







AMERICAN SOCIETY

OF

CIVIL ENGINEERS

INDEX TO TRANSACTIONS

VOLUMES I to LXXXIII

(1867 to 1920)

Prepared under direction of the COMMITTEE ON PUBLICATIONS

by

ELBERT M. CHANDLER
Acting Secretary

PUBLISHED BY THE SOCIETY

33 West 39th Street, New York

1921

1 620.6

SUBJECT INDEX - Page 11 AUTHOR INDEX - Page 129

Titles of papers, when given with the author's name, are in quotation marks. For each entry in the Subject Index, in addition to the volume and page, the year of publication is also given. For general data concerning the publications herein indexed see page 5.



	Conten	its.					Date in this Index.	
Volume.	Papers.	Pages.	Form and	(1873-April, 1874. (Monthly Transactions, May, 1874. (Mar., 1875. Monthly Transactions, AprDec., 1875. " " JanDec., 1876. " " 1877. " " 1878. " " 1879.				
I	0-32	391						
II	33-81	426	and A 1873-A	and Monthly Transactions, Nov., 1873-April, 1874.				
III	82-105	448	Mar., 1875.				187	
IV	106-115	336	Monthly 7	ransactions,	AprDec.,	1875.	187	
V	116-131	426	44	"	JanDec.,	1876.	187	
VI	132-152	364		44	11	1877.	187	
VII	153-174	422	**	4.6	4.6	1878.	187	
VIII	175-188	380	44	4.6	4.4	1879.	187	
IX	189-213	462	"	4.6	4.6	1880.	188	
X	214-231	392	44	44	4.6	1881.	188	
XI	232-252	436	4.4	44	6.4	1882.	188	
XII	253-271	478	4.6	44	6.6	1883.	188	
XIII	272-296	481			4.4	1884.	188	
XIV	297-317	606		4.4	44	1885.	188	
XV	\{\frac{318-335}{336-348}\}	498 402	**	å 4 4 £	JanJune, July-Dec.,	1886. 1886.	188	
XVI	349-361	389	4.6	4.4	JanJune,	1887.	188	
XVII	362-373	329	"	4.6	July-Dec.,	1887.	188	
XVIII	374-392	317	4.6	4.4	JanJune,	1888.	188	
XIX	393-401	312	4.6	4.4	July-Dec.,	1888.	188	
XX	402-417	286	4.6	4.4	JanJune,	1889.	188	
XXI	418-430	613	4.4	4 4	July-Dec.,	1889.	188	
XXII	431-441	424	4.6	4.6	JanJune,			

	Contents.						
Volume.	Papers.	Pages.	Form as	nd approximate d	ate of publicat	ion.	Date in this Index.
XXIII	442-460	370	Monthly	Transactions,	July-Dec.,	1890.	1890
XXIV	461-482	563	4.6	44	JanJune,	1891.	1891
XXV	483-518	728	44	44	July-Dec.,	1891.	1891
XXVI	519-534	700	14	11	JanJune,	1892.	1892
XXVII	535-571	688	**	11	July-Dec.,	1892.	1892
XXVIII	572-603	462	46	4.4	JanJune,	1893.	1893
XXIX	604-632	736	"	4.6	July-Sept.,	1893.	1893
XXX	633-686	723	44	4.4	OctDec.,	1893.	1893
XXXI	687-713	660	"	4.4	JanJune,	1894.	1894
XXXII	714-741	543	44	44	July-Dec.,	1894.	1894
XXXIII	742-753	617	44	4.4	JanJune,	1895.	1895
XXXIV	754-769	568		44	July-Dec.,	1895.	1895
XXXV	770-782	519	Volume	"	July,	1896.	1896
XXXVI	783-796	617	4.4	**	Dec.,	1896.	1896
XXXVII.	797-808	578	4.6	"	June,	1897.	1897
XXXVIII	809-818	461	4.4	44	Dec.,	1897.	1897
XXXIX	819-832	704	11	44	June,	1898.	1898
XL	833-841	580	**	4.4	Dec.,	1898.	1898
XLI	842-852	649	11	4.6	June,	1899.	1899
XLII	853-864	572	**	4.6	Dec.,	1899.	1899
XLIII	865-877	619	11	4.4	June,	1900.	1900
XLIV	878-887	504	44	16	Dec.,	1900.	1900
XLV	888-897	645	44	4.6	June,	1901.	1901

	Contents,						Date in this Index.
Volume.	Papers.	Pages.	Form and approximate date of publication.				
XLVI	898-910	582	Volume	e Transactions,	Dec.,	1901	. 1901
XLVII	911-915	449	"	4.6	April,	1902	. 1902
XLVIII	916-930	588	4.6	٤.6	Aug.,	1902	. 1902
XĽIX	931-941	382	"	4.4	Dec.,	1902	. 1902
L	942-955	522	44	4.6	June,	1903	1903
LI	956-968	474		4.4	Dec.,	1903.	1903
LII	969-977	567		4.6	June,	1904	1904
LIII	978-987	520		44	Dec.,	1904.	1904
LIV	988-997	554		"	June,	1905.	1905
LIV (A)	1-17	509	"	44	June,	1905.	1905
LIV (B)	18-30	513	4.6	44	June,	1905.	1905
LIV (C)	31-44	579	6.6	64	June,	1905.	1905
LIV (D)	45-59	604	"	4.6	June,	1905.	1905
LIV (E)	60-74	617	4.4	4.6	June,	1905.	1905
LIV (F)	75-96	572	4.4		June,	1905.	1905
LV	998-1013	467	4.6	4.6	Dec.,	1905.	1905
LVI	1014-1025	492	4.4	4.4	June,	1906.	1906
LVII	1026-1037	544	4.4	4.4	Dec.,	1906.	1906
LVIII	1038-1050	568	6.6	"	June,	1907.	1907
LIX	1051-1061	581	4.4	"	Dec., 1	1907.	1907
LX	1062-1076	595	6.6	"	June, 1	1908.	1908
LXI	1077-1091	575	4.6	4.4	Dec., 1	1908.	1908
LXII	1092-1098	564	4.6	44	Mar., 1	.909.	1909

	Contents,		Form and approximate date of publication.			
Volume.	Papers. Pages.					
LXIII	1099-1104	433	Volume Tra	insactions	June, 1909.	190
LXIV	1105-1117	592	**	4.1	Sept., 1909.	190
LXV	1118-1130	533	"	1.6	Dec., 1909.	190
LXVI	1131-1142	510	44		Mar., 1910.	19
LXVII	1143-1149	635	4.6		June, 1910.	19
LXVIII	1150-1159	485	4.6	"	Sept., 1910.	19
LXIX	1160-1166	441	"	4.6	Oct., 1910.	19
LXX	1167-1178	480	4.6	6.6	Dec., 1910.	19
LXXI	1179-1189	454	"	6.4	Mar., 1911.	19
LXXII	1190-1193	600	6.6	"	June, 1911.	19
LXXIII	1194-1202	511		4.6	Sept., 1911.	19
LXXIV	1203-1215	530	4.6	**	Dec., 1911.	19
LXXV	1216-1238	1198	4.6	1.1	Dec., 1912.	19
LXXVI	1239-1280	2263	"	44	Dec., 1913.	19
LXXVII.	1281-1312	1926	6.6	4.6	Dec., 1914.	19
LXXVIII	1313-1334	1581	4.6	"	June, 1915.	19
LXXIX	1335-1351	1495	6.6		Dec., 1915.	19
LXXX	1352-1378	2261	4.6		Dec., 1916.	19
LXXXI	1379-1402	1838	4.6	* *	Dec., 1917.	19
LXXXII.	1403-1425	1737	4.4	"	Dec., 1918.	19
LXXXIII	1426-1462	2425		**	Dec., 1920.	19 19

The numbers of the papers given in the second column of the foregoing table are not used in either the Subject or Author Index, the references in each being to the volume and page. In the Subject Index the year of publication is added.

Papers Nos. 0 to 57 (inclusive) were published separately at irregular intervals, and their collection in volumes is arbitrary.

Beginning with Paper No. 58 (Nov., 1873), the *Transactions* were issued in monthly numbers; this form of publication was discontinued with Paper No. 769 (Dec., 1895).

Since Jan., 1896, papers have been published in monthly numbers of *Proceedings* in advance of the date of their presentation to the Society, and the volumes of *Transactions* (beginning with Vol. XXXV and with Paper No. 770) have been made up of these papers and the discussions to which they have given rise.

Parts A, B, C, D, E, and F of Vol. LIV contain the papers and discussions presented at the International Engineering Congress held under the auspices of the Society, at St. Louis, 1904.



SUBJECT INDEX

ACCIDENTS.

"-to Railway Structures." Thomas C. Clarke, I, 323 (1872).
"An Accident to Steam Pipes Arising from the Use of Blast Furnace Wool." T. Eglecton (With Dispussion) VI 273 Egleston. (With Discussion.)

Egleston. (With Discussion) (1883).

Analysis of—to workmen and others on Manhattan Elevated Railway improvements. LXXXII, 740 (1918).

Bridge accident. XXXVII, 9 (1897).
Failure of bridges. XXI, 47 (1889).

"Federal Investigations of Mine—. Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).

"On a New Method of Detecting Overstrain in Iron and Other Metals, and on its Application in the Investigation of the Causes of—to Bridges and Other Con-structions." Robert H. Thurston. VII,

structions. Robert R. Huiston. 71, 53 (1878).
"On the Means of Averting Bridge—." Report of the Committee. IV, 122 (1875). Discussion, IV. 208.
"Some Peculiar Railroad Bridge—." J. I.

unar Railroad Bridge —." J. I. (With Discussion.) XLV, 446 (1901).

"The Failure of the Ashtabula Bridge." Charles Macdonald. VI, 74. (1877). Discussion, VI, 85, 195, 231.

ACCOUNTS.

"Notes on the Classification of Railroad— and the Analysis of Railroad Rates." Gratz Mordecal. XVIII, 62 (1888). "On Railroad—and Returns." William P. Shinn. V, 215 (1876). Discussion, V,

330.

"Road Construction and Maintenance: Cost Records and Reports:" An Informal Dis-cussion. Nelson P. Lewis and others. LXXVII, 129 (1914).

ADDRESSES.

Address delivered at the First Annual Con-

Address delivered at the First Annual Convention, held June 16th, 1869. John B. Jervis. 1. 137 (1872).

Delivered at the Opening of the New Society House, November 24th, 1897. Rt. Rev. H. C. Potter, President B. M. Harrod, Gen. Wm. P. Craighill, J. G. Schurman, LL.D., Hon. Joseph H. Choate, XXXVIII, 423.

Presidential Address, December 4th, 1867. James P. Kirkwood. I, 3 (1872).

Presidential Address, September 2d, 1868. W. J. McAlpine. 1, 45 (1872).

Presidential Address at the Second Annual Convention, June 15th, 1870. A. W. Craven. I, 217 (1872).

Presidential Address read at the Twelfth Annual Convention of the Society held at St. Louis, Mo., May 25th, 1880; prepared by O. Chanute, Vice-President. IX, 217.

Presidential Address at the Thirtcenth Anresidential Address at the Thirtcenth Anresid

Presidential Address at the Thirteenth Annual Convention of the Society, at Montreal, June 15th, 1881. James Bicheno Francis. X. 187.
Presidential Address at the Annual Convention of the Society, at Washington,

ADDRESSES-(Continued).

D. C., XI, 153. May 16th, 1882. Ashbel Welch,

D. C., May 16th, 1882. Ashbel Welch. XI, 153.
Presidential Address at the Annual Convention, at Buffalo, N. Y., June 10th, 1884. D. J. Whittemore. XIII, 159.
Presidential Address at the Annual Convention, at Deer Park, Md., June 24th, 1885. Frederic Graff. XIV, 227.
Presidential Address at the Annual Convention, at Denver, Colo., July 2d, 1886. Henry Flad. XV, 499.
Presidential Address at the Annual Convention at the Hotel Knaterskill, New York, July 2d, 1887. William E. Worthen. XVII, 1.
Presidential Address at the Annual Convention at Milwaukee, Wisconsin, June 28th, 1888. Thomas C. Keefer. XIX, 55.
Presidential Address at the Annual Convention at Seabright. N. J., June 21st, 1889. Max J. Becker. XX, 233.
Presidential Address at the Annual Convention at Cresson, Pa., June 26th, 1890. William P. Shinn. XXII, 359.
Presidential Address at the Annual Convention at Chattanooga, Tenn., May 22d, 1891. O. Chanute. XXIV, 397.
Presidential Address at the Annual Convention at Hygeia Hotel, Fortress Monroe, Va., June 8th, 1892. Mendes Cohen. XXVI, 535.
Presidential Address at the Annual Convention at Hygeia Hotel, Fortress Monroe, Va., June 8th, 1892. Mendes Cohen. XXVI, 535.
Presidential Address at the Annual Convention at Chicago, III., August 4th,

XXVI, 535.

Presidential Address at the Annual Convention at Chicago, Ill., August 4th, 1893. William Metcalf. XXVIII, 391.

Presidential Address at the Annual Convention at the Cataract House, Niagara Falls, N. Y., June 20th, 1894. Wm. P. Craighill. XXXI, 555.

Presidential Address at the Annual Convention at the Hotel Pemberton, Hull, Mass., June 19th, 1895. George S. Morison. XXXIII, 467.

Presidential Address at the Annual Convention at Address at the Annual Convention and Market States.

Presidential Address at the Annual Convention at San Francisco, Cal., June 30th, 1896. Thomas Curtis Clarke. XXXV,

bus.

Presidential Address at the Annual Convention at the Chateau Frontenac, Quebec, June 30th, 1897. Benjamin Morgan Harrod. XXXVII, 537.

Presidential Address at the Annual Convention at Detroit, Mich., July 26th, 1898. Alphonse Fteley. XXXIX, 665.

1898, Alphonse Fteley, XXXIX, 665.
Presidential Address at the Annual Convention at Cape May, N. J., June 27th, 1899, Desmond FitzGerald. XLI, 596.
Presidential Address at the Annual Convention, London, England, July 2d, 1900, John Findley Wallace. XLIII, 603.
Presidential Address at the Annual Convention at Niagara Falls, N. Y., June 25th, 1901. J. James R. Croes. XLV, 599. 599

Presidential Address at the Annual Convention at Washington, D. C., May 20th, 1902. Robert Moore, XLVIII, 227.

Presidential Address at the Annual Convention at Asheville, N. C., June 9th, 1903. Alfred Noble, L., 327.

Presidential Address at the Thirty-sixth Annual Convention, held in the Hall of Congresses, Administration Building, St.

Congresses, Administration Building, St.

ADDRESSES-(Continued).

ADDRESSES—(Continued).

Louis, Mo., October 3d, 1904. Charles Hermany. L111, 452.

Presidential Address at the Annual Convention at Cleveland, Ohio, June 20th, 1905. Charles C. Schneider. LIV. 213.

Presidential Address at the Annual Convention at Frontenac, Thousand Islands, N. Y., June 26th, 1906. Frederic P. Stearns. LVI, 451.

Presidential Address at the Annual Convention in the City of Mexico. July 8th, 1907. Georg H. Benzenberg. LVIII, 515.

Presidential Address at the Annual Convention, Denver, Colorado, June 23d, 1908. Charles Macdonald. LXI, 544.

Presidential Address at the Annual Convention, Bretton Woods, New Hampshire, July 6th, 1909. Onward Bates. LXIV, 567.

Presidential Address at the 42d Annual Convention, Chicago, Illinois, June 21st, 1910. John A. Bensel. LXX, 464.

Presidential Address at the 43d Annual Convention, Chattanooga, Tennessee, June 13th, 1911. Mordecai T. Endicott. LXXIII, 392.

Presidential Address at the 44th Annual Convention, Seattle. Washington, June

Presidential Address at the 44th Annual Convention, Seattle, Washington, June 25th, 1912. John A. Ockerson. LXXV,

Presidential Address at the Annual Convention. in Ottawa, Ontario, June 18th, 1913. George Fillmore Swain. LXXVI,

1112

Presidential Address at the Annual Convention in Baltimore, Md., June 2d, 1914. Hunter McDonald. LXXVII, 1737.

Presidential Address at the Annual Convention, in San Francisco, Cal., September 16th, 1915. Charles D. Marx, LXXIX, 1329.

Presidential Address at the Annual Con-

vention, in Pittsburgh, Pa., June 27th, 1916. Clemens Herschel. LXXX, 1306. Presidential Address at the Annual Meeting, January 16th, 1918. George H. Pegram. LXXXII, 158.

Presidential Address at the Annual Meeting at New York, N. Y., January 15th, 1919. Arthur N. Talbot. LXXXIII, 404.

1919. Arthur N. Talbot. LXXXIII, 404.
Presidential Address at the Annual Convention in St. Paul and Minneapolis, Minu., June 17th, 1919. Fayette S. Curtis. LXXXIII, 776.
"The First Fifty Years of the American Society of Civil Engineers: 1552-1902." Address at the Annual Convention at Washington, D. C., May 20th, 1902. Chas. Warren Huut. XLVIII, 220.

"The National Railroad Question of To-Day." Francis Lee Stuart. (With Dis-cussion.) LXXXIII, 927 (1919-20).

AERATION.

of water supplies. XXI, 536 (1889).
"Remarks on the of Water." Charles B.
Brush. (With Discussion.) XV, 139 (1886).

"The Absorption of Oxygen by De-Aerated Water." Earle B. Phelps. (With Discussion.) LXXVI, 1624 (1913).
"The Purification of Ground-Waters Containing Iron and Manganese." Robert Spurr Weston. (With Discussion.) Spurr Weston. LXIV, 112 (1909).

AGREEMENTS.

See CONTRACTS.

AGRICULTURE.

"A Complete Method for the Classification of Irrigable Lands." F. H. Peters. (With Discussion.) LXXXI, 222 (1917). Soil surveys, Imperial Valley, California. LXXVI, 1271, 1527, 1555 (1913). "South African Irrigation." Francis Robert Johnson. (With Discussion.) LII, 1 (1904). "The Reclamation of River Deltas and Salt Marshes." J. Francis Le Baron. (With Discussion.) LIV, 51 (1905).

AIR COMPRESSORS.

See COMPRESSORS.

AIR TANKS.

on Pipe Lines." Minton M. Warren. LXXXII, 250 (1918). Discussion: Irving P. Clurch. R. D. Johnson, P. Wahilman, and L. R. Jorgensen, LXXXII, 264. "— on

"On the Fresh Water — and Their Relation to the Purity of Public Water Supplies." George W. Rafter. (With Discussion.) XXI, 483 (1889).

ALLOYS.

"Strength and Ductility of the Copper-Tin-Zinc —." Robert H. Thurston. X, 309 (1881).

"The Strongest of the Bronzes. A Newl Discovered Alloy of Maximum Strength. Robert H. Thurston. X, 1 (1881).

ALUMINUM.

"Experiments on the Protection of Steel and — Exposed to Sea Water. A. H. Sabin. First Paper (With Discussion), XXXVI, 483 (1896); Supplementary Paper (With Discussion), ALIII, 444

Resilience tests of -. XXXIX, 237 (1898).

SOCIETY OF CIVIL EN-AMERICAN GINEERS.

Facts relating to membership of —. LXXVII, 1749 (1914). Presidential Address at the Annual Meeting at New York, N. Y., January 15th, 1919, Arthur N. Talbot. LXXXIII, 404 (1919-20).

(1919-20).
Suggestions for Improvement of —
LXXVII, 1754 (1914).
"The Activities of the — During the Past
Twenty-five Years." Chas. Warren Hunt.
LXXXII, 1577 (1918).
"The First Fifty Years of the —: 1852-1902."
Address at the Annual Convention at
Washington, D. C., May 20th, 1902. Chas.
Warren Hunt. XLVIII, 220 (1902).

AMMONIA ENGINES.

See ENGINES.

AMMUNITION.

"—for Cannon." Thales L. Ames. (Inter. Eng. Cong. 1904.) LIV, Part B, 283

(1905). Improvements in powders. LIV, Part B, 218 (1905). Ordnance. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part B, 389 (1905). "The Art of Designing and Constructing Mobile Artillery." George W. Burr. (Inter. Eng. Cong. 1904). LIV, Part B, 313 (1905). (Inter. En 313 (1905).

AMPHITHEATRE.

