580 p. 1913. Wilhelm Engelmann, Leipzig.

Bibliographical foot-notes.

Contains a large amount of material on molding-sand.

Palmer, R. H.

Foundry practice. 332 p. 1912. Wiley.

Chapter 22, p.217-233, covers "Molding-sands."

Payne, David W.

The founder's manual. 676 p. 1917. Van Nostrand.

Chapter 20, "Moulding sand," p.468-491.

Contains also short sections on sand conveyors and driers, and on weight of sand. See index under "Sand."

Rhead, E. L.

Principles and practice of ironfounding. 505 p. Scientific Pub. Co., Manchester.

Considerable attention to properties and uses of molding-sands.

Richards, William Allyn.

Text-book of elementary foundry practice for the use of students in colleges and secondary schools. 121 p. 1910. Macmillan.

Presents considerable material on molding-sand.

Ries, Heinrich, & Rosen, J. A.

Foundry sands. 1908. (In *Michigan—Geological survey. Annual report* (9th), of state geologist, A. C. Lane, p.33-85.)

States requisites of molding-sands; outlines test methods; gives test results of various sands; presents notes on Michigan molding-sand occurrences.

Roxburgh, William.

General foundry practice. 296 p. 1910. Constable, London.

Considerable attention to molding-sand.

Sexton, A. Humboldt, & Primrose, J. S. G.

Principles of ironfounding (and foundry metallography). 330 p. 1911. Van Nostrand.

Chapter 13, p.176-198, covers "Moulding-sands."

Sharp, John.

Modern foundry practice. 759 p. 1900. Spon.

Considerable attention to molding-sand.

Shaw, J.

Composition and properties of moulding sand. 1910. (In *Mechanical engineer*, v.25, p.311.)

Abstract of paper before Birmingham branch of British Foundrymen's Association. Gives briefly the requisites of good molding-sand.

Specifications for foundry supplies. 1902. (In *Engineering news*, v.48, p.184-187.)

Gives list of specifications as laid down by laboratory department of the J. I. Case Threshing Machine Co., Racine, Wis. Specification no. 298, p.185-186, gives lengthy consideration to the requisites of molding-sand.

Tate, James M. & Stone, M. O.

Foundry practice; a treatise on molding and casting in their various details. Ed.3, rev. 234 p. 1909. Wiley.

Contains considerable material on the properties and uses of molding-sand.

Truesdale, D. H.

Molding sand. 1897. (In *Journal of the American Foundrymen's Association*, v.3, p.159-162.)

Discussion, p.162-175.

Discussion. 1897. (In *Iron age*, v.60, p.16-18.)

Deals chiefly with the chemical characteristics and their effects.

Vickers, Charles.

Sand for molding. 1915. (In *Brass world and platers' guide*, v.11, p.160-161.)

Discusses requisites of a good molding-sand for various kinds of work.

Vinsonneau.

Notes sur les sables à mouler et sur leur emploi en fonderie. 1906-08. (In *Revue de métallurgie, mémoires*, v.3, p.112-127; v.5, pt.1, p.130-139.)

Walker, E. H.

Molding sand. 1900-01. (In *Journal of the American Foundrymen's Association*, v.9, pt.3, p.67-68.)

Short extract from specifications for molding-sands used by manufacturing concern.

West, Thomas D.

American foundry practice. Ed.9. 408 p. 1897. Wiley.

Considerable attention to molding-sand.

West, Thomas D.

West's moulders' text-book; being part II of American foundry practice. 461 p. 1885. Wiley.

Considerable attention to molding-sand.

Tests

See also Properties and Specifications

American Foundrymen's Association.

Molding sand tests. 1912. (In its *Transactions*, v.21, p.17-125.)

Series of tests of molding-sands, under auspices of American Foundrymen's Association.

Contents: Introduction, Richard Moldenke.—Mineral characteristics of the molding-sands, D. Dale Condit.—Microscope as a testing medium for molding sand, H. C. Loudenberg.—Rational analysis of the molding sands tested, H. E. Field.—Fineness.—Transverse strength.—Crushing strength.—Permeability to air.—Clay bond.

Bourdon, E.

Étude générale des sables à mouler. 1906. (In Bulletin de la Société d'Encouragement pour l'Industrie Nationale, v.108, p.314-317.)

Report on certain studies of Jules Vinsonneau in Paris.

Condit, D. Dale.

See **American Foundrymen's Association.**

Curtis, Algernon Lewin.

Étude résumée sur les sables de fonderie et leur traitement. 1913. (In Revue de métallurgie, v.10, pt.1, p.903-915.)

The same, abstract translation. 1914. (In Metal industry, v.12, p.241-243.)

A study of molding-sands from various sources for the purpose of determining their suitability for foundry work. Includes instruction in microscopical examination and testing.

Field, H. E.

See **American Foundrymen's Association.**

Fürth, Hugo.

Untersuchen des formsandes. 1906. (In Stahl und eisen, v.26, pt.2, p.1195-1197.)

Cohesion, permeability and refractoriness are considered the main factors that should be investigated.

Irresberger, Carl.

Der formsand; seine prüfung und bewertung. 1913. (In Stahl und eisen, v.33, pt.2, p.1433-1438, 1595-1601.)

Illustrated description of tests for molding-sand.

Johnson, Edw. A.

Testing molding sands at Wentworth Institute, 1914. (In Transactions of the American Foundrymen's Association, v.22, p.285-290.)

Lane, Henry Marquette.

Core testing standards. 1914. (In Transactions of the American Foundrymen's Association, v.22, p.123-129.)

Discussion, p.343-346.

Author advocates tension tests as being more accurate than transverse tests in investigating the bond of core sands. Explains and illustrates his method of testing.

Le Chatelier, Henry.

Observations sur les sables de fonderie. 1909. (In Revue de métallurgie, v.6, p.1256-1263.)

Gives results of tests of molding-sands.

Loudenbeck, H. C.

See **American Foundrymen's Association.**

Mather, Richard.

Testing of moulding sands. 1912. (In Mechanical engineer, v.29, p.4.)

Abstract of author's lecture before British Foundrymen's Association.

Points out the inadequacy of molding-sand tests and suggests remedies.

Moldenke, Richard.

Molding sand tests. 1915. (In Transactions of the American Foundrymen's Association, v.23, p.690-705.)

Summary of results of tests of the various properties.

Moldenke, Richard.

See also American Foundrymen's Association.

Ries, Heinrich.

Laboratory examination of molding sand. 1906. (In *Foundry*, v.28, p.327-343.)

Paper before American Foundrymen's Association, Cleveland, June 1906.

Full treatment of texture, permeability, life, refractoriness and bonding power. Includes several extensive tables of test results and of properties of various sands.

Ries, Heinrich.

Relative values of the physical and chemical examinations of molding sands. 1908. (In *Foundry*, v.32, p.224-226.)

Author deduces that chemical examination of molding-sands is of little value except in cases where it is desired to select a highly silicious sand for special work.

Robeson, J. S.

Core sands. 1906. (In *Transactions of the American Foundrymen's Association*, v.14, p.100-107.)

The same. 1905. (In *Foundry*, v.26, p.281-288.)

Shows photomicrographs of grains of core sands from various localities and explains their characteristics. Also shows diagram of "sieve analysis of sands and tensile strength of cores made with gluetrin."

Saurer, Adolf, & Steinitzer, F.

Ermittlung der durchlässigkeit von form- und kernsand. 1907. (In *Stahl und eisen*, v.27, pt.1, p.779-781.)

Schmid, A.

Beitrag zur untersuchung von formsand. 1914. (In *Stahl und eisen*, v.34, pt.2, p.1428-1430.)

Outlines simple method of testing molding-sand.

Searle, Alfred B.

Testing of moulding sands. 1912. (In *Mechanical engineer*, v.30, p.168-170.)

The same. 1912. (In *Castings*, v.10, p.182-186.)

The same, condensed. 1912. (In *Engineering magazine*, v.44, p.103-106.)

Outlines the characteristics which should be investigated and gives procedure for performing the necessary tests.

Treatment

Methods and Machinery

See also Reclaiming Waste Sand

Bagshaw, Walter.

On the mechanical treatment of moulding sand. 1891. (In *Proceedings of Institution of Mechanical Engineers*, v.42, p.94-101; plates 25-29.)

Discussion, p.102-107.

The same. 1891. (In *Engineering*, v.51, pt. 1, p.259-260.)

The same, abstract. 1891. (In *Engineering*, v.51, pt.1, p.157-158.)

Methods of mechanical treatment, machinery used and costs.

Behrens, H.

Die aufbereitung und beförderung des formsandes in der neuen giessereie von Gebrüder Bühler, Uzwil (Schweiz). 1914. (In Zeitschrift des Vereines Deutscher Ingenieure, v.58, pt.1, p.161-170.)

Description of modern machinery for handling and preparing molding-sand.

Coleman, E. A.

Core room practice. 1912. (In Transactions of the American Foundrymen's Association, v.20, p.307-353.)

Profusely illustrated article on apparatus and methods of procedure in the core room. Treatment of core sand constitutes the greater part of the article.

A crane sand cutting machine. 1915. (In Iron trade review, v.56, p.88-90.)

The same. 1915. (In Foundry, v.43, p.77-79.)

Description of a device for tempering and cutting over molding-sand in steel and heavy gray-iron foundries.

Efficient foundry sand-handling plant. 1913. (In Foundry, v.41, p.21-26.)

Illustrated description of plant in the foundry of Hart-Parr Co., Charles City, Ia. Shows record forms used in the foundry.

Electrically-driven, portable sand riddle. 1915. (In Foundry, v.43, p.325.)

Brief illustrated description of riddle for molding-sand.

Flumerfelt, O. F.

How economies can be effected in core shops. 1913. (In Foundry, v.41, p.532-534.)

Includes material on selection and treatment of sand for cores.

Fortschritte auf dem gebiete der eisengiessereie. 1892. (In Dinglers polytechnisches journal, v.283, p.200-206, 214-220.)

Section on "Materialien und deren verarbeitung" contains data on molding-sands and their treatment.

Foundry sand mixer. 1906. (In Iron and coal trades review, v.73, p.1004.)

Illustrated description of a motor-driven mechanical sand-mixer for foundries,

Geiger, C.

Eine selbsttätige anlage zur aufbereitung von formsand. 1912. (In Stahl und eisen, v.32, pt.2, p.2165-2168.)

Illustrated description of apparatus for handling and preparing molding-sand.

Gillot, A. & Lockert, Louis.

Nouveau manuel complet du fondeur de fer et de cuivre, suivi de la fonte des statues et des cloches [rédigé] par N. Chrysochoïdes. Rev. and enl. ed. 2v. 1905. Mulo, Paris.

Pt.3 of chapter 2, v.1, p.74-105, is concerned with molding-sands and their preparation.

Gilmour, E. B.

Grinding of sands in the foundry. 1912. (In Castings, v.9, p.135-136.)

Preparation of molding-sand for heavy castings.

Green, J. C.

Making molding sand. 1903. (In American machinist, v.26, pt.1, p.767-768.)

Letter to editor in which author tells his experience in treating molding-sand with other substances in order to add to its bonding power.

Ideal core sand mixer. 1914. (In Foundry, v.42, p.242.)

Brief illustrated description of apparatus.

Improved magnetic separator for use of ironfounders. 1914. (In Iron and coal trades review, v.88, p.204.)

Brief description of apparatus for magnetically separating iron particles from used molding-sand.

Improved sand shaker. 1915. (In Foundry, v.43, p.208.)

Brief illustrated description of pneumatic shaker for molding-sand.

Knauth, G.

Preparation of molding sand. 1904. (In Foundry, v.25, p.90.)

Abstract of article in "Giesserei zeitung," Aug. 15, 1904.

Kraus, J.

Ueber aufbereitung und beförderung des formsandes in den giesereien. 1907. (In Stahl und eisen, v.27, pt.2, p.1485-1491, 1536-1541, 1576-1581.)

Lohse, U.

Neuzeitliche sandaufbereitungsapparaturen. 1915. (In Giesserei zeitung, v.12, p.97-101, 132-135.)

Describes and illustrates machinery for the mechanical treatment of sand.

Lohse, U.

Die sandaufbereitungsanlagen der eisengiesserei von A. Stotz A.-G. in Stuttgart-Kornwestheim. 1915. (In Giesserei zeitung, v.12, p.209-214.)

Describes and illustrates machinery for the mechanical treatment of molding-sand.