See GRANDSTANDS AND STADIA.

ANCHOR ICE. See ICE.

ANCHORAGE.

"The Foundations for the Brooklyn—of the East River Bridge." Francis Colling-wood. III, 142 (1874). Discussion, IV,

wood. 111, 142 (1614). Discussion, 205 (1875).
"The Re-Enforcement of the — and Renewal of the Suspended Superstructure of the Niagara Railroad Suspension Bridge." L. L. Buck. X, 195 (1881).

APPRAISAL.

See VALUATION.

AQUEDUCTS.

Croton Aqueduct. VI, 54 (1877). Flow of water in Sudbury Aqueduct.

Flow of water in Sudbury Aqueduct. XXXV, 241 (1896).
"Grouting Operations, Catskill Water Supply." James F. Sanborn and M. E. Zipser. (With Discussion.) LXXXIII, 980 (1919-20)

(1919-20).

New York City water supply, Brief description of — for. LXXVI, 1787 (1913).

"Notes and Suggestions on the Croton Water-Works and Supply, for the Future." Benjamin S. Church. V, 107 (1876). Discussion, V, 254; VI, 68 (1877).

"Tufa Cement, as Manufactured and Used on the Los Angeles Aqueduct." J. B. Lippincott. (With Discussion.) LXXVI, 520 (1913).

520 (1913).

"Tunnel Surveying on Division No. 6, New Croton Aqueduct." F. W. Watkins. (With Discussion.) XXIII, 17 (1890).

See also PIPE-LINES.

ARCHES.

"A Description of the Proposed Plan for Erecting the Superstructure of the Illi-nois and St. Louis Bridge." Walter Katté. II, 135 (1873).

Mois and St. Louis Bridge." Walter Katté. II, 135 (1873). "A Few Points in the Design of Reinforced Concrete—" B. R. Leffler. LV, 183 (1905). Discussion: William Cain, Wil-bur J. Watson, and Almon H. Fuller, LV, 189.

"A Shortened Method in Arch Computa-tion," H. A. Sewell. LXXVI, 133 (1913). Discussion: William Cain, LXXVI, 138. Arch and box culverts for railroads. LI,

424 (1903).

"Arched Beams." Casimir Constable. I, 375 (1872). - carrying railroad

- carrying railroad tracks over streets, Philadelphia. LXXVI, 1852 (1913).

"Arching Bergen Tunnel on Erie Railroad."
John Houston. I, 75 (1872).

"Brick—for Large Sewers." R. Hering.
VII, 252 (1878). Discussion, VII, 258.

"Comparison of Weights of a Three-Hinged and a Two-Hinged Spandrel-Braced Parabolic Arch." C. W. Hudson. (With Discussion). XLIII, 20 (1900).

"Computation of Stresses in Open-Webbed—Without Hinges." C. W. Hudson.
LXV. 145 (1909).

— Without Hinges." C. W. Hudson. LXV, 145 (1909).
"Concrete Bridges: Some Important Fea-tures in Their Design." Walter M. Smith, Sr., and Walter M. Smith, Jr. (With Discussion.) LXXVII, 695 (1914). Concrete eneased steel arch bridge for Niagara River crossing. LXXXIII, 44

(1919-20)

(1919-20).

"Concrete-Steel Bridges." Fritz von Emperger. (Inter. Eng. Cong. 1904.) LIV, Part E, 523 (1905).

"Erection of the Bellows Falls Arch Bridge." Lewis D. Rights. (With Discussion.) LXI, 253 (1908).

ARCHES-(Continued).
"Fall of the Western Arched Approach to

ARCHES—(Continued).

"Fall of the Western Arched Approach to South Street Bridge, Philadelphia, Pa."

D. McN. Stauffer. VII, 264 (1878). Discussion, IX, 319 (1880).

"Improving Arch Action in Arch Dams."

L. R. Jorgensen. (With Discussion.)

LXXXIII, 316 (1919-20).

"Notes on the Erection of the Illinois and St. Louis Bridge." Theodore Cooper. 111, 239 (1874). Discussion., IV, 205 (1875).

"On a New Principle in the Theory of Structures." George F. Swain. (With Discussion.) LXXXIII, 622 (1919-20).

"On Skew Bridges, and on the Construction of Falls Skew Bridge over the Schuylkill, near Philadelphia." J. Dutton Steele. I, 209 (1872).

"On the Designing and Erection of the Oakley Arch. A Full Centered Oblique Construction of Extreme Skew, to Carry a Railway Embankment over Another Double Track Railway." J. Foster Crowell. (With Discussion.) XXIII, 155 (1890). (1890).

Crowell. (With Discussion.) XXIII, 139 (1890).
Origin of the arch. XXIV, 322 (1891).
"Reinforced Concrete Bridge Across the Almendares River, Havana, Cuba." Eugene Klapp and W. J. Douglas. (With Discussion.) LXXIV, 216 (1911).
"Remarks on the Causes of Fall of the Western Arched Approach to the South Street Bridge, Philadelphia." (Discussion on Paper No. 171, Vol. VII, p. 264.) J. G. Barnard. IX, 319 (1880).
"Revision of the Niagara Railway Arch Bridge." Charles Evan Fowler. LXXXIII, 1919 (1919-20). Discussion: O. H. Ammann, C. Bentham. J. A. L. Waddell, Theodore Belzner, F. E. Schmitt, P. G. Lang, Jr., James E. Howard, Clyde T. Morris, and Almon H. Fuller, LXXXIII, 2000. 2000.

"Some Observations on Trusses and Trussed

"T, Willis Pratt. I, 346 (1872).
"Steel Centering Used in the Construction of the Rocky River Bridge, Cleveland, Ohio." Wilbur J. Watson. LXXIV, 1 (1911). Discussion: L. J. Mensch,

Chilo. Wilbur J. Watson. LAXIV, 10, (1911). Discussion: L. J. Mensch, LXXIV, 10.

"Steel-Concrete Construction." An Informal Discussion. R. S. Buck and others. XLVI, 93 (1901).

"Stress Measurements on the Hell Gate Arch Bridge." D. B. Steinman. (With Discussion.) LXXXII, 1040 (1918).

"Tests of floor —. XXXIV, 521 (1895).

"The Arch Principle in Engineering and Esthetic Aspects, and Its Application to Long Spans." C. R. Grimm. (With Discussion.) LXXI, 233 (1911).

"The Cherry Street Bridge, Toledo, Ohio." Clement E. Chase. (With Discussion.) LXXXI, 744 (1916).

"The Design and Construction of Four Reinforced Concrete Viaducts at Fort Worth, Texas." S. W. Bowen. (With Discussion.) LXXXIII, 1206 (1915).

"The East Canyon Creek Dam." A. F. Parker. (With Discussion.) LXXXIII, 574 (1919-20).

"The Economics of Steel Arch Bridges." J. A. L. Waddell. (With Discussion.) LXXXIII, 1 (1919-20).

"The Groined Arch as a Covering for Reservoirs and Sand Filters: Its Strength and Volume." Leonard Metcalf. (With Discussion.) XLIII, 37 (1900).

"The Hell Gate Arch Bridge and Approaches of the New York Connecting Railroad over the East River in New York City." O. II. Ammann. (With Discussion.) LXXXIII, Discussion.) LXXXIII, 852 (1918).

ARCHES-(Continued).

"The Niagara Railway Arch." R. S. Buck.
(With Discussion.) XL, 125 (1898).
"The Picaza Bridge." A. A. Agramonte.
LXXX, 200 (1916).
"The Rainforaca George."

LXXX, 200 (1916).

"The Reinforced Concrete Bridge across the Hudson River at Sandy Hill, New York." William H. Burr. (With Discussion.) LIX, 195 (1907).

"The Semicircular Masonry Arch." A. E. Lindau. LXI, 387 (1908).

"The Stability of Loaded Masonry—." Arthur S. C. Würtele. (With Discussion.) XXIII, 1 (1890).

"The Twelfth Street Trafficway Viaduct, Kansas City, Missouri." E. E. Howard. (With Discussion.) LXXX, 484 (1916).

"Three-Hinged Masonry—: Long Spans Especially Considered." David A. Moli-

(With Discussion.) LXXX, 484 (1916).
"Three-Hinged Masonry—; Long Spans Especially Considered." David A. Molitor. (With Discussion.) XL, 31 (1898).
"Upright Arched Bridges." James B. Eads. 111, 195 (1874). Discussion, 111, 215, 285, 319; IV, 81, 162, 177, 201 (1875).
"Walnut Lane Bridge, Philadelphia." George S. Webster and Henry H. Quimby. LXV, 423 (1909).

See also BRIDGES.

ARMOR PLATE.

"Experiments on the Front or Shield of the Experimental Casemate at Fort Mon-roe," J. G. Barnard. I, 173 (1872).

ARTILLERY. See ORDNANCE.

ASPHALT.

"A Rational Formula for — Street Surfaces." J. Alden Griffin. LXXVII, 64 (1914).

and - Pavements." George W. (With Discussion.) XXXVIII, 215 (1897).

for reservoir lining, XXXV, 70 (1896).

payements. LXXXII, 1391, 1399, 1412 (1918).

reservoir lining. Astoria, Oregon. XXXVI, 45 (1896).
Bituminous macadam payements and bitu-

minous surface treatments. LXXXII, 1403 (1918).

Note on the nomenclature of bitumens. VIII, 361 (1879). "Sampittic Surfacing." Walter Wilson Crosby. (With Discussion.) LXIV, 352

"Street Grades and Cross-sections in - and

"Street Grades and Cross-sections in — and Cement." Robert P. Woods. (With Discussion, XLII, 1 (1899).
Tests of —. LXXIX, 318, 324 (1915).
Tests of bituminous materials used in road construction. LXXXII, 1448 (1918).
"The Maintenance of — Streets." James N. Hazlehurst. (With Discussion.) XLIX, 182 (1902).

Hazlehurst. (With Discussion.) XLIX, 482 (1902).

"The Use of Asphaltum for Reservoir Linings." James D. Schuyler. XXVII, 629 (1892). Discussion, XXVIII, 130 (1893).

"The Use of Asphaltum in Building Sea Walls." W. C. Ambrose. (With Discussion.) XXIV, 223 (1891).

"The Water-Proofing of Solid Steel-Floor Railroad Bridges. "Samuel Tobias Wagner. (With Discussion.) LXXIX, 306 (1915).

"Water-Proof Coverings." F. Collingwood. IX, 348 (1880).

ASPHALT BLOCKS.

— for pavements. LXXXII, 1391, 1399 (1918).

- used in pavements, XXXVIII, 231 (1897).

ASPHALTIC CEMENT.

- used in paving. XXXVIII, 227 (1897). 1117 Mill 17 1

ASSESSMENTS.

ASSESSMENTS.

- for street sprinkling, St. Paul, Minn. LXXVI, 77 (1913).

- in levee districts. LXXIX, 512 (1915).

Practice of special—in fifty cities. XXXVIII, 342 (1887).

"Theory and Practice of Special—." J. L. Van Ornum. (With Discussion.) XXXVIII, 336 (1897). 1001111111

ATMOSPHERE.

"The Cause of Rain and the Structure of the -." Franz A. Velschow, XXIII, 303 (1890).

AUTOMOBILES AND AUTOMOBILE TRUCKS.

See MOTOR TRUCKS.

AVERAGING MACHINE.

"Averaging Machine." W. S. Auchincloss.

XI, 121 (1882).
"Exponent of the Principle of Moments."
W. S. Auchineloss. 'X, 135 (1881).

BACKWATER.

- caused by obstructions in rivers.

LXXXII, 344 et seq. (1918).

"-in Streams as Produced by Dams." De

Wood, (With Discussion.) II, 255 (1873). "On the Determination of the Flood Dis-

charge of Rivers and of the Caused by Contractions." William R. Hutton. Contractions," William R. F. (With Discussion.) XI, 211 (1882). Hutton.

Theory of—curves as applied to the expanding flume. LXXXIII, 1193 (1919-

BACTERIA.

'-and Other Organisms in Water." John W. Hill. (With Discussion.) XXXIII, 423 (1895).

BALLAST.

Transmission of pressures in -. LXXXIII, 1527 (1919-20).

BARGES.

"Screw Steamship and Tow Barge Effi-ciency on the Northwestern Lakes of America." Joseph R. Oldham. (With Discussion.) XXV, 373 (1891).

BAROMETERS.

"The Aneroid Barometer and its Use in Estimating Altitudes," Theo. G. Ellis. I, 277 (1872).

BARS.

"Some Recent Experiments with Dynamite on an Ocean Bar.", O. M. Carter. (With Discussion.) XXV, 442 (1891). "The Causes of the Formation of—at the Mouths of Rivers, as Shown in an Exam-ination of the Cannesticut River," Theo-

Mouths of 19vers, as Shown in an Examination of the Connecticut River," Theodore G. Ellis. II, 313 (1873).

"The Reaction Breakwater as Applied to the Improvement of Ocent—" Lewis M. Haupt. XLIII, 485 (1899). Discussion, XLII, 501; XLIII, 93 (1900).

BASCULE BRIDGES.

See LIFT BRIDGES.

BASE LINES.

"Invar (Nickel-Steel) Tapes on the Mea-surement of Six Primary—." Owen B. French. (With Discussion.) LX, 219

Use of long steel tapes for measuring —. XXX, 81 (1893).

BEACHES.

See SHORE PROTECTION.

"A Simple Diagram, Giving, by Inspection, the Dimension of Wooden—for a Given Span and Load." J. M. Michaelson. XXV, 231 (1891).
"Arched—." Casimir Constable. I, 375

(1872)

of concrete and reinforced concrete. LXXXI, 1124 et seq. (1917).

LXXXI, 1124 et seq. (1917).

"Bond-Friction-Resistance in Reinforced Concrete." William Fry Scott. (With Discussion.) LXXIII, 230 (1911).

Deflection of reinforced concrete—under repeated loadings. LXXVII, 449 (1914).

"Deflections of — with Variable Moments of Inertia." C. W. Hudson. LI. 1 (1903).

Discussion: Irving P. Church, Mansfield Merriman, and C. H. Lindenberger, LI, 18.

"Economy in Rectangular Panels, Using—of Constant Cross-Section." J. S. Branne. (With Discussion.) LXXIV, 166 (1911). "Experiments on the Deflection of Continuous—, Supported at Equidistant Points." James B. Francls. II, 117

Points." James B. Francls. II, 117 (1873).

"Faults in the Theory of Flexure, and an Epitome of Certain I-Beam Tests Made at Ambridge, Pa." Henry S. Prichard. (With Discussion.) LXXV, 895 (1912).

Final report of the Special Committee on Concrete and Reinforced Concrete, Discussion by L. J. Mensch and others. LXXXII, 1541 (1918).

"Flexure and Transverse Resistance of —." Chas. E. Emery. VIII, 149 (1879). Discussion, IX. 353 (1880).

"Method of Designing a Rectangular Rein-

cussion, IX. 353 (1880).

"Method of Designing a Rectangular Reinforced Concrete Flat Slab. Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. (With Discussion.) LXXX, 1689 (1916).

"Note on the Coefficient of Elasticity of Concrete and Mortar — during Flexure." Myron S. Falk. L. 473 (1903). Discussion: E. J. McCaustland, W. K. Hatt, and Gaetano Lanza, L. 447.

"On a New Principle in the Theory of Structures." George F. Swain. (With Discussion.) LXXXIII, 622 (1919-20).

"Pine Stringers and Floor—for Bridges." Onward Bates! (With Discussion.)

(With Discussion.)

"Pine Stringers and Floor—for Bridges."
Onward Bates. (With Discussion.)
XXIII, 261 (1890). //
Progress report of Special Committee on
Concrete and Reinforced Concrete.
LXXVII, 416 (1914).
"Proof of an Assumption in the Theory
of Concrete—" Ralph E. Goodwin.
LXXVIII, 1263 (1915). Discussion: J. P. J.
Williams. LXXVIII, 1267.
"Resistance of—to Flexure." John G. Barnard. III, 123 (1874). Discussion, III,
127; IV, 277 (1875).
"Shearing Strength of Construction Joints
in Stems of Reinforced Concrete TBeams, as Shown by Tests." Lewis J.
Johnson and John R. Nichols. (With
Discussion.) LXXVIII, 1490 (1914).
"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat

BEAMS—(Continued).

Slab Floors." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).
"Steel Stresses in Flat Slabs." H. T. Eddy. (With Discussion.) LXXVII, 1338 (1914).

1338 (1914).
Strength of —, and position of neutral axis.
111, 33 (1874).
"Stresses in Wedge-Shaped Reinforced Concrete —." William Cain. LXXVII, 745 (1914). Discussion: A. C. Janni, L. J. Mensch, and L. H. Nishkian, LXXVII, 763; LXXVIII, 734.
"Tests of a Wrought, iron, Double, Track

Mensen, and L. H. Nishkan, Laxvii, 763; LXxVIII, 734.

"Tests of a Wrought-iron Double Track Floor Beam." Affred P. Boller. (With Discussion.) XVIII, 119 (1888).

"The Strength and Elasticity of Structural Steel, and its Efficiency in the Form of —and Struts." James Christle. XIII, 253 (1884). Discussion, XIII, 267.

"The Structural Design of Buildings." Charles C. Schneider. (With Discussion.) LIV. 371 (1995).

"The Theorem of Three Moments." J. P. J. Williams. (With Discussion.) LXXVI, 785 (1913).

"The Transverse Strength of —as a Direct Function of the Tensile and Crushing Stresses of Material." M. Lewinson. (With Discussion.) XXXV, 484 (1896).

"Theory of Reinforced Concrete Joists." John L. Hall, LXXVI, 145 (1913). Discussion: Ernest McCullough, LXXVI, 152.

152.

Transverse resilience of -. XXII, 106 (1890).

See also GIRDERS.

Thrust — in electric plant of Alahama Power Company. LXXVIII, 1443, 1553, 1578 (1915).

BENCH MARKS.

"Experiments on the Stability of -."
George W. Cooley. (With Discussion.) George W. Co XX, 73 (1889),

BETON.

See CONCRETE.

BIBLIOGRAPHY.

Classified List of Searches Made in the Library," January, 1901, to November 1916. LXXX, 2086 (1916).

BISULPHIDE OF CARBON.

"Triple Thermlc Motor: Description, Operation and Results of a Single Expansion, Non-Condensing Steam Engine, Supplemented by the Evaporation of the — and Expansion of its Vapor, at Brush Electric Light Company, Cleveland, Ohio." Charles II, Haswell, XVII, 193 (1887).

BITUMEN See ASPHALT.

BLAST FURNACE WOOL.

"An Accident to Steam Pipes Arising from the Use of —." T. Egleston. (With Dis-cussion.) XII, 253 (1883).

BLAST FURNACES.
"The Manufacture of Pig Iron," E. N. K.
Talcott, I, 191 (1872).

BLASTING.

"A New Safety Explosive." Richard T. Dana. (With Discussion.) L, 382 (1903).

Average unit drilling and — quantities for Astoria Gas Tunnel. LXXX, 617 (1916).

BLASTING-(Continued).

- for the Laramie-Poudre Tunnel. LXXV. 739 (1912).

on Panama Canal. XIX, 288 (1888).
rock in construction of Morena Rock Fill

Dam. LXXV, 45 (1912).

with Nitro-G I v c e r i n e." Edward P. North. I, 13 (1872).

North. I, 13 (1872).

"Dimension Stone Quarrying: The—Process." William L. Saunders. (With Discussion.) XXV, 501 (1891).

"Electric Rock—: The American Method." William L. Saunders. XXVII, 529 (1892). Discussion, XXVIII, 144 (1893).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910). bert M. LXX, 190 190 (1910).

"Nitro-Glycerin: Its Manufacture and Use."

Stephen Chester. I, 117 (1872).

"On —. Memoranda of Two Blasts Fired April, 1869, on the Union Pacific Railroad." E. P. North. I, 214 (1872).

"On Igniting Blasts by Means of Electricity." Julius H. Striedinger. VII, 1

city." (1878).

"On the Simultaneous Ignition of Thousands of Mines, and the Most Advantageous Grouping of Fuses." Julius H. Striedinger. VI, 177 (1877).
"Removal of Rock 40 Ft. below Surface of Water, North River, N. Y." John A. Bensel. (With Discussion.) XXXII, 231 (1894).