Lohse, U.

Die sandaufbereitungsapparaturen der Alfred Gutmann Aktiengesellschaft für Maschinenbau, Altona-Ottensen. 1915. (In Giesserei zeitung, v.12, p.293-296, 309-311.)

Describes and illustrates machinery for the mechanical treatment of sand.

Lohse, U.

Die sandaufbereitungsapparaturen der Vereinigten Schmirgel- und Maschinenfabriken, Hannover-Hainholz. 1915. (In Giesserei zeitung, v.12, p.257-263, 278-282.)

Describes and illustrates machinery for the mechanical treatment of sand.

May, Walter J.

Facing sands and their use; variations in faces and how to obtain them. 1908. (In Scientific American supplement, v.66, p.363.)

Describes processes of molding in which facing-sands are applicable and explains the use of the latter.

Minich, V. E.

Mechanical sand tempering. 1912. (In Transactions of the American Foundrymen's Association, v.21, p.231-240.)

Advocates machinery rather than hand labor for the tempering or "cutting" of molding-sand.

Moderne sandaufbereitung. 1904. (In Stahl und eisen, v.24, pt.2, p.963-965.)

Description of apparatus for treatment of molding-sand preparatory to its use.

Motor-driven rotary sand riddle. 1915. (In Foundry, v.43, p.510.)

Brief illustrated description of riddle for molding-sand.

Müller, Eduard.

Maschinelle aufbereitung des formsandes in giessereien. 1912. (In Zeitschrift des Vereines Deutscher Ingenieure, v.56, pt.2, p.1147-1157.)
Describes and illustrates a plant for the working and handling of molding-sand.

Mulvey, James.

Green sand cores. 1915. (In Transactions of the American Foundrymen's Association, v.23, p.373-375.)

Advocates the more extensive use of green sand cores in molding, and draws attention to their advantages.

Mumford, E. H.

A loose ring riddle. 1907. (In Iron age, v.79, p.1797.)

Illustrated description of an improved type of sand riddle for foundry work.

Oppen, Erich.

Eisenverluste in giessereien. 1914. (In Stahl und eisen, v.34, pt.2, p.1532-1533.)

Describes a traveling magnetic separator for recovering iron from molding-sand.

Oppen, Erich.

Elektromagnetische eisenseparatoren im giessereibetriebe. 1910. (In Stahl und eisen, v.30, pt.2, p.1912-1917.)

Illustrates and describes apparatus for the magnetic separation of iron particles from used molding-sand.

Outerbridge, Alexander E.

Molding sand and its preparation. 1896. (In Iron age, v.57, p.415-417.)

Outerbridge, Alexander E. jr.

Improvement of molding sand by mechanical treatment. 1907. (In Transactions of the American Society of Mechanical Engineers, v.29, p.865-874.)

Discussion, p.874-876.

The same, abstract. 1907. (In Engineering news, v.58, p.639.)

Shows, by tests, the effect of mechanical treatment of molding-sands.

Palmer, R. H.

Core practice and sands used for cores in various parts of the country. 1905. (In American machinist, v.28, pt.2, p.448-452.)

Ronceray, E.

New method of preparing foundry sand. 1908. (In Transactions of the American Foundrymen's Association, v.16, p.12-13.)

Automatic device for mixing and rubbing molding-sand.

Sand-handling system for brass foundries. 1914. (In Foundry, v.42, p.105-107.)

Illustrated description of plant of Arcade Mfg. Co., Freeport, Ill.

Sand mixing plant for a large foundry. 1914. (In Iron age, v.94, pt.2, p.1273-1275.)

How four different core sand requirements for five core rooms are met by the Aluminum Castings Company, Detroit.

Sand treating equipment. 1911. (In Iron age, v.87, pt.1, p.110-114.)

Gives individual illustrated descriptions of several devices for treating molding-sand. Includes descriptions of "Hanna" sifter, "Deane" sifter, "Pangborn" dryer, "Auto" mixer, "Sellers" centrifugal mixer, and the "Standard" blending machine.

Eine selbsttätige aufbereitanlage für modellsand und masse. 1913. (In Zeitschrift des Vereines Deutscher Ingenieure, v.57, pt.2, p.1062-1065.)
Illustrated description of plant.

Silica facing mixture. 1914. (In Foundry, v.42, p.146.)

Gives directions for the preparation of silica sand facing for green sand molds for steel castings.

Stockham homogeneous sand mixer. 1906. (In Iron age, v.78, p.477.)

Illustrated description of motor-driven mechanical sand-mixer for foundries.

Treiber, E.

Foundry machinery. 139 p. 1913. Scott, Greenwood.

Considerable attention to the mechanical handling of molding-sands.

West, Thomas D.

Instruction in molding and cupola work. 1903. (In Journal of the American Foundrymen's Association, v.12, p.210-212, 404-417.)

Second part treats of the methods of hand preparation of molding-sands.

West, Thomas D.

Recent advances and improvements in founding. 1916. (In Transactions of the International Engineering Congress, 1915, v.7, Mechanical engineering, p.1-47.)

Discussion, p.48-50.

Contains considerable information on handling and treating molding-sand.

What to do with molder's sand. 1904. (In Scientific American supplement, v.57, p.23513-23514.)

Outlines the chief requisites of a good molding-sand and tells how it should be treated before use.

Wilson, Thomas D.

Foundry practice. 1911. (In Proceedings of the Cleveland Institution of Engineers, session 1910-11, p.206-234.)

Discussion, p.235-244.

The same, abstract. 1911. (In Iron and coal trades review, v.82, p.615.)

Includes material on the preparation of molding-sand.

Reclaiming Waste Sand

Capron, S. A.

Waste sands in the foundry. 1914. (In Transactions of the American Foundrymen's Association, v.20, p.563-564.)

Use of core sand washing machines.

Estep, H. Cole.

Utilization of old foundry sand. 1913. (In Foundry, v.41, p.521-522.)

Discusses profitable uses to which used molding-sand may be put.

Lane, H. M.

Waste foundry sand. 1916. (In Transactions of the American Foundrymen's Association, v.25, p.567-569.)

Discussion, p.569-576.

Outlines the principles which govern the reclamation of used foundry sand.

Reclaiming of waste foundry sand. 1914. (In *Iron age*, v.93, pt.2, p.1315-1318.)

The same, abstract. 1914. (In *Industrial engineering and the engineering digest*, v.14, p.301.)

The same, condensed. 1914. (In *Brass world and platers' guide*, v.10, p.253-256.)

Describes methods for restoring waste foundry sands to usable condition.

Restoring the good qualities of molding sand. 1912. (In *Castings*, v.10, p.115.)

Outlines method used in German foundries.

Saunders, W. M. & Hanley, H. B.

Reclaiming molding sand. 1916. (In *Transactions of the American Foundrymen's Association*, v.24, p.179-185.)

Discussion, p.185-191.

Methods and tests pertaining to the process of restoring used molding-sand to its former condition.

Smith, Charles A.

Use of old core sand. 1904. (In *Foundry*, v.25, p.157-158.)

Explains author's method for preparing old core sand so that it may be used again.

Swan, H. B.

Waste foundry sand. 1916. (In *Transactions of the American Foundrymen's Association*, v.25, p.563-566.)

Gives results of a questionnaire sent to a number of foundries in an endeavor to collect data as to the disposition of used molding and core sand.

Thompson, A. M.

Economies in the manipulation of sand. 1914. (In *Foundry*, v.42, p.197.)

The same. 1914. (In *Iron age*, v.93, pt.2, p.1232.)

Abstract of paper before Chicago Foundrymen's Club.

Gives methods of effecting economies by treating old molding and core sands so that they may be used again.

Miscellaneous

American Foundrymen's Association.

Report of the A. F. A. Advisory committee to the United States bureau of standards. 1916. (In its *Transactions*, v.25, p.558-560.)

Discussion, p.561-562.

Regarding an endeavor of the American Foundrymen's Association, in collaboration with the United States bureau of standards, to prepare an artificial molding-sand.

Consumption of sand in the foundry. 1904. (In *Foundry*, v.25, p.13.)

Figures compiled by editor in attempt to determine average amount of molding-sand required per ton of iron castings and per ton of brass castings.

Gordon, F. E.

Molding sand. 1903. (In *American machinist*, v.26, pt.1, p.647-648.)

The same. 1903. (In *Iron trade review*, v.36, pt.1, April 16, p.53-54.)

Briefly describes several important deposits of molding-sand and emphasizes the importance of selecting a good grade of sand.

Keep, W. J.

Molding sand. 1915. (In *Foundry*, v.43, p.380-381.)

In answer to a question asking whether good molding-sand is more difficult to obtain at present than it was formerly, whether artificially mixed sand is as good as the natural product, and whether foundries dry and bolt as much sand now as formerly.

Munk, Eugen.

Stahlformsand, stahlputzsand und stahlsand. 1913. (In *Stahl und eisen*, v.33, pt.2, p.1984.)

Author points out that these three terms are often misused and suggests that a definite meaning be given to each.

Stratton, S. W.

Report of work on molding sand. 1916. (In *Transactions of the American Foundrymen's Association*, v.25, p.557.)

Report of progress made by United States bureau of standards in attempting to prepare, in collaboration with a committee of the American Foundrymen's Association, an artificial molding-sand.

Glass Sand

Benrath, H. E.

Glasfabrikation. 495 p. 1880.

Use of sand in glass industry briefly mentioned, p.37, 173, 265.

Biser, Benjamin F.

Elements of glass and glass making. 174 p. 1900. Glass and Pottery Pub. Co.

Section on "Silica," p.24-29, treats of sand for use in glass-making.

Boswell, P. G. H.

Sands for glass making, with special reference to optical glass. 1917. (In *Scientific American supplement*, v.84, p.310-311.)

Abstract of paper before the Optical Society (London).

Considers requisites and treatment.

Burchard, Ernest F.

Requirements of sand and limestone for glass making. 1906. (In *United States—Geological survey. Bulletin no.285: Contributions to economic geology*, 1905, p.452-458.)

Definition and components of glass, requirements of glass sand, analyses of glass sand, "literature."

Dralle, Robert, ed.

Die glasfabrikation. 2v. 1911.

Glass sand considered, v.1, p.139-145, giving the requisites of a good sand for the manufacture of glass.

Ferguson, John B.

Determination of iron in glass sand. 1917. (In *Journal of industrial and engineering chemistry*, v.9, p.941-943.)

Gives procedure for testing for iron in glass sands, especially sand for optical glass.

Frink, R. L.

Effects of alumina on glass. 1909. (In *Transactions of the American Ceramic Society*, v.11, p.99-102.)

Urges the value of alumina as a constituent of glass and states that it is better not to wash glass sand, as such washing removes the loam which carries alumina.

Frink, R. L.

Some fallacies and facts pertaining to glass making. 1909. (In *Transactions of the American Ceramic Society*, v.11, p.296-317.)

Discussion, p.317-319.

Treats of sand, p.305-308.

Gerner, Raimond.

Glas-fabrikation. 348 p. 1897. Hartleben.

Glass sand mentioned briefly, p.29-40.

Gessner, Frank M.

Glassmakers' hand-book. 175 p. 1891. George E. Williams, Pittsburgh.

Glass sand mentioned briefly, p.1, 2, 24.

Grimsley, G. P.

History of the glass sand industry in West Virginia. 1909. (In West Virginia—Geological survey. Report, v.4, p.375-390.)

Brief outline of essential features of glass manufacture, requirements of a glass sand and description of the various West Virginia deposits of glass sand.

Halik, Johann.

Handbuch der glasfabrikation. 137 p. 1908.

Glass sand treated briefly, p.57-59.

Hasluck, Paul N.

Glass working by heat and by abrasion. 160 p. 1899. Cassell.

Brief reference to the use of sand in glass-making, p.150-151.

Jarves, Deming.

Reminiscences of glass-making. Ed.2. 116 p. 1865. Hurd & Houghton.

"Sand, or silex," p.111-112, mentions early use of sand in glass-making.

Linton, Robert.

Glass. 1900. (In Mineral industry for 1899, v.8, p.234-263.)

Gives brief reference to sand as used in glass-making.

Peddle, C. J.

British glass-making sands, pt.1: The substitution of some British sands for foreign sands in the manufacture of high grade glass. 1917. (In Journal of the Society of Glass Technology, v.1, transactions, p.27-59.)

Discussion, p.59-61.

The same, abstract. 1917. (In Chemical news and journal of physical science, v.115, p.58.)