"Submarine -." F. Collingwood. I, 216 (1872).

BOILER-PLATE.

"Experiments on the Tensile Strength of Bar-Iron and —." C. B. Richards. (With Discussion.) II, 330 (1873).

BOILERS.

for dredges used on Panama Canal.
LXXXII, 523 (1918).
used in contractors' plant, Pennsylvania Railroad Tunnels, New York. LXIX, 14 (1910)

(1910).

"Connected — Arc Marine —, a Demonstration of the Principles of their Construction." Charles E. Emery. VI, 169 (1877). Discussion, VI, 294.

Cost of —. LXXIV, 15 (1911).
"Efficiency of Furnaces Burning Wet Fuel, as Determined by Experiments on a Large Scale." R. H. Thurston. III, 290 (1874). Discussion, III, 316, 334; IV, 88 (1875). 88 (1875).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Her-bert M. Wilson, (With Discussion.) LXX, 190 (1910).

"Marine Engineering." W. F. Durand. (Inter. Eng. Cong. 1904.) LIV, Part C. 183 (1905).

Marine Engineering. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part C, 261 (1905).

"Marine Engineering in France." V. Day-mard and R. Lelong. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part C, 243 (1905).

"On the Use of a Surface Condenser in Connection with a Set of Blast Furnace —, at the Franklin Iron Works, Oneida Co. N. Y." W. B. Cogswell. II, 41 (1873).

BORINGS.

"Apparatus for Obtaining — by Direct Pressure." Theodore Allen. (With Discussion.) II, 33 (1873).

— at site of Pearl Harbor Dry Dock. LXXX, 257, 305 (1916).

— for Warrior River improvements. XLIX,

325 (1902).

-in Broadway, New York." William Bar-clay Parsons. (With Discussion.) clay Parsons. (WXXVIII. 13 (1893).

BRACING.

"Pressure, Resistance, and Stability of Earth." J. C. Meem. (With Discussion.) LXX, 352 (1910).
"The—of Trenches and Tunnels, with Practical Formulas for Earth Pressures." J. C. Meem. (With Discussion.) LX, 1 (1908).

BRAKES.

'Power — for Freight Trains." William P. Shinn, XIV, 405 (1885).

BREAKWATERS.

for Cape Cod Canal. LXXXII, 36 (1918).

—for Cape Cod Canal. LXXXII, 36 (1918).
Harbors. Discussion on Inter. Eng. Cong.
Papers, 1904. LIV, Part A, 339 (1905).
"Harbors on Lakes Erie and Ontario."
Dan C. Kingman. (Inter. Eng. Cong.
1904.) LIV, Part A, 237 (1905).
"Harbour Development in Holland." H.
Wortman. (Inter. Eng. Cong. 1904.)
LIV, Part A, 181 (1905).
"Harbours of Great Britain." William
Matthews. (Inter. Eng. Cong. 1904.)
LIV, Part A, 159 (1905).
"How to Build a Stone Jetty on a Sand
Bottom in the Open Sea." Henry C.
Ripley. (With Discussion.) LXXV, 1040
(1912). (1912).

"Seacoast Harbors in the United States."
Cassius E. Gillette. (Inter. Eng. Cong. 1904.) LIV, Part A, 297 (1905).
"The Breakwater at Buffalo, New York."
Emile Low. LII, 73 (1904). Discussion: Thomas D. Pitts, William T. Lyle, D. E. Hughes, G. H. Raymond, and George E. Fell. LII, 198.
"The Delaware, Sandy Bay and San Pedro—" C. H. McKinstry. (Inter. Eng. Cong. 1904.) LIV, Part A, 325 (1905).
"The Reaction Breakwater as Applied to the Improvement of Ocean Bars." Lewis M. Haupt. XLII, 485 (1899). Discussion XLII, 501; XLIII, 93 (1900).

See also JETTIES.

"An Investigation of the Properties of—, under Different Physical Conditions." Sherman M. Turrill. Ll, 35 (1903). Dis-cussion: E. J. McCaustland, Ll. 65. — Manufacture and — Pavement." F. A. Calkins. (With Discussion.) XXVI, 363

"- Manufacture (1892)

(1892).

"—Manufacture near Chicago." D. V. Purington. XVIII, 291 (1888).

—pavements. LXXXII, 1391, 1404 (1918).

"Experiments for Making — Masonry Impervious to Water, Tried on the Walls of the Back Bays of the Gate-Houses of the New Croton Reservoir in New York, and on the Brick Arch of High Bridge. in 1863." William L. Dearborn. I, 203 (1879). (1872).

Manufacture of -. (Discussion.) XVIII,

304 (1888). "Note on — Making in Sinaloa, Mexico." Fran. Sosa y Avela. XVIII, 303 (1888).

BRICK-(Continued).

"Notes on the Resistance of Bricks to a Crushing Force." George S. Greene, Jr. II. 185 (1873).

Rattler test for paving -. LXXXII, 1445 (1918)

"Slate Bricks." José R. Villalon. XVIII,

297 (1888). Tests of vitrified paving -. XXXIX, 237 (1898). "The — Industry about

New York City."

Calvin Tomkins, XVIII, 281 (1888).
"The Manufacture and Use of Paving—,"
Daniel W. Mead. XXIX, 653 (1893) Discussion, XXX, 585 (1893).

BRIDGE FLOORS.

- for Hell Gate Arch Bridge. LXXXII, 880, 902, 982 (1918). Concrete-metal construction in bridges and floors. XXXI, 438 (1894). New railway floor used in revision of Niagara Railway Arch Bridge. LXXXIII,

Niagara Railway Arch Bridge, LXXXIII, 1981 (1919-20). "On an Economical and Efficient Railroad Bridge Floor." W. Howard White, XII,

Bridge Floor." W. Howard White. XII, 451 (1883).
"The Water-Proofing of Solid Steel-Floor Railroad Bridges." Samuel Tobias Wagner. (With Discussion.) LXXIX, 306 (1915).

"Thin Floors for Bridges." Albert F. Rob-inson. XXVII, 483 (1892). Discussion, XXVII, 500, 680.

BRIDGE PIERS.

"Obstruction of — to the Flow of Water,"
Floyd A. Nagler. LXXXII, 334 (1918).
Discussion: A. J. Wiley, R. D. Goodrich,
E. W. Lane, Mansfield Merriman, F. H.
Frankland, Charles Evan Fowler, Robert
E. Horton, and David A. Molitor, LXXXII, 364.

See also FOUNDATIONS.

BRIDGE PINS.

"Approximate Determination of Stresses in the Eye-Bar Head." William II. Burr. VI, 127 (1877). Discussion, VI, 263; VII, 189 (1878).

"Proportions of Eye-Bar Heads and Pins, as Determined by Experiment." (Discussion on Paper No. 140, vol. VI, p. 127.) C. Shaler Smith. VI, 263 (1877). Specification for — XXXVI, 106 (1896). "The Condition of Steel in —." A. C. Cunting the Con

ningham. (With Discussion.) XXXVI, 91 (1896).

BRIDGES.

BRIDGES.

"A Description of the Proposed Plan for Erecting the Superstructure of the Illinois and St. Louis Bridge." Walter Katté. II, 135 (1873).

"A Direct Method of Spacing Rivets and Finding the Position, etc., of Stiffeners in Plate Girders." E. Schmitt. (With Discussion.) XLV, 550 (1901).

"A Few Points in the Design of Reinforced Concrete Arches." B. R. Leffler. (With Discussion.) LV, 183 (1905).

"A Four-Track, Center-Bearing, Railroad Draw Span." Louis H. Shoemaker. (With Discussion.) LXXV, 711 (1912).

"A Graphical Method for the Solution of Stresses in the Continuous Girder, as Applied to Draw—" George F. Barton. XLVI.1, 72 (1902). Discussion: C. H. Lin'enberger, and H. A. La Chicotte, XLVIII, S9.

"A New Graphical Solution of the Problem,

"A New Graphical Solution of the Problem,

BRIDGES—(Continued).

What Position a Train of Concentrated Loads Must Have in Order to Cause the Greatest Stress in any Given Part of a Bridge Truss or Girder." Henry T. Eddy. XXII, 259 (1890).

Bridge Truss or Girder." Henry T. Eddy. XXII. 259 (1890).

"A New Swing Bridge at Copenhagen, Denmark." H. C. V. Moeller. LV, 129 (1905). Discussion: John C. Moses, L. J. Le Conte, and H. T. Forchhammer, LV, 139.

"A Novel Method of Repairing a Swing Bridge." Herbert C. Keith. LXXXIII, 1080 (1919-20). Discussion: T. Kennard Thomson, Guy Pinner, Shortridge Hardesty, and James B. French. LXXXIII. 1107.

"A Rational Form of Stiffened Suspension Bridge." Gustav Lindenthal. LV, 1 (1905). Discussion: W. Hildenbrand, Joseph Mayer, R. S. Buck, W. W. Crehore. Theodore Cooper. C. C. Schneider, Oswald Erlinghagen, Henry W. Hodge, F. Schüle, J. Melan, Leon S. Moisseiff, and A. Rieppel. LV, 16.

"A Shortened Method in Arch Computation." H. A. Seweil. (With Discussion.) LXXVI, 133 (1913).

"A Simple Method of Computing Deflections of a Cable Span Carrying Multiple Loads Evenly Spaced." F. C. Carstarphen. (With Discussion.) LXXXIII, 1383 (1919-20).

1383 (1919-20).

pnen. (With Discussion.) LXXXIII, 1333 (1919-20).

"American Railroad —." Theodore Cooper. XXI, 1 (1889). Discussion, XXI, 566.

"An Account of the Erection of a Bridge over the Danube, near Vienna." W. Howard White. II, 291 (1873).

"An Account of the Erection of a Draw Bridge without False Works." C. S. Maurice. II, 330 (1873).

"An Examination into the Method of Determining Wind Pressures." F. Collingwood. (With Discussion.) X, 172 (1881).

"Application of the Theory of Continuous Girders to Economy In Bridge Building." Charles Bender. V, 147 (1876). Discussion, V, 219.

"Arched Beams." Casimir Constable. I, 375 (1872).

Bibliography relating to continuous gir-

Bibliography relating to continuous girders, 1854-1874. III, 446 (1874).

- across the Cape Cod Canal. LXXXII, 44 (1918)

- at Paris Exposition of 1900, XLI, 300 (1899)

— carrying railroad tracks over a Philadelphia. LXXVI, 1840 (1913) "Bridging Casions Lengthwise". F

"Bridging Caffons Lengthwise." Howard V. Hinckley. XXVI, 521 (1892). "Central Avenue Bridge at Newark, New Jersey." Alfred P. Boller. II, 379

"Combination Bridge Building on the Pacific Coast." Alfred D. Ottewell, XXVII, 466 (1892). Discussion, XXVIII, 43 (1893).

Combination —. XXI, 18 (1889).
"Comparison of Modern Engine Loading, with Standard Specifications for Spans from 10 to 200 Feet." C. D. Purdon, XXIX, 426 (1893). Discussion, XXX, 515 (1893).

"Comparison of Weights of a Three-Hinged and a Two-Hinged Spandrel-Braced Parabolic Arch." C. W. Hudson. (With Discussion.) XLIII. 20 (1900).

Concerning the Investigation of Over-loaded — Wilbur J. Watson. LVII, 247 (1996). Discussion: R. D. Coombs, Mansfield Merriman, Henry B. Seaman, George B. Francis. Theodore Belzner, and J. E. Greiner, LVII, 257.

BRIDGES—(Continued).

"Concrete —: Some Important Features in Their Design." Walter M. Smith, Sr., and Walter M. Smith, Jr. LXXVII, 695 (1914). Discussion: S. W. Bowen, Wilson Fitch Smith. C. E. Gregory, Henry H. Qulmby, A. C. Janni, Philip Aylett, L. J. Mensch, A. W. Buel, and W. D. Maxwell, LXXVII, 709.

Concrete encased steel arch bridge for Niagara River crossing. LXXXIII, 44

(1919-20)

"Concrete-Steel—," Fritz von Emperger. (Inter, Eng. Cong. 1904.) LIV, Part E. (Inter. En 523 (1905).

"Construction Problems, Dumbarton Bridge, Central California Railway." E. J. Schneider. (With Discussion.)

E. J. Schneider. (With Discussion.) LXXVI, 1572 (1913). "Description of a Combined Triangular and Suspension Bridge Truss, and Com-parison of its Cost with that of the Warren, Pratt, Whipple and Howe Trusses." Edwin Thacher. XIII, 123 (1884).

(1884).

"Description of Guard Gates at the Point Street Bridge at Providence, R. I." William D. Bullock. XX, 78 (1889).

"Description of the New Wrought-Iron Bridge at Bridgeport, Ct." Alfred P. Boller. I, 317 (1872).

"Determination of the Stresses in Elastic Systems by the Method of Least Work." William Cain. XXIV, 265 (1891).

"Draw-Spans and Their Turn-Tables." C. Shaler Smith. III, 129 (1874). Discussion, III, 139; IV, 203 (1875).

"Early American iron railroad—. XXI, 11 (1889).

11 (1889). Early Am American wooden railroad --. XXI,

bridge engineering. XXIV, (1891).

"Economy in Rectangular Panels, Using Beams of Constant Cross-Section." J. S. Branne. (With Discussion.) LXXIV, 166 (1911).

Effect of San Francisco earthquake on —. LIX, 258 (1907). Effect of San Francisco earthquake on highway structures. LIX, 263, 270, 311, 323 (1907).

323 (1907).

"Erection of the Bellows Falls Arch
Bridge." Lewis D. Rights. LXI, 253
(1908). Discussion: J. R. Worcester,
J. P. Snow, F. W. Skinner, Henry H.
Quimby, and Philip Aylett. LXI, 263.

"Erection of the Verrugas Bridge." L.
Lefferts Buck. V, 103 (1876). Discussion, V, 240.

Expansion and contraction in spans of Kentucky and Indiana Bridge. XVII,

125 (1887).

"Experimental Determination of the Rolling Friction in Operating the Draw of the Thames River Bridge, together with Method for Determining Power to Operate Draw —." Alfred P. Boller, Jr., and H. J. Schumacher. (With Discussion.) XXV, 638 (1891).

"Experimental Strains upon a Bowstring Trussed Girder," Theo, G. Ellis, II,

Trussed Girder." Theo, G. Ellis, II, 107 (1873).

"Fall of the Western Arched Approach to South Street Bridge, Philadelphia, Pa." D. McN. Stauffer. VII, 264 (1878). Discussion, IX, 319 (1880).

"Formulas for the Weights of —." A. J. Du Bois. First Paper, XVI, 191 (1887); Discussion, XVI, 218, 257; Supplementary Paper, XVIII, 179 (1888).

"Formulas for the Weights of Iron and

BRIDGES-(Continued).

BRIDGES—(Continued).

Steel Railway—under Standard Specifications." George H. Pegram. (With Discussion.) XV, 85 (1886).

"Friction Rollers." C. L. Crandall and A. Marston. XXXII, 99 (1894). Discussion, XXXII, 127, 270.

"General Criterion for Position of Loads Causing Maximum Stress in any Member of a Bridge, Truss." L. M. Hoskins. (With Discussion.) XLII, 240 (1899).

"General Methods for the Calculation of Statically Indeterminate—as Used in the Check Calculations of Designs for the Manhattan Bridge and the Blackwell's Island Bridge, New York." Frank H. Cilley. LIII, 413 (1904).

"General Suggestions as to the Conditions

Cilley. Lill, 413 (1904).

'General Suggestions as to the Conditions
Proper to be Required in Ordinary Iron
Highway Bridge Construction." J. A. L.
Waddell. XII, 459 (1883).

Waddell. XII, 459 (1883).

Harlem River Bridge, Manhattan Elevated
Railways. LXXXII, 605, 682 (1918).

Harlem River End-Lift Bridge, XXXIII,

Harlem River End-Bit 37 (1895).

"Harper's Ferry Improvement." William Lee Sisson. XXXII, 351 (1894).

Highway and railroad—crossing Sunnyside Yard, Pennsylvania Railroad Terminal, New York. LXIX, 138 (1910).

"Highway—." James Owen. (With Dis-

minal, New York, LXIX, 138 (1919).
"Highway —" James Owen. (With Discussion.) XI, 277 (1882).
"Historical Sketch of the Successive Improvements in Suspension—to the Present Time." Charles Bender, I, 27 (1879). (1872).

Present Time." Charles Bender. I, 27 (1872).

"History of Little Rock Junction Railway Bridge, of the St. Louis, Iron Mountain and Southern Railway Company, Over the Arkansas River at Little Rock, Arkansas, 1883-1914." C. E. Smith. (With Discussion.) LXXIX, 1 (1915).

Injury to St. Louis Bridge by tornado. XXXVII, 229 (1897).

"Inspection and Maintenance of Railway Structures." A Discussion. John A. Wilson, Willard S. Pope, George H. Pegram, G. Bouscaren, W. S. Lincoln, Joseph M. Wilson, James G. Dagron, J. A. L. Waddell, Edward S. Philbrick, A. Bryson, Robert A. Shailer, W. A. Haven, John M. Goodwin, Albert Luctus, E. P. Dawley, C. A. Marshall. D. J. Whittemore, Theodore Cooper, H. Stanley Goodwin, A. M. Wellington, Percival Roberts, Jr., C. C. Schneider, C. Frank Allen, John Bogart, Frederic Graff, Robert I. Sloan, J. Foster Flagg, J. J. R. Croes, William Kent, Robert Moore, and William J. McAlpine. XVII, 259 (1887).

"Inspectors and Bridge Work." Samuel (1887).

"Inspectors and Bridge Work." Samuel Tobias Wagner. (With Discussion.)

Tobias Wagner. (With Discussion.) XVII, 318 (1887). "Insufficient Provision for Counterstresses in Railroad —." Henry S. Prichard. (With Discussion.) XLII, 547 (1899). Intensities of working stresses. XXVI, 98

(1892).

"Kinetic Effects of Crowds." C. J. Tilden.
LXXVI, 2107 (1913). Discussion: Frazer
C. Hilder, Henry H. Quimby, R. D.
Coombs, and J. B. French, LXXVI, 2127.
Lift rail and rail-locking device Hackensack Draw-Bridge, Pennsylvania Railroad. LXVII, 81 (1910).

Lift-rail for Dumbarton Point Draw-Bridge.
LXXVI, 1618 (1913).

"Live Loads for Railroad —." Henry W.
Hodge. (Inter. Eng. Cong. 1904.) LIV,
Part A. 79 (1905). Discussion: Alexander Ross, Gustav Lindenthal, Robert
Moore, J. E. Greiner, C. D. Purdon, (1892).

W. M. Camp, Charles S. Churchill, Albert

W. M. Camp, Charles S. Churchill, Albert Reichmann, J. M. Johnson, and A. F. Robinson, LIV, Part A, 87.

"Loadings for Railroad—." An Informal Discussion. Henry W. Hodge, J. W. Schaub, Emil Swensson, Theodore Cooper, and A. J. Himes, LI, 105 (1903).

"Loads and Strains of—." John Griffen and Thomas C. Clarke. II, 93 (1873).

Mattress pier protection at Memphis Bridge. XXXV, 230 (1896).

"Maximum Stresses in Bascule Trusses."

"Maximum Stresses in Bascule Trusses."
W. Watters Pagon. LXXVI, 73 (1913).
"Mexican Bridge Construction." J. Foster

"Mexican Bridge Construction." J. Foster Flagg, XV, 345 (1886). "Movable —." C. C. Schneider. (With Dis-cussion.) LX, 258 (1908). "New Transfer Bridge, Harsimus Cove. Jersey City, N. J." J. A. Bensel. (With Discussion.) XIX, 309 (1888). New York City —, Brief description of. LXXVI, 1727 (1913).

Niagara Suspension Bridge, History of. XL, 125 (1898).