Outlines requirements of good glass sands, and gives results of many tests of treated British sands.

Peligot, Eug.

Le verre; son histoire, sa fabrication. 495 p. 1877. G. Masson, Paris.

Glass sand treated, p.7-8, 10-15.

Powell, Harry J.

Principles of glass-making. 186 p. 1883. Bell.

Chapter 6, "Raw materials," treats briefly of glass sand, p.24-25.

Use of sand in crown and sheet glass, p.101-102.

Rosenhain, Walter.

Glass manufacture. 264 p. 1908. Van Nostrand.

Section on "Sources of silica," p.37-39, touches on the qualities of sand for glass-making.

Tscheuschner, E.

Handbuch der glasfabrikation nach allen ihren haupt- und nebenzweigen. Ed.5. 666 p. 1885. Voigt, Weimar.

Glass sands, p.72-75.

United States—Census office.

Manufacture of glass. 1913. (In United States—Census bureau. (13th census, 1910.) [Final reports], v.10, p.875-884.)

Gives statistics on the use of sand in the glass industry.
Similar data in previous census reports.

United States—Geological survey.

Survey publications on glass sand and glass-making materials. 1910. (In Bulletin no.430: Contributions to economic geology, 1909, pt.1, p.421.)

Similar list, 1908. (In Bulletin no.340: Contributions to economic geology, 1907, pt.1, p.428.)

Wardman, George.

Grains of sand. 1887. (In Popular science monthly, v.31, p.247-249.)

The same. 1887. (In Scientific American supplement, v.24, p.9822, under title "Sand for glass.")

Outlines the glass sand industry of the Pittsburgh district, 1887.

Weeks, Joseph D.

Glass materials. 1885. (In United States—Geological survey. Mineral resources, calendar years 1883, 1884, p.958-977.)

Contains sections on "Tests of sand," "Glass sands of the United States," and tables of analyses of European and United States glass sands, p.960-962.

Weeks, Joseph D.

Glass materials. 1886. (In United States—Geological survey. Mineral resources, calendar year 1885, p.544-557.)

Section on "Sand," p.545-546. "Consumption of materials in the manufacture of glass in 1885, [including sand]," p.556.

Weeks, Joseph D.

Report on the manufacture of glass. 114 p. 1883. David Williams, N. Y.

Consists of part of Final report of tenth census, v.2.

Chapter 3, p.24-30, treats of glass sand, its sources, analysis, statistics, etc.

Sand for Ceramic Industries

Ashley, Harrison Everett.

Requirements of pottery materials. 1910. (In Transactions of the American Ceramic Society, v.12, p.433-451.)

Discussion, p.451-462.

"Placing sand" treated, p.449-450.

Burt, Stanley G.

Fineness of flint in its relation to the manufacture of pottery bodies. 1901. (In Transactions of the American Ceramic Society, v.3, p.17-23.)

Discussion, p.23-24.

Describes tests to show relation between fineness of pottery sands and quality of finished product.

Carlsen, O.

Cement-bricks and sand-testing. 1906. (In Minutes of proceedings of the Institution of Civil Engineers, v.165, p.443-444.)

Abstract of article dealing with the quality and quantity of sand that should be used in cement bricks.

Grünwald, Julius.

Raw materials for the enamel industry and their chemical technology. 225 p. 1914. Griffin.

Table of analyses of various sands for enamel manufacture, p.18-20.

New process of manufacturing silicate-of-lime stone from sand. 1904. (In *Scientific American supplement*, v.58, p.23062-23063.)

Describes process of making solid blocks or slabs from sand. They are said to be as hard and as durable as quarried stone.

Orton, Edward, jr.

Experiments on the drying of certain tertiary clays. 1911. (In *Transactions of the American Ceramic Society*, v.13, p.765-791.)

Has section on the effect of antiplastic materials as additions to pottery clay. A short portion of this section deals with sand as such an antiplastic.

Orton, Edward, jr.

Note on the relation between the tensile strength of clay mixtures and the size of the grains of their non-plastic constituents. 1900. (In *Transactions of the American Ceramic Society*, v.2, p.100-119.)

Discussion, p.119-125.

Describes series of tests of tensile strength of clay mixed with sand of six different grades of fineness.

Peppel, Samuel Vernon.

Manufacture of artificial sand stone or sand-lime brick. 1905. (In *Ohio—Geological survey*. (4th survey.) *Bulletin no.5*.)

Type of sand that can be used and the effects of different physical characteristics of the sand used are discussed, p.24-30. Preparation of sand for use, p.38-39.

Ries, Heinrich.

Clays; their occurrence, properties and uses. 490 p. 1906. Wiley.

Makes several brief references to the use of sand in the clay industries.

Ries, Heinrich, & Kümmel, H. B.

Clays and clay industry of New Jersey. 548 p. 1904. (In *New Jersey—Geological survey*. (3d survey.) *Final report of state geologist*, v.6.)

Considerable attention to the effect of sand on the chemical and physical properties of clays.

Speir, Harry F.

Methods employed in connection with the reduction, milling and shipment of quartz, flint rock or silica sand. 1911. (In *Transactions of the American Ceramic Society*, v.13, p.326-331.)

Discussion, p.331-335.

Deals with the grinding of sand for use in the pottery industry.

Filter Sand

Burgess, Philip.

Mechanical analysis of sands. 1915. (In *Journal of the American Water Works Association*, v.2, p.493-500.)

Discussion, p.500-514.

The same, abstract. 1915. (In *Canadian engineer*, v.28, p.699-700.)

The same, abstract. 1915. (In *Engineering record*, v.71, p.644-646.)

Advocates the adoption by the engineering profession of a standard method and standard apparatus for making mechanical analyses of sands and gravels. Pertains almost exclusively to the analysis of filter-bed materials, but some of the subject matter is adaptable to the analysis of concrete mixtures, paving mixtures, etc.

Clark, W.

Geelong and Sandhurst water supplies. 1879. (In Minutes of proceedings of the Institution of Civil Engineers, v.56, p.152-158.)

Discussion on papers by Edward Dobson and Joseph Brady in same volume. Author describes the use of a natural deposit of sand as a storage reservoir and filter for the water-supply of Sydney, New South Wales.

Don, John.

Filtration and purification of water for public supply. 1909. (In Proceedings of the Institution of Mechanical Engineers, v.73, pts.1-2, p.7-105.)

Discussion and communications, p.106-209.

Contains considerable on sand as used for water filtration.

Economy effected in the use of river sand as a filter medium at Moline, Ill. 1915. (In Engineering and contracting, v.43, p.236-237.)

Brief record of success attained in use of river sand instead of special bank or sea-coast sands in filtration work.

Ellms, Joseph W.

Study of the behavior of rapid sand filters subjected to the high-velocity method of washing. 1916. (In Transactions of the American Society of Civil Engineers, v.80, p.1342-1381.)

Discussion, p.1382-1428.

Contains material on behavior of filter sand and on the influence of the quality of the sand when thus washed.

Fritze, L. A.

River sand as a filter medium. 1915. (In Journal of the American Water Works Association, v.2, p.390-392.)

Treats of the adaptability of river sand, as compared to bank sand, for a filter medium. Relative costs of the two are also mentioned.

Goetze, Eugen.

Filtration for public water supplies, with especial reference to the double filtration plant at Bremen, Germany. 1904. (In Transactions of the American Society of Civil Engineers, v.53, p.210-227.)

Discussion, p.228-271.

Contains considerable on sand for filters, especially the handling and washing of sand, p.226-227, 229-231, 250-254, 265-269.

Gow, Charles R.

Methods and costs of construction of the slow sand purification works for the new Springfield, Mass., water supply. 1910. (In Journal of the Association of Engineering Societies, v.45, p.189-263.)

Discussion, v.45, p.263-280; v.46, p.130-143.

Presents data, p.244-256, on character, treatment, handling and cost of filter sand.

Hazen, Allen.

Some physical properties of sands and gravels, with special reference to their use in filtration. 1893. (In Massachusetts—Health board. Annual report for 1892, v.24, p.541-556.)

Gives an account of some of the methods of analysis used and results obtained in tests of the physical properties of filter sands at Lawrence Experiment Station, Massachusetts.

Hazen, Allen, & Hardy, E. D.

Works for the purification of the water supply of Washington, D. C. 1906. (In Transactions of the American Society of Civil Engineers, v.57, p.307-363.)

Discussion, p.364-454.

Contains considerable on sand for filtration plants, especially p.326-334, 340-350, 386-399, 400-408, 445-447.

Hoopes, E. M. jr. & Caird, J. M.

Washing sand at Wilmington filters. 1914. (In Engineering record, v.69, p.587-588.)

Gives statistics regarding the washing of filter sand at Wilmington, Del., with a Blaisdell machine.

Knowles, Morris, & Hyde, C. G.

Lawrence, Mass., city filter; a history of its installation and maintenance. 1901. (In Transactions of the American Society of Civil Engineers, v.46, p.258-308.)

Discussion, p.309-378.

Contains considerable on sand for filters, especially the handling and washing of sand.

Lea, R. S.

Sand filtration of public water supplies. 1899. (In Transactions of the Canadian Society of Civil Engineers, v.13, p.33-77.)

Discussion, p.78-99.

Contains data on filter sand.

New sedimentation basin and masonry covered sand filter beds at Albany, N. Y. 1898. (In Engineering news, v.39, p.91-92.)

Description, with two-page plate, of proposed new filtration plant. Gives specifications for the filter gravel and filter sand.

Nichols, E. M.

Development of devices for cleaning the sand of slow sand filters. 1909. (In Engineering news, v.62, p.359-360.)

Brief discussion of the various types of washers used up to that time, with illustrated description of new washing device perfected by author.

Open slow sand filters at Yonkers, N. Y. 1904. (In Engineering record, v.50, p.30-32.)

Describes system used for washing filter-bed sand. Describes experimental sand-washer for removing fine particles from sand for filters.

Pittsburgh water purification works. 1902. (In Engineering record, v.45, p.73-77.)

Contains condensed specifications for filter sand and description of sand-washers.

Settling basins and slow sand filter beds for Pittsburg, Pa. 1902. (In Engineering news, v.47, p.137-139.)

Contains condensed specifications for filter sand and description of sand-washers.

Soper, George A.

Sand washer for the filter beds of the water-works of Hudson, N. Y. 1895. (In Engineering news, v.34, p.170.)

Letter to editor in answer to inquiry in previous issue regarding a machine for washing filter sand. Gives description of machinery used and states costs.

Types of filter underdrains, a new balanced valve and a modified Koerting ejector sand washer. 1905. (In Engineering news, v.53, p.136.)

Gives brief illustrated description of the Koerting washer.

Water purification in America. 1893. (In *Engineering news and American railway journal*, v.30, p.97-98.)

Concerned with scheme used in Lawrence, Mass. Includes information on handling and treatment of the filter sand used.

Sanding of Rails

Automatic sand dryer. 1915. (In *Electric railway journal*, v.46, p.455.)

Details of construction of a device for drying sand for use on electric cars.

Bentley, F. W.

Clearing sand pipes and testing injectors. 1917. (In *Railway and locomotive engineering*, v.30, p.28.)

Description of device for clearing locomotive sand-pipes when they have become clogged with damp sand.

Carr, W. F.

Railway sand experience. 1915. (In *Electric railway journal*, v.45, p.143.)

Author concludes that the use of high-grade sand which needs no cleaning is cheaper for electric railway sand-box use than is a cheaper sand that has to be cleaned and dried.

Caruthers, C. H.

Handling sand on locomotives. 1913. (In *American engineer*, v.87, p.172-173.)

Letter to editor commenting unfavorably on careless methods of handling sand on locomotives. Is also concerned with the position of the sand-box on the locomotive.

Drying sand in 7-yd. batches. 1915. (In *Electric railway journal*, v.46, p.193.)

Details of construction of a device for drying sand for use on electric cars.

Hawkins, C. L.

New sand-drying plant of the United Railways Company of St. Louis. 1912. (In *Journal of the Association of Engineering Societies*, v.48, p.61-67.)

The same, abstract. 1912. (In *Engineering news*, v.67, p.842-843.)

Description of plant for drying sand used on trolley-cars.

Lister, F. G.

Oil burning sand drier. 1915. (In *Railway age gazette*, mechanical edition, v.89, p.407.)

Shows details of an apparatus used for drying sand used on locomotives.

McDonald's sand drier. 1891. (In *Engineer* [London], v.71, p.183.)