Nickel Steel for—" J. A. L. Waddell.
LXIII, 101 (1909). Discussion: Charles
Evan Fowler, M. F. Brown, H. P. Bell.
L. J. Le Conte, W. K. Hatt. John C.
Ostrup, T. Claxton Fidler, Robert E.
Johnston, Albert Lucius, G. Lindenthal,
Henry S. Prichard, Henry Le Chatelier,
A. Ross, L. Dumas, Victor Prittie Perry,
W. H. Warren, William R. Webster,
William H. Breithaupt, E. A. Stone, C.
Codron, W. W. K. Sparrow, B. J. Lambert, William Marriott, Henry Rohwer,
Samuel Tobias Wagner, A. W. Carpenter, Leon S. Moisseiff, James C. Hallsted, F. Arnodin, Wilson Worsdell, and
William F. Pettigrew, LXIII, 300.
"Notes on Bridgework." S. Vilar v Boy,
LXXVI, 241 (1913). Discussion: W. J. C.
Howalt, and William P. Parker, LXXVI,
249.

"Notes on Early Practice in Bridge Building," George E. Gray (With Discussion.) XXXVII, 1 (1897).

"Notes on the Erection of the Illinois and St. Louis Bridge." Theodore Cooper. III, 239 (1874). Discussion, IV, 205 (1875). "Notes on the Masonry of the East River Bridge." Francis Collingwood. VI, 7

"Notes on the Replacing of the Superstructure of the Harlem Ship Canal Bridge," Horace J. Howe. LXVII, 1 (1910). Discussion: Lincoln Bush, Martin Gay, St. John Clarke. Theodore Belzner, and Frank W. Skinner, LXVII, 23.
"Observations on the Forth Bridge." Charles E. Emery. (With Discussion.)

XXII, 409 (1890).

"Obstruction of Bridge Piers to the Flow of Water." Floyd A. Nagler. (With Dis-cussion.) LXXII, 334 (1918). "On a New Method of Detecting Overstrain

in Iron and Other Metals, and on its Application in the Investigation of the Causes of Accidents to—and Other Con-structions." Robert H. Thurston. VII, 53 (1878).

"On a New Principle in the Theory of Structures." George F. Swain, LXXXIII, 622 (1919-20). Discussion: C. W. Hudson, Edward Godfrey, Irving P. Church, John I. Parcel, L. J. Mensch, F. E. Turneaure, G. A. Maney, William H. Burr, A. C. Janni, H. T. Eddy, and William Cain, LXXXIII, 639.

BRIDGES—(Continued).

On an Economical and Efficient Railroad Bridge Floor." W. Howard White. XII,

451 (1883).
"On Skew —, and on the Construction of Falls Skew Bridge over the Schuylkill, near Philadelphia." J. Dutton Steele.

near Philadelphia." J. Dutton Steele.
I, 209 (1872).
"On Specifications for Strength of Iron—."
Joseph M. Wilson. XV, 389 (1886). Discussion, XV, 415; XVI, 33 (1887).
"On the Calculation of the Stresses in—
for the Actual Concentrated Loads."
George Fillmore Swain. XVII, 21 (1887).
"On the Care and Maintenance of Iron—."
Henry D. Blunden. (With Discussion.)
XI, 418 (1882).
"On the Designing and Erection of the

on the Designing and Erection of the Oakley Arch. A Full Centered Oblique Construction of Extreme Skew, to Carry a Railway Embankment over Another Double Track Railway." J. Foster Crowell. (With Discussion.) XXIII, 155 "On (1890),

"On the Mode of Underpinning Adopted for the Croton Lake Bridge, N. Y. C. & N. R. R., during the Repairs to the Masonry Piers." Alfred P. Boller. XI, 150 (1882).

150 (1882).

"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving Drawbridges Having Two Spans or Openings, and Built as Continuous Girders, more especially as Continuous Panel Girders," Clemens Herschel. III, 395 (1874). Discussion, IV, 202 (1875). 203 (1875).

"On the Use of Cast Iron for Compressive Members of Iron -." F. C. Lowthorp.

Members of Iron —." F. C. Lowthorp. I, 228 (1872).

"On Truss Bridge Building." S. Whipple. I. 239 (1872).

"Painting of Iron Structures Exposed to Weather." E. Gerber. (With Discussion.) XXXIII, 485 (1895).

"Painting the Louisville and Jeffersonville Bridge." O. E. Selby. (With Discussion.) XXXIX, 19 (1898).

Plate girder proportioning. XXVI, 106 (1892).

"Probable Wind December 1988.

(1892).

(1892).

(1892).

(1892).

(1892).

(1892).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

(1893).

ist River (1880)

(1880).

"Progress Report of Special Committee on Steel Columns and Struts." (With Discussion.) LXVI, 401 (1910).

Proposed design for lower Thames River Bridge. LXXXIII, 51, 56 (1919-20).

Proposed design for North River Bridge, New York City. LXXXIII, 57 (1919-20).

Protecting — XLVIII, 516 (1902).

"Rebuilding of the Monongahela Bridge, at Pittsburgh, Pa." G. Lindenthal. (With Discussion.) XII, 353 (1883).

"Recent Tests of Bridge Members." J. E. Greiner. (With Discussion.) XXXVIII, 41 (1897).

(1897).

41 (1897). "Reconstruction of the Norfolk and Western Railway Company's Bridge Over the Ohio River at Kenova, West Virginia." William G. Grove and Henry Taylor. LXXIX, 411 (1915). Discussion: C. H. Cartilidge, T. Kennard Thomson, F. W. Skinner, and L. L. Jewel, LXXIX, 483.

BRIDGES—(Continued).

"Red Rock Cantilever Bridge: Foundations." S. M. Rowe. XXV. 662 (1891);
"General Specifications." S. W. Robinson. XXV. 697: "Superstructure." Henry H. Quimby. XXV, 704. With Discussion.
"Reinforced Concrete Bridge Across the Almendares River, Havana. Cuba." Eugene Klapp and W. J. Douglas. LXXIV, 216 (1911). Discussion: L. J. Mensch, G. B. Strickler, and William Barclay Parsons, LXXIV, 241.
"Relative Quantities of Material in—of Different Kinds, of Various Heights." Charles E. Emery. VI, 235 (Section I) (1877): VI. 277 (Section II).
"Remarks on the Causes of Fall of the Western Arched Approach to the South Street Bridge, Philadelphia." (Discussion on Paper No. 171, vol. VII, p. 264.) J. G. Barnard. IX, 319 (1880).
"Replacing the Stone Towers of the Niagara Railway Suspension Bridge, with Iron Towers." L. L. Buck. XVII, 204 (1887).

204 (1887).

with Fron Towers. L. L., Buck. Avii, 204 (1887).

"Restoration of the Cable Ends of the Covington and Cincinnati Suspension Bridge." G. Bouscaren. XXVIII, 47 (1893). Discussion. XXVIII, 358.

"Revision of the Niagara Railway Arch Bridge." Charles Evan Fowler. (With Discussion.) LXXXIII, 1919 (1919-20).

"Some Disputed Points in Railway Bridge Designing." J. A. L. Waddell. (With Discussion.) XXVI, 77 (1892).

"Some Experiments on—under Moving Train Loads." F. E. Turneaure. (With Discussion.) XLI, 410 (1899).

"Some Observations on Trusses and Trussed Arches. T. Willis Pratt. I, 346 (1872). Specifications for cantilever highway bridge at Cincinnati, O. XXVII, 194 (1892).

Specifications for Cincinnati and Covington Bridge. XXIII, 61 (1890).

Specifications for material for—. XXXIII,

Specifications for material for -. XXXIII, 16 (1895)

16 (1895).

"Specifications for Metal Railroad — Movable in a Vertical Plane." B. R. Leffler. (With Discussion.) LXXVI. 370 (1913).

Specifications for the Design of — and Subways." Henry B. Seaman. LXXV. 313 (1912). Discussion: S. W. Bowen, Victor H. Cochrane. Albert I. Frye. F. W. Gardiner. Almon H. Fuller, S. M. Swaab, J. B. French, and Charles E. Conover, LXXV. 353.

Specifications for the steel railroad—."

LXXV. 353.

Specifications for the steel railroad—."
XLI, 154, 257 (1839).

"Specifications for the Strength of Iron—,"
(Discussion on Paper No. 335, Vol. XV,
p. 389.) J. A. L. Waddell. (With Discussion.)

XVI, 33 (1887).

"Steel Centering Used in the Construction
of the Rocky River Bridge, Cleveland,
Ohio." Wilbur J. Watson. (With Discussion.)

LXXIV, 1 (1911).

"Steel-Concrete Construction." An Informal Discussion. R. S. Buck and others.
XLVI, 93 (1901).

mal Discussion. R. S. Buck and others. XLVI, 93 (1901). Gress Measurements on the Hell Gate Arch Bridge," D. B. Steinman. LXXXII, 1040 (1918). Discussion: H. J. Bingham Powell, J. A. L. Waddell, F. H. Frankland, L. A. Waterbury, F. D. Hughes, A. H. Fuller, James E. Howard, Isidore Delson, Gustav Lindenthal, John I. Parcel, H. M. MacKay, F. E. Turneaure, Henry S. Jacoby, O. H. Ammann, C. A. Randorf, and David A. Molitor. LXXXII, 1077.

"Stresses in -. " William H. Booth. XX,

137 (1889).

BRIDGES-(Continued).

"Stresses in Railway — on Curves." Ward Baldwin. (With Discussion.) XXV, 459 (1891)

"Substructure of Piscataquis Bridge, and Analysis of Concrete Work." G. A. Hersey. LXI, 377 (1908). Discussion: George B. Francis, James H. Brace, A. L. Bowman, James Owen, and James C. Boyd, LXI, 383.
"Suspension—: A Study." George S. Morison. (With Discussion.) XXXVI, 359 (1896).

(1896).

Table giving dimensions Table giving dimensions of the principal transportation —. LXXVIII, 255 (1915). Table giving principal — of the world over

Table giving principal—of the world over waters frequented by seagoing vessels. LXXVIII, 258 (1915).

"Temperature Stresses in a Series of Spans." Tresham D. Gregg. LXXX. 1626 (1916). Discussion: Charles W. Martin. LXXX, 1642.

"Tests of Built-Up Steel and Wrought-Iron Compression Pieces." Artnur N. Talbot and Herbert F. Moore. (With Discussion.) LXV, 202 (1909).

Tests of full size bridge members, XXI, 53 (1889).

53 (1889).

Tests of Sibley Bridge members. XXI, 126 (1889).

126 (1889).

"The American Railroad Viaduct: Its Origin and Evolution." J. E. Greiner. (With Discussion.) XXV, 349 (1891).

"The Arch Principle in Engineering and Esthetic Aspects, and Its Application to Long Spans." C. R. Grimm. LXXI, 233 (1911). Discussion: Max M. Miller, Leon S. Moisseiff, Fr. Engesser, R. Krohn, R. S. Buck, Ernst Jonson, Gustay Lindental, and Paul Chapman. tay Lindenthal, and Paul Chapman, LXXI, 249.

"The Bridge over the Tennessee River at Johnsonville, Tennessee." Hunter Mc-Johnsonville, Tennessee." Hunter Mc-Donald. (With Discussion.) XXXIII,

171 (1895).

171 (1895).

"The Cantilever Bridge at Niagara Falls."
Charles C. Schneider. (With Discussion.) XIV, 499 (1885).
"The Cantilever Highway Bridge at Cincinnati." Gustave Kaufman and F. C. Osborn. XXVII, 173 (1892).

"The Cherry Street Bridge. Toledo. Ohio." Clement E. Chase. LXXX, 744 (1916) Discussion: Edward Godfrey, and James Ritchie, LXXX, 792.
"The Construction of the Bridge over the

"The Construction of the Bridge over the Arkansas River, at Van Buren, Arkansas." C. D. Purdon. (With Discussion.) XX, 151 (1889).
"The Construction of the Poughkeepsie Bridge." John F. O'Rourke. XVIII, 199

(1888).

"The Continuous Girder as a Tipper."
C. H. Lindenberger, XXVI, 469 (1892).
"The Continuous Superstructure of the Memphis Bridge," George S. Morison.
XXIX, 573 (1893). Discussion, XXX, 559 (1893).

"The Design and Construction of Four Reinforced Concrete Viaducts at Fort Worth. Texas." S. W. Bowen. (With Disenssion.) LXXVIII, 1206 (1915).

Discussion.) LXXVIII, 1206 (1915).

"The Determination of the Safe Working Stress for Railway—of Wrought Iron and Steel." E. Herbert Stone. (With Discussion.) XLI, 467 (1899).

"The Development and Recent Improvement of Coucrete-Iron Highway—." Fr. von Emperger. (With Discussion.) XXVI. 438 (1894).

von Emperger. (With Discussion.) XXXI. 438 (1894). "The Economics of Steel Arch —." J. A. L. Waddell. LXXXIII, 1 (1919-20). Dis-

cussion: Paul A. Blackwell, T. Kennard Thomson, Charles Evan Fowler, W. B. Farr, Horatio P. Van Cleve, Henry S. Jacoby, H. S. Sales, David A. Molitor, Edward W. Stoney, and F. H. Frankland. LXXXIII, 42.

"The Effects of Straining Structural Steel and Wrought Iron." Henry S. Prichard. (With Discussion.) LXXX, 1429 (1916).

"The Evolution of the Practice of American Bridge Building." Presidential Address at the Annual Convention at Cleveland, Ohio, June 20th. 1905. Charles C. Schneider. LIV, 213 (1905).

"The Exact Design of Statically Indeterminate Frameworks. An Exposition of its Possibility, but Fufility." Frank H. Cilley. (With Discussion.) XLIII, 353 (1906). cussion: Paul A. Blackwell, T. Kennard

(1900)

The Ferry Bridge Across the Ship Canal at Duluth, Minnesota," C. A. P. Turner.

at Duluth, Minnesota," C. A. P. Turner, LV, 322 (1905).

"The Footbridge for Building the Cables of the New East River Bridge." Isaac Harby. XLIX, 165 (1902). Discussion: W. Hildenbrand. XLIX, 180.

"The Halsted Street Lift Bridge." J. A. L. Waddell. (With Discussion.) XXXIII, 1 (1805).

(1895)

"The Hell Gate Arch Bridge and Approaches of the New York Connecting Railroad over the East River in New York City." O. H. Ammann. LXXXII, 852 (1918). Discussion: W. H. Breithaupt, Leon S. Mosseiff, Samuel T. Wagner, Charles Evan Fowler, Henry H. Quimby, Henry B. Seaman Gustav Lindenthal, and Clement E. Chase, LXXXII, 1005 1005.

"The Kentucky and Indiana Bridge." Mace Moulton. XVII, 111 (1887). Discussion, XVII. 169.

"The Kinzua Viaduct of the Erie Railroad Company." C. R. Grimm. (With Discussion.) XLVI, 21 (1901).
"The Launhardt Formula, and Railroad Bridge Specifications." Henry B. Seaman. (With Discussion.) XLI, 140 (1899)

(1899).

"The 'Light Railways' of the Battle Front in France." Frank G. Jonah (With Discussion.) LXXXIII. 1220 (1919-20).

"The Marent Guleh Viaduct." George S. Morison. XXV. 305 (1891).

"The Merchants' Bridge Terminal Railway Viaduct at St. Louis. Mo." Robert Moore. XXXI, 500 (1894).

"The New Portage Bridge." George S. Morison. V, 1 (1876). Discussion, V, 235.

"235. "The Niagara Railway Arch." R. S. Buck. (With Discussion.) XL. 125 (1898). "The Picaza Bridge." (Reinforced Concrete). A. A. Agramonte. LXXX, 200

(1916)

(1916).

"The Pittsburg and Lake Eric Railroad Cantilever Bridge Over the Ohio River at Beaver. Pa." Albert R. Raymer. LXXIII. 136 (1911). Discussion: C. W. Hudson, Henry S. Prichard, Albert B. Hager, F. W. Skinner, A. W. Carpenter, and Albert Lucius. LXXIII. 166.

"The Possibilities in Bridge Construction by the Use of High-Alloy Steels." J. A. L. Waddell. LXXVIII. 1 (1915). Discussion: M. J. Butler, Albert Lucius, Henry W. Hodge, Charles Evan Fowler, L. J. Le Conte, N. Petinot, Leon S. Moisseiff, F. W. Skinner, E. L. Corthell, W. H. Warren, David A. Molitor, Sir Bradford Leslie, John C. Fergusson, V. E. de B. de Broë, M. Séjourné, George

BRIDGES-(Continued).

L. Norris, and J. W. Richards, LXXVIII, 39.

"The Railway Pile and Pontoon Bridge Across the Mississippi River at Prairie du Chien, Wis." John Lawler. (With Discussion.) XIII, 67 (1884).
"The Reconstruction of a Portion of the Substructure of the Johnsonville Bridge." Walter H. Gahagan. (With Discussion.) XXXI, 587 (1894).
"The Reconstruction of Grand River Bridge." W. A. Rogers. (With Discussion.) XXXVI, 341 (1896).
"The Reconstruction of the Baltimore and Ohio Railroad Bridge over the Ohio River, at Benwood, West Virginia." J. E. Greiner. LV, 146 (1905). Discussion: O. E. Hovey, LV, 156.
"The Re-enforcement of the Anchorage and Renewal of the Suspended Superstruc-

"The Re-enforcement of the Anchorage and Renewal of the Suspended Superstructure of the Niagara Railroad Suspension Bridge." L. L. Buck. X. 195 (1881). "The Reinforced Concrete Bridge Across the Hudson River at Sandy Hill. New York." William H. Burr. LIX, 195 (1907). Discussion: Henry H. Quimby. C. L. Slocum. D. W. Krellwitz, and E. W. Stern. LIX. 203. "The River Spans of the Cincinnati and Covington Elevated Railway. Transfer and Bridge Company." William H. Burr. (With Discussion.) XXIII, 47 (1890).

(1890).

Burr. (With Discussion.) AXIII, 41 (1890).

"The St. Croix River Bridge." C. A. P. Turner. LXXV, 1 (1912).

"The Sewickley Cantilever Bridge Over the Ohio River." A. W. Buel. (With Discussion.) LXXVI, 582 (1913).

"The Sibley Bridge." O. Chanute, John F. Wallace and W. H. Breithaupt. XXI, 97 (1889). Discussion. XXI, 130, 608.

"The Sinking of the Piers for the Grand Trunk Pacific Bridge at Fort William, Ontario, Canada." H. L. Wiley. (With Discussion.) LXII, 113 (1909).

"The Sixth Street Viaduet, Kansas City." E. E. Howard. (With Discussion.) LXV, 42 (1909).

"The Stability of Loaded Masonry Arches." Arthur S. C. Würtele. (With Discussion.) XXIII, 1 (1890).

"The Stiffening System of Long-Span Suspension—for Railway Trains." Joseph Mayer. (With Discussion.) XLVIII, 371 (1902).

371 (1902). "The Substructure of Marsh River Bridge."

"The Substructure of Marsh River Bridge."
Herbert J. Wild. (With Discussion.)
LII, 451 (1904).
"The Theorem of Three Moments." J. P. J.
Williams. LXXVI, 785 (1913). Discussion: Milo S. Ketchum. LXXVI, 807.
"The Twelfth Street Trafficway Viaduct,
Kansas City, Missouri." E. E. Howard.
(With Discussion.) LXXX, 484 (1916).
"The Use of Steel for —." Theodore Cooper.
VIII, 263 (1879). Discussion, VIII, 277;
IX, 315 (1880).
"The Utica Lift Draw Bridge." Squire
Whipple. III, 190 (1874). Discussion,
III, 194; IV, 203 (1875).
"The Water-Proofing of Solid Steel-Floor
Railroad —." Samuel Tobias Wagner.
(With Discussion.) LXXIX, 306 (1915).
"The Weehawken Elevators and Viaduct."

(With Discussion.) LXXIX, 306 (1915).

"The Weehawken Elevators and Viaduct."

Thomas E. Brown, Jr., and George H.
Blakeley, XXVII, 1 (1892).

"Theory and Formulas for the Analytical
Computation of a Three-Span Suspension
Bridge with Braced Cable." Leon S.
Moisseiff, LV, 94 (1905). Discussion:
I. P. Church, and George F. Swain, LV,
114

BRIDGES-(Continued).

"Thin Floors for —," Albert F. Robinson, XXVII, 483 (1892). Discussion, XXVII, 500, 680.

"Three-Hinged Masonry Arches: Spans Especially Considered." David A. Molitor. (With Discussion.) XL, 31 (1898).

"Train Loadings for Railroad -." Theo-dore Cooper. (With Discussion.) XXXI,

174 (1894)

Uniform loads vs engine concentrations.
 XXVI, 78 (1892).
 "Upright Arched —." James B. Eads. III,

42 (1887).