Brief illustrated description of device for drying sand for locomotives.

Patton, F. E.

Use of sand on locomotives. 1913. (In *Railway age gazette*, mechanical edition, v.87, p.594.)

Gives several suggestions as to the type and use of sand for the prevention of slipping in railway locomotive drive-wheels.

Rankin, K.

Sanding rails. 1917. (In *Coal age*, v.11, p.946.)

Gives advice in regard to the use of sand on electric locomotives. Emphasizes the possibility of using sand so frequently or in such large amounts that the locomotive is partially insulated from the rails, thereby creating a dangerous condition.

Sand-handling by the Philadelphia Rapid Transit Company. 1914. (In *Electric railway journal*, v.43, p.910-914.)

Illustrated description of elaborate plant for receiving, drying, storing and distributing sand for trolley-cars. Includes description of 15-yard tank car which discharges sand by means of compressed air.

Sand supply house, Union Pacific R. R. 1901. (In *Railway and engineering review*, v.41, p.675.)

Description of plant for drying and distributing locomotive sand.

Sandbremse für elektrische und andere bahnen. 1904. (In *Annalen für gewerbe und bauwesen*, v.54, p.76-77.)

Illustrated description of apparatus for handling and distributing sand for railroads.

General and Miscellaneous

American Railway Engineering and Maintenance of Way Association.

Report of Committee No.II: On ballasting. 1904. (In its *Proceedings*, v.5, p.481-514.)

Includes (p.488) a brief comment as to the value of sand as railway ballast.

American Society for Testing Materials.

Standard method for making a mechanical analysis of mixtures of sand or other fine material with broken stone or broken slag, except for aggregates used in cement concrete. 1916. (In *A. S. T. M. standards of the American Society for Testing Materials*, 1916 issue, p.538-539.)

Boswell, P. G. H.

Sands used in metallurgical practice, with comparative notes on those used in glass-manufacture. 1917. (In *Journal of the Society of Chemical Industry*, v.36, p.753-758.)

The same, abstract. 1917. (In *Colliery guardian*, v.114, p.113-114.)

Concerned principally with the necessary physical and chemical properties of glass sands and molding-sands. Gives tables of analyses.

Bush, Lincoln.

Use of scows and sand jacks in moving and lowering a 1000-ton draw bridge over the Passaic river at Newark, N. J. 1903. (In *Engineering news*, v.50, p.596-599.)

Editorial comment, p.599-600.

Detailed account of the use of sand-jacks on a particular work requiring the careful lowering of a heavy mass.

Charles, Walter N.

Removing and washing sand from sewage grit chamber, New Bedford, Mass. 1914. (In *Engineering news*, v.71, p.886-888.)

Method of cleansing the sand which enters a combined storm- and house-sewage system, in order that when removed at the sewage disposal plant it will not be objectionable to residents near by.

Chomley, W. B.

Movable sand-collecting tank. 1914. (In *Engineering and mining journal*, v.97, p.1103-1104.)

Abstract of article in "Monthly journal of the Chamber of Mines of Western Australia," Jan. 31, 1914.

Describes apparatus used by Oroya Black Range Gold Mines in its leaching process.

Danger of tapping water-bearing sand under pressure. 1894. (In *Engineering news*, v.32, p.518-519.)

An account of difficulties encountered in Germany, when a well was bored into sand containing water under pressure.

Darton, N. H.

Notes on sand for mine flushing in the Scranton region. 1912. (In *United States—Mines bureau. Bulletin no.25, pt.1, p.72-75.*)

Pertains to the use of sand as a filler for old mine workings.

Darton, N. H.

Sand available for filling mine workings in the northern anthracite basin of Pennsylvania. 33 p. 8 plates. 1913. (*United States—Bureau of mines. Bulletin no.45.*)

Geology and location of sand deposits, comparative suitability of materials for mine filling, and quantity of filling required and available.

Dufrénoy, J.

L'exploitation des zones de sédimentation. 1916. (In *Revue générale des sciences pures et appliquées*, v.27, p.713-716.)

Commercial uses of wastes deposited at mouths of rivers. Includes sand.

Ferry, Charles.

Fusibility of bottom sand. 1895. (In *Iron age*, v.56, p.1264-1265.)

Treats of the requisite properties of a good sand "for making bottoms of reheating furnaces in rolling mills."

Ferry, Charles.

Sand for rolling mill reheating furnace bottoms. 1900. (In *Mineral industry, calendar year 1899*, v.8, p.513-514.)

Discusses requirements of sand for this purpose.

Foster, Horatio A. comp.

Electrical engineer's pocket-book. Ed.7, rev. 1913. Van Nostrand.

Makes brief reference (p.1290) to "Foundations on sand or gravel;" and (p.1294) to sand in its relation to the strength of cement and concrete.

Fréchette, Howells.

Report on the non-metallic minerals used in the Canadian manufacturing industries. 199 p. 1914.

The same, abstract. 1915. (In *Canadian mining journal*, v.36, p.216-220, 239-243.)

Issued by the Mines branch of the Department of mines of Canada.

"Quartz and sand," p.76-91, gives data on the requirements, prices and employment of various types of sand used in Canadian industries.

Gockinga, R. H.

Use of sand for construction of dams in flowing water. 1911. (In *Minutes of proceedings of the Institution of Civil Engineers*, v.185, p.420-421.)

Abstract of article on method of building dams of sand in a river in Holland.

Hatt, William Kendrick, & Scofield, H. H.

Laboratory manual of testing materials. 135 p. 1913. McGraw.

Contains data on methods of making volumetric and strength tests of sand.

Johns, Cosmo.

Silica as a refractory material. 1917. (In *Transactions of the Faraday Society*, v.12, p.165-169.)

Includes brief material on silica sand, together with table giving analyses of refractory sands from various foreign countries.

Käferstein, H.

Substitution of a single span for two openings of the Magdeburg railway bridge. 1879. (In Minutes of proceedings of the Institution of Civil Engineers, v.55, p.352-354.)

Abstract of article describing the use of sand in cylinders for the lowering of heavy bridge members.

Kirk, Edward.

The cupola furnace; a practical treatise on the construction and management of foundry cupolas. 361 p. 1899. Baird.

Contains information on the use of sand as a bottom material in the cupola-furnace.

Le Grom.