"Vibration, or the Effect of Passing Trains on Iron -, Masonry and other Struc-

"Vibration, or the Effect of Passing Trains on Iron —, Masonry and other Structures." James L. Randolph. (With Discussion.) XII, 444 (1883). "Walnut Lane Bridge, P hila delphia." George S. Webster and Henry H. Quimby. LXV, 423 (1909).
"Web Strains in Simple Trusses with Parallel or Inclined Booms." Elnathan Sweet, Jr. IX, 415 (1880). Discussion, X, 20 (1881).
"What is the Life of an Iron Railroad Bridge?" J. E. Greiner. (With Discussion.) XXXIV, 294 (1895).
"Wheel Concentrations and Fatigue Formulas in Bridge Design." An Informal Discussion. Gustav Lindenthal. Palmer C. Ricketts, W. A. Doane, George S. Morison. W. L. Cowles. E. M. Scofield, Henry B. Seaman. J. P. Snow. Edwin Thacher. J. A. L. Waddell. O. E. Selby. Henry S. Prichard. Charles B. Wing, and Edgar Marburg. XLII, 189 (1899).
"Wind Pressure against —." Ashbel Welch. (With Discussion.) IX, 291 (1881).
See also ACCIDENTS: ANCHORAGE:

See also ACCIDENTS: ANCHORAGE: BEAMS: CAISSONS: COLUMNS: EYE-FOUNDATIONS: MASONRY: BARS: STRUTS.

BRINE.

"One Way of Obtaining —." Charles B. Brush. (With Discussion.) XXIII, 95 (1890).

BRONZES.

"Strength and Ductility of the Copper-Tin-Zinc Alloys." Robert H. Thurston. X, 309 (1881).

"The Strongest of the —. A Newly Dis-covered Alloy of Maximum Strength." covered Alloy of Maximum Stre Robert H. Thurston. X, 1 (1881).

BUILDING LAWS.

Building laws. LIII, 1 (1904). "The Structural Design of Buildings." Charles C. Schneider. (With Discussion.) LIV, 371 (1905).

BUILDING STONE.

"Dimension Stone Quarrying: The Blasting Process." William L. Saunders. (With Discussion.) XXV, 501 (1891). "Experimental Tests of Building Stones." Robert G. Hatfield. II, 145 (1873). "Experiments on the Resistance of Stones to Crushing." C. B. Richards. II, 187 (1873).

(1873).

BUILDING STONE—(Continued).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Her-bert M. Wilson. (With Discussion.)

Structural Structural Structural Structural Structural LXX, 190 (1910).

"Nomenclature of Building Stones and of Stone Masonry." Report of the Committee, VI, 297 (1877). Discussion, VII,

Stone Masonry." Report of the Committee. VI, 297 (1877). Discussion, VII, 284 (1878).

"Notes upon Testing Building Stones." F. Lynwood Garrison. (With Discussion.) XXXII. 87 (1894).

"Selection of Stone for Masonry." George R. Eichbaum. II, 167 (1873). Stone and tests of stone used in the construction of the Pennsylvania Avenue Subway. XLVIII, 486, 506, 563 (1902).

Stone in comparison with concrete. LXXVII, 695 (1914).

"The Cause and Prevention of the Decay of—." Thomas Egleston. (With Discussion.) XV, 647 (1886).

"The Disintegration of the Egyptian Obelisk in the Central Park, New York." Thomas Egleston. XV, 79 (1886).

"The Relative Effects of Frost and the Sulphate of Soda Efforescence Tests on Building Stones." Lea McI. Luquer. (With Discussion.) XXXIII, 235 (1895).

BUILDINGS.

"Agreements for Building Contracts." William B. Bamford. (With Discussion.) LXVII, 438 (1910).

"Can — be Made Fire-Proof?" Corydon T. Purdy. (With Discussion). XXXIX, 121

Purdy. (With Discussion). XXXIX, 121 (1898).

(Cinder Concrete Floors." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914).

(Concerning Foundations for Heavy—in New York City." Charles Sooysmith. (With Discussion.) XXXV, 459 (1896).

(Economy in Rectangular Panels, Using Beams of Constant Cross-Section." J. S. Branne. LXXIV. 166 (1911). Discussion: E. G. Walker, LXXIV, 175.

("Effect of Earthquake Shock on High—." R. S. Chew. LXI, 238 (1908). Discussion: Guy B. Waite. E. G. Walker, and Eugene W. Stern, LXI, 246.

Fire protection in high—. XLIV, 460 (1900).

("Fire-Resistant Construction of—." An In-

Fire protection in high—XLIV, 460 (1900).
"Fire-Resistant Construction of—"An Informal Discussion. Herbert M. Wilson and others. LXV, 274 (1909).
"Foundations for the New Singer Building, New York City." T. Kennard Thomson. (With Discussion.) LXIII, 1 (1909).
"Height of—"An Informal Discussion. Corydon T. Purdy. Reginald Pelham Bolton, Robert W. Hunt, W. E. Riley, H. de B. Parsons, R. J. Gifford Read, Oscar J. Kirby, John F. Wallace, Maurice M. Sloan, and William Copeland Furber. XLIV, 449 (1900).
"Kinetic Effects of Crowds." C. J. Tilden. (With Discussion.) LXXVI, 2107 (1913).

(1913).

dechanical Installation in the Modern Office Building," Charles G. Darrach. XLVIII, 1 (1902). Discussion: Robert C. Clarkson, John W. Hill, William Cope-"Mechanical land Furber, and Reginald Pelham Bolton. XLVIII, 17.

New York City public and semi-public—
Brief description of. LXXVI, 1744

(1913).

"Notes on the Guatemala Earthquakes, and Earthquake - Proof Construction." S. Vilar y Boy. (With Discussion.) LXXXIII, 1689 (1919-20). "On a New Principle in the Theory of

BUILDINGS—(Continued).

Structures." George F. Swain. (With Discussion.) LXXXIII, 622 (1919-20).
"Recent Developments in Pneumatic Foundations for _" D. A. Usina. (With Discussion.) LXI, 211 (1908).

"Report on Cause and Correction of Foun-

"Report on Cause and Correction of Foundation Troubles of Box Factory at Natchez, Mississippi." C. E. Smith. (With Discussion.) LXXXIII, 1289 (1919-20).
"Rust; As Shown in the Removal of a Seventeen-Story Building." T. Kennard Thomson. LXXI, 200 (1911). Discussion; E. L. Verreer, A. W. Carpenter, F. Lavis, S. M. Purdy, R. A. MacGregor, J. B. French, and F. W. Gardiner, LXXI, 202

Specifications for structural work of—.
LIV, 371 (1905).

"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat Slab Floors." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).

"Steel Stresses in Flat Slabs." H. T. Eddy. (With Discussion.) LXXVII, 1338 (1914).

"Tests of Fire-Proof Flooring Material."
George Hill. XXXIV, 542 (1895). Discussion. XXXV, 125 (1896).

"The Collapse of a Building during Construction." H. de B. Parsons. LIII, 1 (1904). Discussion: Nathaniel Roberts, C. J. Tilden, F. T. Llewellyn, James P. Whiskeman, Guy B. Waite, C. C. Schneider, Oscar Lowinson, H. P. Macdonald, J. H. O'Brien, and George A. Just, LIII, 10.

"The Economical Design of Reinforced."

"The Economical Design of Reinforced Concrete Floor Systems for Fire-Resisting Structures." John S. Sewell. (With Discussion.) LVI, 252 (1906).
"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of of the San Francisco Association of Members of the American Society of Civil Engineers. (With Discussion.) Civil Enginee LIX, 208 (1907).

"The Failure and Righting of a Million-Bushel Grain Elevator." Alexander Al-laire. (With Discussion.) LXXX, 799

"The Foundations of the New Capitol at Albany, N. Y." William J. McAlpine. II, 287 (1873).

Abany, N. Y." William J. McAlpine. II, 287 (1873).

"The Iron Work for the Dome of the Proposed Government Building, World's Columbian Exposition. Chicago, III." James C. McGuire. XXVI, 1 (1892).

"The New York Tunnel Extension of the Pennsylvania Railroad. Certain Engineering Structures of the New York Terminal Area." George B. Francis and Joseph H. O'Brien. LXIX, 152 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs. LXIX, 226, 434 (1910).

"The Reinforced Concrete Work of the McGraw Building." William H. Burr. (With Discussion.) LX, 443 (1908).

"The Structural Design of —." Charles C. Schneider. LIV, 371 (1905). Discussion. W. B. W. Howe, Charles Worthington, J. R. Worcester, Joseph H. O'Brien, Henry B. Seaman, Augustus Smith, R. D. Coombs, Jr., F. T. Llewellyn, Theodore Cooper, Henry W. Post, Gunvald Aus, J. K. Freitag, Virgil H. Hewes, L. J. Johnson, H. P. Macdonald, E. P. Goodrich, M. S. Ketchum, George H.

BUILDINGS—(Continued).

Blakeley, John B. Clermont, Oscar Lowinson, Eugene W. Stern, Charles G. Darrach, E. C. Shankland, Foster Crowell, St. John Clarke, William W. Crehore, and C. A. I'. Turner, LIV, 413.

"The Theory of Frameworks with Rectangular Panels, and Its Application to Which Have to Resist Wind." Ernst F. Jonson. (With Discussion.) LV, 413 (1905).

"The Tower of the New City Hall at Philadelphia, Pa." C. R. Grimm. (With Discussion.) XXXI, 249 (1894).

"The Underpinning of Heavy—." Jules Breuchaud. With Discussion. XXXVII, 31 (1897). Blakeley, John B. Clermont, Oscar Low-

Breuchaud. With Discussion. XXXVII, 31 (1897).

"The Use of Reinforced Concrete in Engineering Structures." An Informal Discussion. E. P. Goodrich and others. LXI, 35 (1998).

"Underpinning the Cambridge Building. New York City." T. Kennard Thomson. (With Discussion.) LXVII, 553 (1910)

(1910).

"Underpinning Trinity Vestry Building for Subway Construction." H. de B. Par-sons. (With Discussion.) LXXXI, 74

sons. (With Discussion).

(1917).

"Wind Bracing in High—." Henry H. Quimby. (With Discussion.) XXVII, 221 (1892).

"Wind Bracing in High—." Guy B. Waite. (With Discussion.) XXVIII, 190 (1895).

"Wind Pressures in the St. Louis Tornado, with Special Reference to the Necessity of Wind Bracing for High—." Julius Baier. (With Discussion.) XXXVII, 221 (1897).

BULKHEAD WALLS.

See RETAINING WALLS.

BULKHEADS.

for protection of beaches. LXXX, 1800 (1916).

"The Use of Canvas in Water-Tight..."
M. Meigs. (With Discussion.) XXXI, 524 (1894).

BUOYS.

See LIGHTHOUSES.

CABLE RAILWAYS.

"Motive l'ower for Street Railways." Alfred F. Sears. XXVII, 313 (1892). Discussion, XXVII, 574.
"Notes on Cost of Operating—." D. Bontecou. XXVIII, 250 (1893). Discussion, XXVIII, 456.

"The Cable Railway on the New York and Brooklyn Bridge." G. Leverich. XVIII, 67 (1888).

"Transmission of Power in Operating —."
Robert Gillham. XXIX, 543 (1893). Discussion, XXX, 548 (1893).

CABLES.

"A Simple Method of Computing Deflec-tions of a Cable Span Carrying Multiple Loads Evenly Spaced." F. C. Carstar-phen, LXXXIII, 1383 (1919-20), Discus-sion: William Hewitt and Edward B. Durham, LXXXIII, 1399, Eye-bar cable suspension bridges. LV, 1 and 94 (1905)

and 94 (1905).

and 94 (1905).

"Restoration of the Cable Ends of the Covington and Cincinnati Suspension Bridge." G. Bouscaren, XXVIII, 47 (1893). Discussion, XXVIII, 358.

"The Footbridge for Building the—of the New East River Bridge." Isaac Harby. (With Discussion.) XLIX, 165 (1902).

CABLEWAYS.

"A Simple Method of Computing Deflections of a Cable Span Carrying Multiple Loads Evenly Spaced." F. C. Carstarphen. (With Discussion.) LXXXIII, 1383

(With Discussion.) LXXXII, 1883 (1919-20).

"An Aerial Tramway for the Saline Valley Salt Company, Inyo County, California." F. C. Carstarphen. LXXXI, 709 (1917). Discussion: Richard Lamb, and H. F. Scholtz, LXXXI, 738 "Cableways." Spencer Miller. XXXI, 397 (1894)

(1894).

oused in construction of dam and power plant, Lock 12 Development, Alabama Power Company, LXXVIII, 1467, 1566

"Notes on Wire Rope Tramways." A. C. Savage. XXXII, 38 (1894).
"Steam and Electric—for Logging and Canal-Boat Towing." Richard Lamb. (With Discussion.) XXXII, 44 (1894).

CAISSONS.

"A Coffer Dam or Calsson without Timber or Iron in its Construction." Robert L. Harris. (With Discussion.) XXIV, 230 (1891).

"A Few Facts about the—of the East River Bridge." F. Collingwood. (With Discussion.) I, 353 (1872). "Caisson Disease and Its Prevention." Henry Japp. (With Discussion.) LXV,

(1909).

- at Johnsonville Bridge. XXXI, 591 (1894).

-, East River Tunnels, Pennsylvania Railroad. LXVIII, 426, 430 (1910).

- for shafts, Colorado River siphon.
LXXVII, 4 (1914).

of Cincinnati and Covington Bridge. XXIII, 53 (1890).

XXIII, 53 (1890).

— of East River Bridge. VI, 15 (1877).

— of Sibley Bridge. XXI, 108 (1889).

— used for Illinois and St. Louis Bridge at St. Louis. I, 259 (1872).

— used in construction of shafts for Pennsylvania Rallroad Tunnels, New York. LXIX, 63 (1910).

"Foundations for the New Singer Building, New York City." T. Kennard Thomson. (With Discussion.) LXIII, 1 (1909).

"Further Notes on the—of the East River Bridge." F. Collingwood. (With Discussion.) II, 119 (1872)

"Further Notes on the —of the East River Bridge." F. Collingwood. (With Discussion.) II, 119 (1873).
"History of Little Rock Junction Railway Brldge, of the St. Louis, Iron Mountain and Southern Railway Company, Over the Arkansas River at Little Rock, Arkansas, 1883-1914." C. E. Smith. (With Discussion.) LXXIX, 1 (1915).
Iron — at Hackensack and Passaic River Bridges. II, 9 (1873).
"Pneumatic Foundations." William Soov Smith. (With Discussion.) II, 411 (1873).

"Recent Developments in Pneumatic Foundations for Buildings." D. A. Usina. (With Discussion.) LXI, 211 (1908).

"Red Rock Cantilever Bridge: Founda-tions." S. M. Rowe. XXV, 662 (1891). "General Specifications." S. W. Robin-son. XXV, 697; "Superstructure." Henry H. Quimby. XXV, 704. (With Discussion.)

Sinking - for East River tunnels. LXIX,

391 (1910).

Sinking of—at Hawkesbury and Pough-keepsie Bridges. XXXIII, 186 (1895). Specifications for caisson for pier of Cin-cinnati Highway Bridge. XXVII, 218

(1892).

CAISSONS—(Continued).

"The Construction of the Bridge over the Arkansas River, at Van Buren, Arkansas," C. D. Purdon. (With Discussion.) XX, 151 (1889).
"The Removal of a Defective Pivot Pier, and its Reconstruction." Howard G.

"The Removal of a Defective Pivot Pier, and its Reconstruction." Howard G. Kelley, XXXI, 277 (1894).
"The Sinking of the Piers for the Grand Trunk Pacific Bridge at Fort William, Ontario, Canada." H. L. Wiley. (With Discussion.) LXII, 113 (1909).
"The Use of Compressed Air in Tubular Foundations and its Application at South Street Bridge, Philadelphia, Pa." D. McN. Stauffer. VII, 287 (1878). Discussion, VIII, 186 (1879).
Use of concrete and reinforced concrete in—. LIV, Part E, 136 (1905).

CAMPS.

Contractors' -, Lock 12 Development, Alabama Power Company. LXXVIII, 1462 (1915)

"Methods of Location on the Choctaw, Oklahoma and Gulf Railroad." F. Lavis. (With Discussion.) LIV, 104 (1905). Leonard S and Wastes Disposal for States Army." Leonard (With Discussion.) LXX 'Sewage United

LXXXIII, 337 (1919-20).

"The Sanitation of Construction -. " Harold Farnsworth Gray. (With Discussion.) LXXVI, 493 (1913). "Water Supply for the—. Cantonments,

Vater Supply for the —. Cantonments, and Other Projects Built by the Construction Division of the United States Army." Dabney H. Maury. (With Discussion.) LXXXIII, 481 (1919-20).

CANALS

"A Study of Economic Conduit Location."
C. E. Hickok. (With Discussion.)
LXXVII, 778 (1914).
"American Irrigation Engineering." Herbert M. Wilson. (With Discussion.) XXV,

161 (2891).

"An Alternative Line for the Nicaragua Canal; and a Proposed New Method of Dam Construction." J. Francis Le Baron. L. 23 (1903). Discussion: Alfred Noble, P. C. Hains, Edward P. North, L. M. Haupt, and Theodore Paschke, L. 39. "Artificial Waterways in Great Britain." W. Henry Hunter. (Inter. Eng. Cong. 1904.). LIV, Part F, 183 (1905). "Artificial Waterways in the United States." William L. Sibert. (Inter Eng. Cong. 1904). LIV, Part F, 255 (1905). Canal embankments. XXXIX. 208 (1898). Canal traction in France, XXIX, 22 (1893). — for irrigation, size, cost, etc. LXXXI, 237 et seq. (1917).

for irrigation, size, cost, etc. Exxx, 237 et seq. (1917).
"between the Lakes and New York." Joseph Mayer, XLV, 207 (1901). Discussion, XLV, 240.
"Cheap Transportation vs. Rapid Transit and Delivery." Martin Coryell. IX, 401 (1880).
Cheaper Canal, VI, 51 (1877).

Chenango Canal. VI, 51 (1877).
"Closing Breaks in—, under Difficulties."
O. T. Whitford. II, 161 (1873).
"Colorado River Siphon." George Schobinger. (With Discussion.) LXXVII, 1

(1914).

(1914).
Delaware & Hudson Canal and Railway,
Early history. VI, 44 (1877).
"Description of Survey for Determining
the Slope of Water Surface in the Eric
Canal." W. H. Searles. VI, 289 (1877).
"Early Surveys and Reports in Reference
to the Transmission of Trade across the
Allegheny Mountains in the State of

CANALS-(Continued).

Pennsylvania, known as the Allegheny Portage." Moncure Robinson, XV, 181 Portage.'

Countries." Len "Economic Canal Location in Uniform Countries." Lyman E. Bishop, LXXIV, 178 (1911). Discussion: H. J. Doolittle, C. E. Shipman, Sam G. Porter, and C. C. Williams, LXXIV, 189.
"Effect of Depth upon Artificial Waterways." Thomas C. Clarke. (With Discussion.) XXXV, 1 (1896).
Erie Canal, history of. VI, 39 (1877). "Hoisting Apparatus of the Canal Head-Gates at Sewall's Falls, N. H." John R. Freeman. (With Discussion.) XXXII. "Economic Location in Uniform

R. Freeman. (With Discussion.) XXXII, 278 (1894).

"Hydrology of the Panama Canal." Caleb Mills Saville. LXXVI, 871 (1913). Discussion: Henry L. Abbot and W. E. Fuller. LXXVI, 986.
"Ice Diversion, Hydraulic Models, and Hydraulic Similarity." Benjamin F. (With Discussion.) LXXXII. Groat. Groat. (With 1138 (1918). Influence of Panama Cana ports. LXXVI, 215 (1918).

Canal on Pacific

ports. LXXVI. 215 (1913).

"Inland Navigation in France." A. Charguéraud. (Translated from the French by Foster Crowell.) (Inter. Eng. Cong. 1904.) LIV, Part F, 235 (1905).

"Inland Transportation." F. A. Mahan. XXIX, 97 (1893). Discussion, XXX, 457

(1893).

and Prewitt Reservoir,

Inlet and outlet—, Frewitt Reality, Colo. LXXVII. 167 (1914).
"Inter-Oceanic Canal Projects." A. G. Menocal. VIII. 311 (1879). Discussion, IX, 1, 47, 87, 117, 429 (1880).
"XXIII. 224 (1890).

Irrigation — in India. XXIII. 224 (1890).
Lining of irrigation — LXXVI, 355 (1913).
"Natural Waterways: A Review of their
Development in the Netherlands." A. B.
Marinkelle. (Inter. Eng. Cong. 1904.)
LIV, Part D, 401 (1905).
"Navigation Works Fraguetation Fragueta

"Navigation Works Executed in France from 1876 to 1891." F. Guillain. (Trans-lated from the French by C. L. Cran-dall, assisted by C. W. Sherman.) XXIX,

1 (1893).

Net registered tonnage at Sault Ste. Marie, 1855-1899. XLV, 277 (1901).
"Notes on Projects for the North Sea Canal from 1629-1893." A Huet. XXX, 416 (1893).
"On Waves of Translation that Emanate

from a Submerged Orifice, together with an Examination of the Feasibility of the Proposed Raje Verte Canal. together of the Proposed Baie Verte Canal." Clemens Herschel. IV, 185 (1875). "Plant and Material of the Panama Canal." William Plumb Williams. XIX, 273

William

(1888).

ailroad Discrimination against New York, and the Remedy." Abel E. Black-mar. (With Discussion.) XLVI, 182 New "Railroad (1901).

"Rotating Screen of Power Canal, Salt River Project." F. Teichman. LX, 337 Salt (1908).

"Ship Canal Locks Calculated for Opera-tion by Steam," Ashbel Welch, IX, 293 (1880).

"Ship - in 1889." R. E. Peary. XXI, 59 (1889).

"Some Important Phases of Canal Navigation, Illustrated by Recent Experiments in Germany." Elnathan Sweet. XLVII,

435 (1902). "Some Notes on the Holland Dikes." William Starling. (With Discussion.) XXVI, 559 (1892).

CANALS-(Continued).

"Steam and Electric Cableways for Log-ging and Canal-Boat Towing." Richard Lamb. (With Discussion.) XXXII, 44 (1894).

"Surges in an Open Canal." R. D. Johnson. (With Discussion.) LXXXI, 112

(1917).

"The Bohio Dam." George S. Morlson.
(With Discussion.) XLVIII, 235 (1902).
"The Cape Cod Canal." William Barclay
Parsons. LXXXII, 1 (1918). Discussion:
Clemens Herschel and T. Kennard
Thomson, LXXXII, 144.
"The Development of the Commerce of the
Great Lakes." Presidential Address at
the Annual Convention at Asheville,
N. C., June 9th, 1903. Alfred Noble.
L, 327 (1903).
"The Distribution of Street

"The Distribution of Stresses in Mitering Lock-Gates, with Special Reference to the Gates on the Panama Canal." Henry Goldmark. LXXXI, 1621 (1917).

The distribution of stresses in mitering lock-gates with special reference to the gates on the Panama Canal. Discussion by David A. Molitor. LXXXII, 1469 (1918).

"The Economic Depth for — of Large Traffic." Joseph Mayer. (With Dis-cussion.) XXXIX, 273 (1898). Large

"The Economic Dimensions for a Water-

"The Economic Dimensions for a Waterway from the Great Lakes to the Atlantic." George Y. Wisner. (With Discussion.) XLV, 224 (1901).
"The Engineering Problems Involved in the Proposed Improvement of the Eric Canal by Increasing the Depth of the Channel One Foot." E. Sweet. IX, 99 (1880). Discussion, IX, 287.
"The Enlargement and Improvement of the North Sca Canal of Holland (Amsterdam Ship Canal)." A. E. Kempees. XXX, 386 (1893). Discussion, XXX, 712.
"The Gatun Dam." C. D. Ward. (With Discussion.) LIII, 36 (1904).
"The Improvement of a Portion of the Jordan Level of the Eric Canal." William B. Landreth. (With Discussion.) XLIII, 566 (1900).
"The Improvement of Three Holland Ship

nam B. Landreth. (With Discussion.) XLIII, 566 (1900).

"The Improvement of Three Holland Ship—". L. F. E. van Hoogenhuyze and J. A. de Lint. (Inter. Eng. Cong. 1904.)

LIV, Part F, 209 (1905).

"The North and East Sea Canal." J. Fülscher. (Translated from the German by Kenneth Allen.) XXX, 421 (1893).

"The Panama Canal." A. G. Menocal. LVI, 197 (1906). Discussion: George B. Francis, Theodore Paschke, and Clemens Herschel, LVI, 204.

"The Panama Canal." George S. Morison. L., 155 (1903). Discussion: M. Meigs. Theodore Paschke, C. L. Harrison, W. E. Cranc. Boyd Ehle, William H. Burr, P. Bunau-Varilla, and L. J. Le Conte, L. 185.

"The Production of Traffic and the Transportation of Freight and Passengers." Martin Coryell. (With Discussion.) II, 240 (1873).

240 (1873).

"The Proposed Lake Erie and Ohio River Ship Canal." John M. Goodwin. (With

"The Proposed Lake Eric and Ohio River Ship Canal." John M. Goodwin. (With Discussion.) XXV, 411 (1891).

"The Radical Enlargement of the Artificial Waterway between the Lakes and the Hudson River." E. Sweet. XIV, 37 (1885). Discussion, XIV, 43, 93.

"The Santa Ana Canal of the Bear Valley Irrigation Company." William Ham. Hall. XXXIII, 61 (1895). Discussion, XVVIII 587 XXXIII, 587.

CANALS-(Continued).

"The Shubenacadie Canal." E. H. Keat-

"The Shubenacadie Canal." E. H. Keating. XII, 436 (1883).
"The Three 15-Cubic Yard Dipper-Dredges, Gamboa, Paraiso, and Cascadas, as Supplied and Used on the Panama Canal." Ray W. Berdeau. (With Discussion.) LXXXII, 515 (1918).
"The Tleton Canal." E. G. Hopson. (With Discussion.) LXXXI, 158 (1911).
Tonnage on Erie, Suez and St. Mary's Falls —. XXXV, 13 (1896).
"Water-Power of the Falls of the Ohio River." Morris S. Belknap. (With Discussion.) II, 261 (1873).
"Water Supply for the Lock Canal at Panama." Julio F. Sorzano. LXVII, 61 (1910). Discussion: C. E. Grunsky, H. F. Hodges, Theodore Paschke, Allen Hazen, and C. M. Saville, LXVII, 91.

CANONS.

"Availability of the — of the Colorado River of the West for Railway Purposes." Robert Brewster Stanton. (With Dis-cussion.) XXVI, 283 (1892). "Bridging — Lengthwise." Howard V. Hinckley. XXVI, 521 (1892). — of the Rio Santa of Peru. XXVI, 333

(1892).

"The First Trip through Big Horn Cañon." E. Gillette. XXV, 8 (1891).

CANTILEVER BRIDGES.

Comparative designs of cantilever, continuous girder, and suspension types for Hell Gate Arch Bridge. LXXXII, 865 (1918).

865 (1918).

"Observations on the Forth Bridge."
Charles E. Emery. (With Discussion.)
XXII, 409 (1890).

"Red Rock Cantilever Bridge: Foundations." S. M. Rowe. XXV, 662 (1891);

"General Specifications." S. W. Robinson. XXV, 697; "Superstructure." Henry H. Quimby. XXV, 704. (With Discussion)

sion.)
Specifications for cantilever highway bridge
at Cincinnati, O. XXVII, 194 (1892).
"The Cantilever Bridge at Niagara Falls."
Charles C. Schneider. (With Discussion.) XIV, 499 (1885).
"The Cantilever Highway Bridge at Cincinnati." Gustave Kaufman and F. C. Osborn. XXVII, 173 (1892).
"The Construction of the Poughkeepsie Bridge." John F. O'Rourke. XVIII, 199 (1888).

Bridge." John F. O'Rourke. XVIII, 199 (1888).

"The Kentucky and Indiana Bridge." Mace Moulton. XVII, 111 (1887). Discussion, XVII, 169.

"The Pittsburg and Lake Erie Railroad Cantilever Bridge Over the Ohio River at Beaver, Pa." Albert R. Raymer. (With Discussion.) LXXIII, 136 (1911).

"The Sewickley Cantilever Bridge Over the Ohio River." A. W. Buel. LXXVI, 582 (1913). Discussion: L. J. Le Conte, Charles Worthington, Theodore A. Straub, C. W. Hudson, V. R. Covell, and Henry H. Quimby, LXXVI, 628.

See also BRIDGES.

CANTONMENTS. See CAMPS.

CANVAS.

"The Use of - in Water-Tight Bulkheads." M. Meigs. (With Discussion.) XXXI, 524 (1894).

CAR FEBRIES.

See FERRIES.

CAR WHEELS.

See WHEELS.

CARBON.

"— and its Uses in Electrical Engineering." Clarence M. Barber, XXIX, 680 (1893).

See ROLLING STOCK.

CARTRIDGE METAL.

"A Peculiar Phase of Metallic Behavior."
O. E. Michaelis. (With Discussion.)
XI, 429 (1882).

CASEMATES.

"Experiments on the Front or Shield of the Experimental Casemate at Fort Monroe." J. G. Barnard. I, 173 (1872).

CAST IRON.
"An Investigation to Determine the Strains in a Hollow — Disk, Cooled from the Interior." G. Leverich. XVIII, 43 (1888).

(1888).

"-: Strength Resilience, Tests and Specifications." J. B. Johnson. (With Discussion.) XXII, 91 (1890).

"External Corrosion of — Pipe." Marshall R. Pugh. (With Discussion.) LXXVIII, 806 (1915).

"Notes on Manufacture and Properties of Malleable —." H. R. Stanford. XXXIV, 1 (1895).

1 (1895)

1 (1895).

"On the Use of — for Compressive Members of Iron Bridges." F. C. Lowthorp. I, 228 (1872).

Relation between tenacity and resistance to torsion. VII, 169 (1878).

Resilience tests of — XXXIX, 237 (1898).

Some dimensions of — water pipe. LXXXIII, 207 (1019-20)

"Tables of the Strength of Columns."
Edwin Thacher. II, 294 (1873).
Tests of — II, 349 (1873); III, 1 (1874).
The use of — in building construction.
LIII, 1 (1994).

See also IRON.

CEMENT.

"American Natural —." F. O. Norton. IX, 278 (1880). Discussion, IX, 341.

Analyses of — for test specimens of con-

Analyses of — for test specimens of concrete to be Immersed in sea water. LXXXI, 652 (1917).

"Behavior of — Mortars under Various Contingencies of Use. With a Brief Discussion of Certain Tests, etc." F Collingwood. XIV, 491 (1885).

— as a preservative of metal. XXXIX, 33 1898).

1898).

-concrete pavement. LXXXII, 1391, 1407 (1918).

"Joints for Cast-Iron Water Mains."
Clark H. Shaw. (With Discussion.)
LXXXIII, 277 (1919-20).
—, mortar and concrete used in the Pennsylvania Avenue Subway. XLVIII, 488,

(1902).

- tests, etc., at Monterrey, Mexico. LXXII, 493 (1911).

493 (1911).
"Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry." Report of Progress of the Committee. XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).
Concrete and—tests. XXXI, 504 (1894).
Effect of sea water on—. LXXVI, 1026 (1913).

CEMENT—(Continued).

Effect of sea water upon—, mortar and concrete. LXI, 42 (1908).

"Experiments on Cements." Edmund Yardley. II, 153 (1873).

"Experiments with Appliances for Testing—." Alfred Noble. IX, 186 (1880).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).

"Final Report of the Special Committee on Uniform Tests of—." LXXV, 665 (1912).

(1912).

"Grouting Operations, Catskill Water Supply." James F. Sanborn and M. E. Zipser. (With Discussion.) LXXXIII,

Zipser. (With Discussion, 980 (1919-20).

"Hot Tests for Determining Change of Volume in Portland—." W. W. Maclay. (With Discussion.) XXVII, 412 (1892).

"Impervious Concrete." An Informal Discussion. R. W. Lesley and others. LI,

cussion. R. W. Lesley and others. Li, 114 (1903).
Kinds of — defined. LXXXI, 1113 (1917).
"Neat Tests vs. Sand Tests for Portland —."
S. Bent Russell. (With Discussion.)
XXV, 295 (1891).
"Note on the Consolidation of Mortar."
George W. Rafter. XLVIII. 96 (1902).
"Notes and Experiments on the Use and Testing of Portland —." William W. Maclay. VI, 311 (1877). Discussion, VII, 274 (1878).

Maclay, VI, 311 (1877). Discussion, VII, 274 (1878).

"Notes on Cements. Mortars and Concretes." William H. Grant. (With Discussion.) XXV, 259 (1891).

"Notes on Portland—Concrete." Andreas

"Notes on Portland — Concrete." Andreas Lundteigen. (With Discussion.) XXXVII, 501 (1897). "On Long-Time Tests of Portland —." I. Hiroi. LXXVI, 1027 (1913). Discussion: Chandler Davis, L. J. Le Conte, George G. Honness, and George S. Binckley,

LXXVI. 1033. "On the Composition of Ancient Cements and Rosendale Cements." Arthur Beckwith. II, 171 (1873).

with II, 171 (1873).

"On the Manufacture and Testing of Portland —." Henry Faija, XXX, 43 (1893).
Discussion, XXX, 594.

"Portland — Testing." Henry Faija, XVII,

218 (1887).

218 (1887).

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385 (1914).

"Record of Tests of—Made for Boston Main Drainage Works, 1878-1884." Eliot C. Clarke. XIV, 141 (1885).

"Retrogression in the Tensile Strength of—." J. M. O'Hara. LXXIV, 398 (1911). Discussion: Maurice G. Parsons, Clifford Richardson, R. S. Greenman, E. P. Goodrich, and E. D. Knap, LXXIV, 403.

"Some Experiments with Mortars and Concretes Mixed with Asphaltic Oils." Arthur Taylor and Thomas Sanborn. (With Discussion.) LXXVI, 1094 (1913).

"Some Notes on Hot-Bath Tests for—." Frederick H. Lewis and J. Edward Whitfield. (With Discussion.) XXXII, 321 (1894).

321 (1894).

321 (1894).

"Some of the Properties of Oil-Mixed Portland — Mortar and Concrete." Logan Waller Page. LXXIV, 255 (1911). Discussion: S. D. Newton, T. S. Oxholm, Lars R. Jorgensen, H. de B. Parsons, Frank J. Phelan, Clifford Richardson, R. D. Coombs, Maurice G. Parsons, E. H. Thomes, H. F. Dunham, J. B. Lippincott, and E. Kuichling, LXXIV, 271

Special Committee on Concrete and Reinforced Concrete: Standard specifications for —. LXVI, 454 (1910).

"Specifications and Methods of Tests of Portland —." LXXXII, 166 (1918).

Specifications for—: Progress Report of Specifications of Congrete and Point Specifications

Special Committee on Concrete and Reinforced Concrete. LXXVII, 427 (1914).
Specifications for Portland — XXXVII. 314 (1897).

"Street Grades and Cross-Sections in Asphalt and —." Robert P. Woods. (With Discussion.) XLII, 1 (1899).
Tensile strength of — mortars. IX, 286

Discussion.) XI.II. 1 (1899).
Tensile strength of—mortars. IX. 286 (1880).
"Tensile Tests of—, and an Appliance for More Accurate Determinations." D. J. Whittemore. (With Discussion.) IX. 329 (1880).
Tests of—, VII. 49 (1878).
"Tests of—" W. A. Aiken. (Inter. Eng. Cong. 1904.) LIV, Part F, 37 (1905).
Tests of— Discussion on Inter. Eng. Cong. Papers, 1904. James E. Howard. F. Schüle. L. J. Le Conte, J. A. Fairleigh, Frederic P. Stearns. Richard L. Humphrey, Edouard Candlot, and W. A. Aiken. LIV, Part F, 43 (1905).
"Tests of Materials other than Metals." Edouard Candlot. (Translated from the Freuch by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV. Part F, 31 (1905).
"The Action of Frost on—and Mortar, Together with Other Experimen's on These Materials." Ernest R. Matthews and James Watson. LXIV, 320 (1909). Discussion: William Mayo Venable. Herbert W. Hatton, John C. Wait, James L. Davis, Robert Brewster Stanton, Eugene W. Stern. Edwin Duryea, Jr., Myron II Lewis: and Theodore Belzner, LXIV. W. Stern, Edwin Duryea, Jr., Myron II Lewis; and Theodore Belzner, LXIV,

"The Effect of Alkali on Concrete." George Gray Anderson. (With Discussion.) LXVII, 572 (1910).

"The Effect of Freezing on — Mortar." Al-

fred Noble. (With Discussion.) XVI, 79 (1887).

"The Fatigue of -- Products."

"The Fatigue of — Products." J. L. Van Ornum. LI, 443 (1903). Discussion: E. R. Buckley. L. F. Bellinger, A. L. Johnson, and H. F. Dunham, LI, 446.
"The Manufacture of —." R. W. Lesley. (Inter. Eng. Cong. 1904.) LIV. Part B, 91 (1905). Discussion: J. A. Fairleigh, Leslie S. Robertson, R. L. Humphrey. F. Schüle, and Oswald Erlinghagen, LIV. Part B, 125.
"The Preservation of Materials of Construction." An Informal Discussion. William Barclay Parsons and others. L, 293 (1903).

William Barclay Parsons and others.
L, 293 (1903).

'The Testing of Portland—and the Development of the — Industry in Germany.'' Max Gary. (Translated from the German by John S. Siebert.) XXX, 1 (1893). Discussion, XXX, 594.

'The Use of — for Excluding Water from Oil Sands in Drilling Wells.'' Paul M. Paine. LXXVI, 1644 (1913).

Theory of concrete. XLII, 104 (1899).

"Tufa —, as Manufactured and Used on the

Theory of concrete. XLII, 104 (1899).
"Tufa—, as Manufactured and Used on the
Los Angeles Aqueduct." J. B. Lippincott. LXXVI, 520 (1913). Discussion:
J. M. O'Hara, L. J. Le Coute, Ralph J.
Reed, Clifford Richardson, Luther Wagoner, E. D. Knap, O. E. Mogensen,
Rapier R. Coghlan, Charles H. Paul,
O. W. Peterson, and Luigi Luiggi,
LXXVI, 548.

CEMENT—(Continued).
"Uniform System for Tests of —." Report
of the Committee. Preliminary Report
(With Discussion). XIII. 53
(1884);
Final Report, XIV, 475 (1885).

CENTERING.

"Steel — Used in the Construction of the Rocky River Bridge, Cleveland, Ohio." Wilbur J. Watson. (With Discussion.) LXXIV, 1 (1911).

CHARTS.

See GRAPHICAL CHARTS.

CHEMI-HYDROMETRY.

"—and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX, 951 (1916).
"Verification of the Bazin Weir Formula by Hydro-Chemical Gaugings." Floyd A. Nagler. (With Discussion.) LXXXIII, 105, 4019, 200.

by Hydro-Cl A. Nagler. (V 105 (1919-20).

CHEMISTRY.

"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX, 951 (1916).

of the corrosion of cast-iron pipe. LXXVIII, 806 (1915).
"Some Remarks on the—of the Processes of Lime Sulphite Fiber Manufacture." Martin L. Griffin. XX, 281 (1889).

CHIMNEYS.

"Chimney for the Narragausett Electric Lighting Company, Providence, R. I." "Chimney for the Narragansett Electric Lighting Company, Providence, R. I."
John T. Henthorn. (With Discussion.)
XXV, 1 (1891).
"The 'Crinoline'—of the Cambria Iron
Company at Johnstown, Pa." George
Webb, XIV, 186 (1885).
"The Merrimack Mannfacturing Company's
Chimney at Lowell Mass." J. T. Baker.
XIV, 175 (1885).
"The Pacific Mills Chimney at Lawrence,
Mass., U. S. A." Hiram F. Mills. (With
Discussion.) XIV, 171 (1885).
"The Station B Chimney of the New York
Steam Co." Charles E. Emery, XIV,
180 (1885).

180 (1885).

CINDER CONCRETE. See CONCRETE.

CITIES.