Sur les étanchements du canal du Rhône au Rhin. 1845. (In Annales des ponts et chaussées, mémoires, ser. 2, v.9, p.225-270.)

Improving canals by the introduction of sand is considered, p.247-250.

Marks, Lionel S. and others, ed.

Mechanical engineers' handbook. 1916. McGraw.

Includes material on sand for cement-mortar and concrete, and on core sands for foundry use.

Merriman, Mansfield, and others, ed.

American civil engineers' pocket book. Ed.3, enl. 1916. Wiley.

Much information on the general properties of sand.

Miner, Edw. F.

Use of a sand jack for placing the shaft of the Battle monument at West Point. 1904. (In Engineering news, v.51, p.62.)

Letter to editor giving details of method used in lowering a 90-ton weight by means of a sand-jack.

Percy, John.

Metallurgy; the art of extracting metals from their ores. 1875. 596 p. Murray, London.

Has chapter on "Refractory materials," in which (p.151-154) is treated sand for furnace beds and for casting.

Reynolds, Marcus T.

New Delaware and Hudson office building at Albany, N. Y. 1915. (In Concrete-cement age, v.6, p.289-293.)

Editorial discussion, p.293.

Shows how the artificial building stone used in the structure was made, by casting concrete in molds made of sand.

Rice, H. H. & Torrance, W. M.

Manufacture of concrete blocks and their use in building construction. 122 p. 1906. Engineering News Pub. Co.

Contains brief reference to sand for use in concrete blocks.

Rice, Harmon Howard.

Concrete-block manufacture; processes and machines. 152 p. 1906. Wiley.

Chapter 3, "Aggregates," considers briefly the sand used in concrete block manufacture.

Ries, Heinrich.

Economic geology of the United States. 451 p. 1908. Macmillan.

"Molding sand," p.189-190. References, p.190.

"Glass sand," p.176-178. References, p.178.

Sand-settling basin for hydraulic plants. 1917. (In Engineering, v.104, p.146.)

Illustrated description of and results of experiments on an apparatus for removing sand from water that is to drive hydraulic turbines. Swiss installation.

Sand wheel motor. 1883. (In American machinist, v.6, Sept. 8, 1883, p.4.)

The same. 1883. (In Minutes of proceedings of the Institution of Civil Engineers, v.74, p.338.)

Very brief reference to use of sand instead of water for purpose of driving an overshot wheel.

Standard apparatus and procedure recommended for sand analysis. 1915. (In Engineering record, v.71, p.644.)

Discussion by Allen Hazen, p.644-646.

Abstract of paper by Philip Burgess before American Waterworks Association, May 1915. Outlines difficulties encountered in making tests of sand for filters, for concrete and for asphalt mixtures. Suggests remedies.

Storm, C. G. & Cope, W. C.

Sand test for determining the strength of detonators. 1916. (In United States—Mines bureau. Technical paper no.125, 68 p.)

The relative effects of various detonators is indicated by noting the pulverizing effect on sand surrounding an exploding detonator. Outlines proper preparation and use of the sand for such tests.

Trautwine, John C.

Civil engineer's pocket-book. Ed.19. 1913. Trautwine.

Much information on the general properties of sand.

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Periodicals and Other Serials Currently Received by the Carnegie Library of Pittsburgh. 7th edition. 1915. 42 pp.

- Books in the Library of the American Philatelic Society. 1910. 20 pp.
 Carnegie Institute and Library of Pittsburgh. 1916. 32 pp.
 Gift of the German Emperor [List of Books, Maps and Photographs].
 1908. 17 pp.
 Rules for Filing Cards in the Dictionary Catalogues of the Carnegie
 Library of Pittsburgh. 2d edition. 1917. 32 pp.
 What a Public Library Finds to Do; by Elisa May Willard. 1917. 18 pp.

Reference Lists

History

- Books of Interest in Connection with the European War. 1914. 26 pp.
 Braddock's Expedition. 11 pp. (Monthly Bulletin, Nov. 1906.)
 Expedition of General Forbes against Fort Duquesne. 1908. 20 pp.
 Expeditions of Colonel Bouquet to the Ohio Country, 1763 and 1764.
 11 pp. (Monthly Bulletin, Dec. 1909.)
 Letters of General Forbes; Reprint of 35 Letters Relating to the Ex-
 pedition against Fort Duquesne. 63 pp. 20 cents, postpaid.
 (Monthly Bulletin, Feb.-May 1909.)
 *Pennsylvania; a Reading List for the Use of Schools, with Special
 Reference to Indian Warfare and the Local History of Pitts-
 burgh. 1911. 83 pp. 20 cents; postpaid, 25 cents.
 Pittsburgh in 1816. 1916. 75 pp.
 Washington's Visits to Pittsburgh and the Ohio Country. 15 pp.
 (Monthly Bulletin, Feb. 1908.)
 The Whiskey Insurrection. 9 pp. (Monthly Bulletin, July 1906.)

Biography

- Famous Royal Women; a Reading List for Girls. 1908. 11 pp.
 Lives and Letters; a Selected and Annotated List. 1910. 36 pp.
 *Men of Science and Industry; a Guide to the Biographies of Scientists,
 Engineers, Inventors and Physicians, in the Carnegie Library of
 Pittsburgh. 1915. 189 pp. 20 cents; postpaid, 30 cents.
 Patriots; a Reading List for Boys and Girls. 1912. 17 pp.

Sociology

- Housing. 1912. 45 pp.
 Immigration. 1918. 12 pp.
 Vocational Guidance. Supplement. 10 pp. (Monthly Bulletin, Dec.
 1915.)

Debating

- *Debate Index. 2d edition. 1912. 84 pp. 15 cents; postpaid, 20 cents.
 Debate Index. Supplement. 1913. 23 pp.
 Debate Index. Second supplement. 1916. 15 pp.
 Debate Index. Third supplement. 1917. 14 pp.

Publications of Interest to Engineers

- Air-Brakes. 1915. 55 pp.
 Air Conditioning. 1914. 58 pp.
 Brick Manufacture and Bricklaying. 26 pp. (Monthly Bulletin, Jan.
 1912.)
 By-Product Coking. 1915. 40 pp.
 Electric Driving in Rolling-Mills and Foundries. 11 pp. (Monthly
 Bulletin, Nov. 1907.)
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