"Commercial—: The Law of their Birth and Growth." Alfred F. Sears. (With Discussion.) XIV, 19 (1885).
"Engineering Achievements and Activities of New York City." Alfred D. Flinn. LXXVI, 1653 (1913).
"On the Comparative Liability to, and Danger from Conflagrations, in London and in American—." Edward B. Dorsey VIII 172 (1884)

Danger from Conflagrations, in London and in American—" Edward B. Dorsey, XIII, 172 (1884).
"Practical and Aesthetic Principles for the Laying Out of—" J. Stibben. (Translated from the German by W. H. Searles.) XXIX, 718 (1893). Discussion, XXX, 591 (1893).

Structural development of -. LXXXI, 585, 631 (1917).

CIVIL ENGINEERS.

See ENGINEERING.

CIVIL ENGINEERS.

"Final Report of the Special Committee to Investigate the Conditions of Employ-

CIVIL ENGINEERS—(Continued).

ment of, and Compensation of —. (With Discussion.) LXXXI, 1207 (1917). Services of — in World War. LXXXIII, 1241 (1919-20).

CLAMPS.

"Clamp for l'ulling Sheet Piling." Charles E. Emery. XX, 118 (1889).

"An Investigation of Sand—Mixtures for Road Surfacing." John C. Koch. (With Discussion.) LXXVII, 1454 (1914). Construction of earth and sand—roads. LXXXII, 1409 (1918).

LXXXII, 1409 (1918).
Facts relating to clays in United States.
XXIX, 654 (1893).
"Federal Investigations of Mine Accidents,
Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.)
LXX, 190 (1910).
Use of—and other materials in puddle.
XXVI, 658 (1892).

COAL.

"Comparative Tests of Bituminous Steam Coals." John W. Hill. (With Discussion.) XLII. 27 (1899).
"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).
"The Anthracite—Trade and Labor Question, as Connected." Martin Coryell. I. 367 (1872).
"The Conflagration now Existing in the—

"The Configuration now Existing in the—at Kidder Slone." Martin Coryell. III. 147 (1874). Discussion, III, 153; IV. 317 (1875).
"The Manufacture of Coke from Illinois.—."

Henry L. Luebbers, II, 163 (1873).

COAL-HANDLING MACHINERY.

Coal conveyors. XLIV, 119, 146 (1900).
"Coal Piers on the Atlantic Seaboard."
J. E. Greiner. LXXVII, 454 (1914).
— used in contractor's plant. Pennsylvania
Railroad Tunnels, New York. LXIX, 20 (1910).

"The Coal Hoists of the Calumet and Hecla Minling Company." Julius Kahn. (With Discussion.) XLI. 269 (1899). "The Narragansett Bay Coal Depot." Au-gustus Smith. (With Discussion.) LVII, 204 (1906).

COAL POCKETS.

Coal bins and pockets on the Atlautic seaboard. LXXVII, 478 (1914).

—, Philadelphia Germantown and Norristown Railroad, in Philadelphia. LXXVI. 1876 (1913).

Construction of -. XLIV, 119 (1900); LVII,

204 (1906). "Two Reinforced Concrete —." Myron S. Falk. LXXI, 192 (1911).

COALING STATIONS.

"Coal Piers on the Atlantic Scaboard."
J. E. Greiner. LXXVII, 454 (1914).

—, Philadelphia Germantown and Norristown Railroad, in Philadelphia. LXXVI, 1877 (1913).

"The Narragansett Bay Coal Depot." Augustus Smith. LVII, 204 (1906). Discussion: E. H. Foster, LVII, 224.

COAST.

"Littoral Movements of the New Jersey -, with Remarks on Beach Protection and

COAST—(Continued).

Jetty Reaction," Lewis M. Haupt. (With Discussion.) XXIII. 123 (1890). Subsidence of the Gulf — at the Mississippi Delta. LIV, 83 (1905).
"The Preservation of Sandy Beaches in the Vicinity of New York City." Elliott J. Dent. (With Discussion.) LXXX, 1786 (1916) 1786 (1916).

See also HARBORS: SHORE PROTEC-TION.

COAST DEFENCE.

"Fortifications," George W. Goethals. (Inter. Eng. Cong. 1904.) LIV, Part A, 57 (1905).

COFFER DAMS.

"A Coffer Dan or Caisson without Timber or Iron in Its Construction." Robert L. Harris. (With Discussion.) XXIV, 230 (1891).

Coffer-dam boat used in construction of Pearl Harbor Dry Dock. LXXX, 279

(1916).

Coffer Dam center pier Arthur Kill Bridge. XXVII, 475 (1892). Coffer-dam used in raising the battleship

Maine; also other sheet-piling-. LXXXI, 553 (1917).

-for construction of main dam, Lock 12

for construction of main dam, Lock 12 Development, Alabama Power Company. LXXVIII, 1482 (1915).
Construction and failure of — used at Pearl Harbor Dry Dock. LXXX, 236 (1916).
'Ilistory of Little Rock Junction Railway Bridge, of the St. Louis, Iron Mountain and Southern Railway Company, Over the Arkansas River at Little Rock, Arkansas, 1883-1914." C. E. Smith. (With Discussion.) LXXIX, 1 (1915).
"The Sinking of the Piers for the Grand Trunk Pacific Bridge at Fort William, Ontario, Canada." H. L. Wiley. (With Discussion.) LXII, 113 (1909).
"Unusual Coffer-Dam for 1000-Foot Pier, New York City." Charles W. Staniford.

Nausan Coher-Dam for 1000-Foot Pier, New York City." Charles W. Staniford. LXXXI, 498 (1917). Discussion: Fred-eric R. Harris, D. A. Watt, C. A. Went-worth, Thomas H. Wiggin, T. Kennard Thomson, Charles S. Boardman, William M. Black, and F. E. Cudworth, LXXXI, 543.

COKE.

"The Manufacture of — from Illinois Coal." Henry L. Luebbers. 11, 163 (1873).

COLUMNS.

"A New Formula for the Strength of —."
A. J. Du Bois. (With Discussion.)
XXVII. 69 (1892).

- for Manhattan Elevated Railways.

for Manhattan Elevated Railways. LXXXII, 573, 747, 752 (1918).
of concrete and reinforced concrete. LXXXI, 1124 et seq. (1917).
"Experiments on the Strength of Wrought-Iron Struts." James Christie. XIII, 85 (1884). Discussiou, XIII, 267.
"Experiments upon Phœnix—." T. C. Clarke, A. Bonzano, John Griffen, and David Reeves. XI, 1 (1882). Discussion, XI. 61. XI, 61.

"Experiments upon Z-Iron —." C. L. Stro-bel. (With Discussion.) XVIII, 103

(1SSS).

"Faults in the Theory of Flexure, and an Epitome of Certain I-Beam Tests Made at Ambridge, Pa." Henry S. Prichard. (With Discussion.) LXXV. 895 (1912). Final report of the Special Committee on

COLUMNS—(Continued).

Concrete and Reinforced Concrete. Discussion by L. J. Mensch and others. LXXXII, 1541 (1918). "Final Report of the Special Committee on Steel—and Struts." (With Discussion.)

Steel—and Struts." (With Discussion.) LXXXIII, 1583 (1919-20). Investigation of—, Twelfth Street Viaduct Kansas City, Mo. LXXX, 491, 550 (1916). "New Formula for Compression Members." R. Krohn. XV, 537 (1886). "Nickel Steel for Bridges." J. A. L. Wad-dell. (With Discussion.) LXIII, 101 (1909)

(1909).

(1909).

"Note on the Coefficient of Elasticity of Concrete and Mortar Beams during Flexure." Myron S. Falk. (With Discussion.) L, 473 (1903).

"On the Strength of—: Discussing the Experiments Which Have Been Accumulated, and Proposing New Formulas." Thomas H. Johnson. (With Discussion.) XV, 517 (1886).

XV, 517 (1886).

Progress report of Special Committee on Concrete and Reinforced Concrete. LXXVII, 415 et seq. (1914).

"Progress Report of Special Committee on Steel—and Struts," (With Discussion.) LXVI, 401 (1910).

"Report on a Series of Tests on Concrete—Reinforced, with a Spiral of Steel."

LXVI, 401 (1910).

"Report on a Series of Tests on Concrete—Reinforced with a Spiral of Steel."
C. G. Wrentmore, Hugh Brodie, and
C. O. Carey. (With Discussion: Henry
B. Setresses in Steel—" J. R. Worcester. LXI, 156 (1908). Discussion: Henry
B. Seaman, Luzerne S. Cowles, Charles
M. Emmons, Henry S. Prichard, Horace E. Horton, F. P. Shearwood, L. D.
Rights, A. W. Carpenter, C. J. Tilden,
Ernst F. Jonson, R. D. Coombs, and
William Cain, LXI, 162.

"Some Experiments on the Strength of
Bessemer Steel Bridge Compression
Members," James G. Dagron. (With
Discussion.) XX, 254 (1889).

"Some Tests of Large Steel—" James E.
Howard, LXXIII, 429 (1911). Discussion: Albert Luclus, Leon S. Moisseif,
A. W. Carpenter, J. S. Branne, Lewis
D. Rights, J. R. Worcester, Horace E.
Horton, Arthur N. Talbot, James Christie, N. R. McLure, R. S. Chew, George
N. Cole, F. P. Shearwood, Charles
Worthington, and F. C. Kunz, LXXIII,
448.
Specifications for—in bridges and sub-

448.

Specifications for—in bridges and subways. LXXV, 339 (1912).

"Stresses in—Subject to Combined Axial and Transverse Loading." Charles Worthington. XLVIII, 462 (1902).

"Tables of the Strength of Cast-Iron—." Edwin Thacher. II, 294 (1873).

"Tests of Built-Up Steel and Wrought-Iron Compression Pieces." Arthur N. Talbot and Herbert F. Moore LXV, 202 (1909). Discussion: John C. Moses, LXV, 246. 246.

Tests of reinforced concrete —. LXX, 88, 130 (1910).
"The Collapse of a Building during Construction." H. de B. Parsons. (With Discussion.) LHI, 1 (1904).

Discussion.) LIII, 1 (1904).

"The Crippling Strength of Wrought Iron —." C. L. Gates. IX, 407 (1880).

"The Practical Column under Central or Eccentric Loads." J. M. Monerleff. (With Discussion.) XLV, 334 (1901).

"The Strength and Elasticity of Structural Steel, and its Efficiency in the Form of Beams and Struts." James Christie. XIII, 253 (1884). Discussion, XIII, 267.

COLUMNS—(Continued).

"The Strength of —." W. E. Lilly, LXXVI, 258 (1913). Discussion: Edward Godfrey, J. O. Eckersley, Henry S. Prichard, and J. S. Braune, LXXVI, 275.
"The Strength of Pillars. An Analysis." Leopold Eidlitz. (With Discussion.)

"The Strength of Pillars. An Analysis."
Leopold Eidlitz. (With Discussion.)
XXXV, 371 (1896).
"The Strength of Wrought Iron—." G.
Bouscaren. IX, 447 (1880). Discussion,
XI, 61 (1882).
"The Structural Design of Buildings."
Charles C. Schneider. (With Discussion.) LIV, 371 (1905).
"The Theory of Continuous—." Ernst F.
Jonson. LIVI, 92 (1906).
"The Use of Reinforced Concrete in Engineering Structures." An Informal Discussion, E. P. Goodrich and others.
LXI, 35 (1908).
"Theory of the Ideal Column." Wm. Cain.
(With Discussion.) XXXIX, 96 (1898).

COMMERCE.

"Commercial Cities: The Law of their Birth and Growth," Alfred F. Sears. (With Discussion.) XIV, 19 (1885). "Notes upon Docks and Harbors," Luther Wagoner. (With Discussion.) LXII,

Wagoner. (With Discussion.) LAII, 135 (1909).
"Ports of the Pacific." H. M. Chittenden. (With Discussion.) LXXVI, 155 (1913).
"Rivers and Railroads in the United States." William W. Harts. (With Discussion.) LXXIX, 919 (1915).
"The Development of the—of the Great Lakes." Presidential Address at the Annual Convention at Asheville, N. C., June 9th, 1903. Alfred Noble. L, 327 (1903).

COMPENSATING WORKS.

"The — of the Lake Superior Power Company." G. F. Stickney. LIV, 346 (1905). Discussion: L. J. Le Conte, LIV, 368. "The Low Stage of Lakes Huron and Michigan." C. E. Grunsky. (With Discussion.) LXIII, 31 (1909).

COMPRESSED AIR.

"A Water Power and — Transmission Plant for the North Star Mining Company, Grass Valley, Cal." Arthur De Wint Foote. (With Discussion.) XXXVI, 171

"Caisson Disease and Its Prevention." Henry Japp. (With Discussion.) LXV,

1 (1909)

as a Motor for Subterranean Railways."

J. Dutton Steele. I, 244 (1872). in tunneling. Colorado River siphon.

J. Dutton Steele. 1, 277 (1812).
—in tunneling. Colorado River siphon.
LXXVII, 8 (1914).

"The Shone Hydro-Pneumatic System of
Sewerage." Urban H. Bronghton.
XXVII, 659 (1892). Discussion, XXVIII, 57 (1893)

"The Use of — in Tubular Foundations and its Application at South Street Bridge, Philadelphia, Pa." D. McN. Stauffer, VII. 287 (1878). Discussion, VIII, 186

COMPRESSION MEMBERS.

See COLUMNS.

COMPRESSORS.

Air - for operating switches, signals, etc., Pennsylvania Railroad Terminal, New York, LXIX, 290 (1910).

— at Grass Valley, Cal. Power Plant, XXXVI, 180 (1896).

Data relating to air—used in construc-

COMPRESSORS—(Continued). tion of Pennsylvania Railroad Tunnels, New York. LXIX, 30 (1910).

CONCRETE.

CONCRETE.

"A—Sewer on Piles." Eugène Lentilhon.
(With Discussion.) XXXI, 569 (1894).

"A—Water Tower." A. Kempkey, Jr.
(With Discussion.) LXX, 334 (1910).

"A Note on the Cost of—." O. E. Michaelis. XV, 873 (1886).

"Béton-Coignet, Its Fabrication and Uses."
Leonard F. Beckwith. I, 93 (1872).

"Bridge Substructure and Foundations in Nova Scotia." Martin Murphy. XXIX, 620 (1893). Discussion. XXX, 567 (1893).

Cement—pavement. LXXXII, 1391, 1407 (1918).

(1918).

Cement, mortar and — used in the Pennsylvania Avenue Subway. XLVIII, 488, 557

(1902).

"Cinder — Floor Construction Between Steel Beams," Harold Perrine and George E. Streban. (With Discussion.) LXXIX.

E. Strehan. (With Discussion.) LXXIX, 523 (1915).

"Cinder — Floors." Guy B. Waite, LXXVII, 1773 (1914). Discussion: Arthur H. Diamant, J. R. Worcester, A. W. Buel, Charles C. Hurlbut, W. B. Claffin, F. W. Skinner, Oscar Lowinson, George E. Strehan, A. L. A. Himmelwright, and Edgar Marburg, LXXVII, 1800.

— and cement tests. XXXI, 504 (1894).

"— and Concrete-Steel in the United States." Edwin Thacher. (Inter. Eng. Cong. 1904.) LIV. Part E. 425 (1905).

"— and Concrete-Steel in the United States." John S. Sewell. (Inter. Eng. Cong. 1904.) LIV. Part E. 459 (1905).

— as a preservative of metal. XXXIX, 33 (1898).

(1898)

— as a preservative of metal. AXAIA, 50 (1898).

"— Blocks at Osaka Harbour Works, Japan." S. Shima. (Inter. Eng. Cong. 1904.) LIV. Part A, 221 (1905).

"— Bridges: Some Important Features in Their Design." Watter M. Smith, Jr., (With Discussion.) LXXVII, 695 (1914).

— encased steel arch bridge for Niagara River Crossing. LXXXIII, 44 (1919-20).

— for bridge piers and foundations. XXXIV. 247 (1895).

"Concrete-Lined Oil-Storage Reservoirs in California; Construction Methods, and Cost Data." E. D. Cole. (With Discussion.) LXXX, 691 (1916).

"— Piles." Howard J. Cole. (With Discussion.) LXXX, 467 (1909).

"Sewer at Mt. Vernon." William E. Worthen. (With Discussion.) XXIV, 393 (1891).

393 (1891)

- used in Buffalo Breakwater. LII, 94 et seq. (1904).

- used in construction of Pearl Harbor Dry Dock. LXXX, 248 (1916). - used on Eric Railway, X, 291 (1881). - walls for 1000-ft. pier. LXXXI, 532

(1917).

Disintegration of —. LXXXI, 682 (1917). Effect of salt water on —. LXXX, 297 (1916)

Effect of sea water on -. LXXVII, 524 et

Effect of sea water on seq. (1914).

Effects of temperature on—in arch dams.

LXXXIII, 590 (1919-20).

"Pabrication of Beton Blocks by Manual
Labor." Schuyler Hamilton. IV, 93
(1875). Discussion, IV, 312.

"Federal Investigations of Mine Accidents,
Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.)

CONCRETE—(Continued).

CONCRETE—(Continued).

"Final Report of the Special Committee on — and Reinforced —." (With Discussion.) LXXXI, 1101 (1917).

Final report of Special Committee on — and Reinforced —." Discussion by L. J. Mensch and others. LXXXII, 1541 (1918).

"Harbors on Lake Superior, Particularly Duluth-Superior Harbor," David Dulk. Gaillard. (Inter. Eng. Cong. 1904.) LIV, Part A, 263 (1905).

"Harbour Development in Holland." H. Wortman. (Inter. Eng. Cong. 1904.) LIV, Part A, 181 (1905).

"Harbours of Great Britain." William Matthews. (Inter. Eng. Cong. 1904). LIV, Part A, 159 (1905).

Part A, 159 (1905).

Historical sketch of use of—and reinforced

— LXXVII, 393 (1914).

"Huacal Dam. Sonora, Mexico (—arch
dam). H. Hawgood. (With Discussion.) LXXVIII, 564 (1915).

"Impervious—." An Informal Discussion.
R. W. Lesley, J. James R. Croes, J. W.
Schaub. B. R. Green, Oscar Lowinson,
Edward Cunningham. W. K. Hatt, Theodore Belzner, Sanford E. Thompson, and
William B. Fuller. LI, 114 (1903).

"Impurities in Sand for—." An Informal
Discussion. Sanford E. Thompson and
others. LXV, 250 (1909).

"Lining a Water-Works Tunnel with—."
Desmond FitzGerald. (With Discussion.)
XXXI, 294 (1854).

XXXI, 294 (1894).

XXXI, 294 (1894).

Manufacture of — blocks, and laying — under water, LIV, Part A, 270 (1905).

Method of building — piers for viaduct for New York Connecting Railroad.

LXXXII, 1020 (1918).

"Method of Designing a Rectangular Reinforced — Flat Slab. Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. (With Discussion.)

LXXX, 1689 (1916).

"Multiple-Arch Dams on Rush Creek, Cali-

"Multiple-Arch Dams on Rush Creek, California." L. R. Jorgensen. (With Discussion.) LXXXI, 850 (1917).

"Note on the Coefficient of Elasticity of— and Mortar Beams during Flexure." Myron S. Falk. (With Discussion.) L, 473 (1903).

"Notes on Cements, Mortars and Concretes," William H. Grant. (With Discussion.) XXV, 259 (1891).
"Notes on Portland Cement —." Andreas

"Notes on Portland Cement—," Andreas Lundteigen. (With Discussion.) XXXVII, 501 (1897).
"On the Theory of—," George W. Rafter, (With Discussion.) XLII, 104 (1899). Placing of—by tremie. LXXIV, 334 (1911). Placing of—by tremies at Pearl Harbor Dry Dock. LXXX, 255, 296, 299 (1916). Practical examples of arch dams: Salmon Creek and Lake Spaulding Dams. Creek and Lake Spaulding LXXVIII, 708 (1915). Dams.

"Progress Report of Special Committee on

- and Reinforced —." (With Discussion.) LXVI, 431 (1910).

"Progress Report of the Special Committee on—and Reinforced—." LXXVII, 385 (1914).

"Reinforced — Docks: Foreign and American Structures. Failures, Costs, and General Considerations." Harrison S. Taft. (With Discussion.) LXXVIII, Taft. (With Discussion.) LXXVIII, 1058 (1915).
"Reinforced — Pler Construction." Eugene Klapp. (With Discussion.) LXX, 448

(1910).

Reinforced - poles for telegraph and telephone lines, Pennsylvania Rallroad TerCONCRETE—(Continued).

minal improvements, New York. LXIX,

minal improvements, New 1331 (1910).

"Some Experiments with Mortars and Concretes Mixed with Asphaltic Oils." Arthur Taylor and Thomas Sanborn. LoxxVI, 1094 (1913). Discussion: Logan Waller Page, William J. Boucher, and A. T. Goldbeck, LXXVI, 1103.

"Some of the Properties of Oil-Mixed Portland Cement Mortar and —." Logan Waller Page. (With Discussion.) LXXIV,

"Steel — Construction." George Hill. (With Discussion.) XXXIX, 617 (1898).
"Steel — Construction." An Informal Discussion. cussion. R. S. Buck and others. XLVI,

"Steel—Construction." An Informal Discussion. R. S. Buck and others. XLVI, 93 (1901).

"Substructure of Piscataquis, Bridge, and Analysis of — Work." G. A. Hersey. (With Discussion.) LXI, 377 (1908).

"Temperature Changes in Mass —" Charles H. Paul and A. B. Mayhew. LXXIX, 1225 (1915). Discussion: George T. Seabury, Wilson Fitch Smith, G. Immediato, Gardner S. Williams, Walter M. Smith, A. J. Wiley, and J. Waldo Smith, LXXIX. 1247.

"Tests of — Specimens in Sea Water, at Boston Navy Yard." R. E. Bakenhus, LXXXI, 645 (1917). Discussion: T. Kennard Thomson, J. J. Yates, J. R. McClintock, S. B. Williamson, Waldo C. Briggs, Charles S. Bilyeu. W. E. Day. Robert Ridgway, George W. Fuller, A. H. Rhett, Marshall W. Brown, Albert Larsen, W. Watters Pagon, R. J. Wig, and Lewis R. Ferguson, LXXXI, 676.

Tests of — underpinning piles for subway on Fulton Street, New York City. LXXXI, 87, et sea., 103 et seq. (1917).

"The Bonding of New to Old—" E. P. Goodrich. LXIV, 247 (1909). Discussion: H. R. Burroughs, Theodore Belzner, James L. Davis, C. L. Slocum, Eugene W. Stern, E. J. Fort, Myron H. Lewis, W. C. Briggs, Frederick C. Harper, and E. G. Walker, LXIV, 270.

"The East Canyon Creek Dam." A. F. Parker. (With Discussion.) LXXXIII, 574 (1919-20).

"The Effect of Alkali on —." George Gray Anderson. LXVII, 572 (1910). Discussion: R. A. Hart, Rudolph Hering, Richard L. Humphrey, George F. Morse, Richard H. Gaines, Thomas H. Means, F. E. Robertson, Philo H. Bates, E. P. Goodrich, and W. E. Belknap, LXVII, 587.

"The Effect of Saturation on the Strength of —" J. L. Van Ornum. LXXXIII, 567.

587.

"The Effect of Saturation on the Strength of —." J. L. Van Ornum. LXXVII, 438 (1914). Discussion: E. A. Moritz, J. R. Worcester, Walter S. Wheeler, Clifford Richardson, W. K. Hatt, and Henry H. Quimby, LXXVII, 446.
"The Fatigue of —." J. L. Van Ornum. LVIII, 294 (1907).
"The Laws of Proportioning —." William B. Fuller and Sanford E. Thompson. LIX, 67 (1907). Discussion: James L. Davis, H. de B. Parsons, Allen Hazen, Samuel Tobias Wagner, R. Feret, W. F. Dennis, and Richard H. Gaines, LIX, 144. 144.

"The Preparation and Use of — Blocks for Harbour Works." I. Iliroi. (Inter. Eng. Cong. 1904.) LIV, Part A, 211

(1905).

"The South Pass Jettles. Notes on the Consolidation and Durability of the Works, with a Description of the-Blocks and Other Constructions of the

CONCRETE—(Continued).

Last Year." Max E. Schmidt. VIII, 189

(1879).

"The Use of Reinforced—in Engineering Structures." An Informal Discussion. E. P. Goodrich and others. LX1, 35 (1908)

"Three-Hinged Masonry Arches: Spans Especially Considered." David A. Molitor. (With Discussion.) XL, 31

(1898).

Use of — in the construction of piers. LIV, Part A, 361 (1905). "Walnut Lane Bridge, Philadelphia." George S. Webster and Henry H. Quim-by. LXV, 423 (1909).

CONCRETE BLOCKS.

See CONCRETE.

CONCRETE-METAL.

See REINFORCED CONCRETE.

CONDENSATION.

"Tests of — in Cast-Iron Radiators." William J. Baldwin. XXXII, 34 (1894).

CONDENSERS.

"On the Use of a Surface Condenser in Connection with a Set of Blast Furnace Boilers, at the Franklin Iron Works, Oneida Co., N. Y." W. B. Cogswell. II, 41 (1873).

CONDUITS.

"A Study of Economic Conduit Location."
C. E. Hickok. LXXVII, 778 (1914). Discussion: H. Hawgood, and M. F. Stein. LXXVII, 784.
"A Water Conduit under Pressure." John T. Fanning. VI. 69 (1877).
—, Bergen Hill Tunnels, Pennsylvania Railroad. LXVIII, 128 (1910).
—, Cross-Town Tunnels, Pennsylvania Railroad. LXVIII, 416 (1910).
— for electric wires, terminal station, Pennsylvania Pennsylvania Railroad.

for electric wires, terminal station. Pennsylvania Railroad, New York. LXIX, 107 electric wites, New York, LXIX, 184, 209, 350 (1910).

North River Tunnels, Pennsylvania Railroad, LXVIII, 203 (1910).
lectric — East River Tunnels, Pennsylvania Railroad, LXVIII, 477 (1910).

Hydraulies of Sudbury Conduit. XII, 114

"On the Hydraulics of the Hemlock Lake Conduit of the Rochester, N. Y., Water-Works," George W. Rafter, XXVI, 13 (1892). Discussion, XXVI, 28.

See also PIPE LINES.

CONFLAGRATIONS.

"On the Comparative Liability to, and Danger from —, in London and in Amer-ican Cities." Edward B. Dorsey. XIII, 172 (1884).

172 (1884).

"The Conflagration now Existing in the Coal at Kidder Slope." Martin Coryell. III, 147 (1874). Discussion, III, 153; IV, 317 (1875).

"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of Members of the American Society of Civil Engineers. (With Discussion.) LIX, 208 (1907).

CONTINUOUS GIRDERS.

"A Graphical Method for the Solution of Stresses in the Continuous Girder, as Applied to Draw-Bridges." George F. (With Discussion.) XLVIII, 72 Barton. (1902).

"Application of the Theory of — to Economy in Bridge Building." Charles Bender. V, 147 (1876). Discussion, V, 219, Bibliography relating to —, 1854-1874. III,

446 (1874). Comparative designs of cantilever, continuous girder, and suspension types for Hell Gate Arch Bridge. LXXXII, 865

Hell Gate (1918).

"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving Drawbridges Having Two Spans or Openings, and Built as—, More Carlottes," and the Calculation
Revolving Drawbridges Having Two
Spans or Openings, and Built as—, More
Especially as Continuous Panel Girders."
Clemens Herschel. III, 395 (1874). Discussion, IV, 203 (1875).
"The Continuous Girder as a Tipper."
C. H. Lindenberger. XXVI, 469 (1892).
"The Theorem of Three Moments." J. P. J.
Williams. (With Discussion.) LXXVI,

See also BRIDGES.

CONTRACTORS' PLANT.

-, Astoria Gas Tunnel. LXXX, 601, 666

-, Astoria Gas Fund.

(1916).

- at Bergen Hill Tunnels, Pennsylvania Railroad, LXVIII, 106 (1910).

-, Cherry Street Bridge, Toledo, Ohio. LXXX, 767 (1916).

-, Colorado River siphon, LXXVII, 8

Colorado River siphon. LXXVII, 8 (1914).
Cross-Town Tunnels, Pennsylvania, Railroad. LXVIII, 392 (1910).
for constructing coffer-dam for 1000-ft. pier. LXXXI, 528 (1917).
for East River Tunnels." Henry Japp. LXIX, I, 393 (1910).
Lexington Avenue Subway, New York City. LXXXI, 379 (1917).
Long Island City approaches, Pennsylvania Railroad. Tunnels, New York. LXIX, 122 (1910).
North River Tunnels, Pennsylvania Railroad. LXVIII, 156 (1910).
Stony River Dam. LXXXI, 1019 (1917).
Terminal Station site, Pennsylvania Railroad. LXVIII, 156 (1910).
Twelfth Street Viaduct, Kansas City, Mo. LXXX, 504 (1916).
used in erection of Hell Gate Arch Bridge and approaches. LXXXII, 922, 957, 1020 (1918).
used on Manhattan Elevated Railway improvements. LXXXII, 2010.

- used on Manhattan Elevated Railway improvements. LXXXII, 731 (1918). Layout of —, Lock 12 Development, Alabama Power Company. LXXVIII, 1467

(1915).

Road Construction and Maintenance:
Equipment for the Construction of Bituminous Surfaces and Bituminous Pavements: An Informal Discussion. Francis P. Smith and others. LXXVII, 171 "Road (1914).

CONTRACTS.

"Agreements for Building—." William B. Bamford, LXVII, 438 (1910). Discussion: Norman R. McLure, William V. Polleys, Charles H. Higgins, W. G. Wilkins, William A. Boring, J. C. Wait, W. L. Bownan, Charles A. Ruggles, Oscar Lowinson, E. T. Thurston, Jr., John Mason Brown, J. A. L. Waddell, DeWitt V. Moore, and Leslie H. Allen, LXVII, 478.

CONTRACTS—(Continued).

CONTRACTS—(Continued).

"—: A Comparison of 'Cost Plus' With Other Forms." Ernest Wilder Clarke. LXXXIII, 784 (1919-20). Discussion: F. Lavis, Missae Thompson. F. H. Frankland, J. Waldo Smith, Edward F. Hammel. Lazarus White, Arthur P. Davis, Henry H. Quimby, J. P. H. Perry, Henry B. Seaman, Frederick Glaeser, George D. Snyder, F. G. Baum, George Perrine, P. L. Reed, Walter H. Wheeler, E. G. Walker, J. A. L. Waddell, William E. Woolley, R. D. L. French, and J. W. Ledoux. LXXXIII, 792.

"In Contract Work, either Public or Private, is it Preferable to make Separate—for the Different Branches of Trades Involved or to Combine all under One General Contract?" An Informal Discussion. George E. Gifford, T. Chalkley Hatton, Charles G. Darrach, S. Bent Russell, M. Ward Easby, Charles Worthington, and Horace Andrews. XLIX. 1 (1902).

(1902).
"Precarious Expedients in Engineering Practice." John Hawkesworth. (With Discussion.) LXVII, 32 (1910).
"The Position of the Constructing Engineer, and his Duties in Relation to Inspection and the Enforcement of—."
Albert J. Himes. (With Discussion.)

Inspection and the Enforcement of—," Albert J. Himes. (With Discussion.) LVI, 104 (1906).
"Uniformity of Requirement and Clearness of Specification in Agreements for the Graduation of Railroads." W. F. Dennis. LVIII, 321 (1907). Discussion: George L. Dillman, J. L. Campbell, M. S. Parker, Halbert P. Gillette, James H. Kennedy, F. Lavis, T. Kennard Thomson, E. H. Beckler, Harold Bouton, Samuel Tobias Wagner, and C. O. Vandevanter, LVIII, 352.

CONVEYORS.

Coal -. XLIV, 119, 146 (1900).

COPYRIGHT.

-in Drawings of a Technical Character." D. A. Usina, LXV, 38 (1909).

CORROSION AND PROTECTION METALS.

"Cinder Concrete Floor Construction Between Steel Beams," Harold Perrine and George E. Strehan. (With Discussion.) LXXIX, 523 (1915).
Concrete as a Dreservative of metal.

nerete as a pre XXXIX, 33 (1898).

Corrosion of metal reinforcement: Progress report of Special Committee on Concrete and Reinforced Concrete. LXXVII, 402 (1914)

(1914).

Effect of cinder concrete on steel. LXXIX, 539, 579, 648 (1915).

"Experiments on the Protection of Steel and Aluminum Exposed to Sea Water."

A. II. Sabin. First Paper (With Discussion.) XXXVI, 483 (1896); Supplementary Paper (With Discussion), XXIII 444 (1900). XLIII, 444 (1900).

"External Corrosion of Cast-Iron Pipe," Marshall R. Pugh. (With Discussion.) LXXVIII, 806 (1915). Masonry metal protection. XXXV, 472 "External

(1896)

"Painting Structural Steel; The Present Situation." A. H. Sabin. (With Discus-sion.) LXXVII, 952 (1914). "Sand-Blast Cleaning of Structural Steel'," George W. Lilly. (With Discussion.)

George W. L, 254 (1903).

CORROSION AND PROTECTION

OF METALS-(Continued).

"The Preservation of Materials of Con-struction," An Informal Discussion, William Barelay Parsons and others.

William Barciay Parsons and others. I., 293 (1903).

"The Protection from Corrosion, of Iron-Work Used as Covering for Railroad Tunnels." James G. Dagron. (With Discussion.) XXVII, 324 (1892).

"The Water-Proofing of Solid Steel-Floor Railroad Bridges." Samuel Tobias Wagner. (With Discussion.) LXXIX, 306 (1915). (1915).

Sec also PAINTING.

COST KEEPING.

"A System of —," Myron S, Falk, LXIV, 401 (1909), Discussion; P. L. Reed, W. C. Hammatt, Emile Low, Richard T, Dana, T. Kennard Thomson, F, H, Newell, William Murray Black, Guy W, Culgin, W, Boardman Reed, George Hill, and Willard D, Lockwood, LXIV, 410.

—for roads and pavements. LXXXII, 1430 (1918)

"Road Construction and Maintenance: Cost Records and Reports." An Informal Discussion. Nelson P. Lewis and others. LXXVII, 129 (1914).

COSTS OF WORK.

Cost data for excavating tunnels for Lexington Avenue Subway, New York City. LXXXI, 381 (1917).
Cost of constructing coffer-dam for New York City pier. LXXXI, 540 (1917).
Cost of constructing multiple-arch dams. LXXXI, 880 (1917).
Cost of constructing the Picaza Bridge, Argentine Republic. LXXX, 219 (1916).
Cost of spreading flood waters in San Bernardino Basin, California. LXXXII, 803 (1918).

(1918).

nardino Basin, California. LXXXII, 803 (1918).

—in repairing reservoirs at Portland, Ore. LXXXII, 780 (1918).

—on Hell Gate Arch Bridge. LXXXII, 882, 975 (1918).

—on Mauhattan Elevated Railway improvements. LXXXII, 733 (1918).

—, Stony River Dam. LXXXI, 1022 (1917).

—, Twelfth Street Viaduct, Kansas City, Mo. LXXX, 526 (1916).

Quantities and cost, Cherry Street Bridge, Tolodo, Ohio. LXXX, 788 (1916).

"The Three 15-Cubic Yard Dipper-Dredges, Gamboa, Paraiso, and Cascadas, as Supplied and Used on the Panama Canal." Ray W. Berdeau. (With Discussion.) LXXXII, 515 (1918).

Unit costs, Astoria Gas Tunnel. LXXX, 615, 660 (1916).

"Thit—in Progress." An Informal Discussion. S. Whinery, Charles S. Churchill.

T. Chalkley Hatton, Oberlin Smith, Charles G. Darrach, Sanford E. Thompson, and W. W. Cummings, XLIX, 63 (1902).

CRANES.

"Componential Trusses for Traveling Crane." Henry B. Seaman, XXIII, 277 (1890).

"On — as Labor-Saving Machines." C. J. Appleby. (With Discussion.) XV, 369

(1886).

'Plant and Material of the Panama Canal. William Plumb Williams. XIX, 27 (1888).

CRANES (Continued).

"The Development of Quay - in the Port of Hamburg." Chr. Nehls. XXX, 258

"The Structural Design of Buildings."
Charles C. Schneider. (With Discussion.)
LIV. 371 (1905).
Use of — on docks. LXII, 144 (1909).

CREMATORIES.

See REFUSE DESTRUCTORS.

CREVASSE.

"The Davis - Levee." Sidney F. Lewis. XVII, 199 (1887).

CRIBS.

See FOUNDATIONS.

CROSS-SECTIONS.

"A Method of Taking—in Deep Rock Cuts by Triangulation." F. W. Watkins. XXII, 386 (1890).

"A New Method of Calculating—of Roads and Railroads." Francisco Da Silva Ribeiro. (Translated from the French by Foster Crowell.) XXIX, 447 (1893). Discussion. XXX, 533 (1893).

"A Rational Formula for Asphalt Street Surfaces." J. Alden Griffin, LXXVII, 64 (1914).

64 (1914).

See also SURVEYING!

CROSS-TIES.

See TIES.

CULVERTS.

and box - for railroads. LI, 424 (1903).

CURRENT DEFLECTORS.

- for deepening river channels. XL, 231

"Ice Diversion, Hydraulic Models, and Hydraulic Similarity." Benjamin F. Groat. (With Discussion.) LXXXII, 1138 (1918).

CURRENT METERS. See METERS.

CURRENTS.

See OCEAN CURRENTS.

CURVES.

"A Simple Method of Running in a Transition Curve." John F. Ward. XXVII, 18 (1892). Discussion, XXVIII, 32, 205 (1893).

(1892). Discussion, AXVIII, 62, 209 (1893).

"Data for Flattening the Ends of Railroad—", Albon P. Man, Jr. (With Discussion.) XV, 359 (1886).

"Economy of Railroad Curvature." Wilson Crosby. II, 323 (1873).

"Line and Surface for Railway—" Chas. C. Wentworth. XLVIII, 357 (1902). Discussion: James K. Geddes and Charles A. Morse. XLVIII, 365.

"On the Theoretical Resistance of Railroad—" S. Whinery. VII, 79 (1878). Discussion. VII, 97; VIII, 179 (1878). Discussion. VII, 97; VIII, 179 (1879).

Relation between curvature and gauge of railroads. LXXVIII, 320 (1915).

"Spirals and Their Use on Railroads." A. S. C. Württele. XXXI, 329 (1894).

"The False Ellipse Reduced by Equations of Condition." Arthur S. C. Würtele. XXIV, 540 (1891).

"The Proper Compensation for Railroad

CURVES—(Continued),

"William R. Morley. (With Discussion.) XIII, 181 (1884).
"The Transition Curve whose Curvature Varies Directly as its Length from the P. C. or Point where it Connects with the Tangent." William Cain. XXVI, 473 (1892). Discussion. XXVIII, 32, 205 (1893) (1893)

(1893).

'ransition —." W. B. Lee. XLVI, 379 (1901). Discussion: George D. Snyder, C. A. Sundstrom, Charles C. Wentworth, J. I. Boggs, Charles A. Alden, and Horace J. Howe, XLVI, 383. "Transition

"An Automatic or Governor — for Steam Engines." William Arthur. II, 81 (1873).

"— on the Mississippi River. Their Effect on the Channel Above and Below." Caleb G. Forshey. V, 317 (1876). "The Atchafalaya River: Some of its Peculiar Physical Characteristics." J. A. Ockerson. (With Discussion.) LVIII, 1 (1907).

DAMS.

DAMS.

"A Masonry Dam." John W. Hill. (With Discussion.) XVI, 261 (1887).

"A Proposed New Type of Masonry Dam." George L. Dillman. XLIX. 94 (1902). Discussion: H. de B. Parsons, Edward Wegmann, William B. Fuller, George H. Pegram. J. Breuchaud, and A. V. Abhott, XLIX. 103.

"A Small Rock-Fill Dam." H. de B. Parsons. L, 351 (1903). Discussion: Samuel H. Lea, and Foster Crowell. L, 359. "A Western Type of Movable Weir Dam." W. C. Hammatt. (With Discussion.) LXXVI, 121 (1913). "American Irrigation Engineering." Herbert M. Wilson. (With Discussion.) XXV, 161 (1891). "An Account of the Method Adopted to

"An Account of the Method Adopted to Repair a Breach in the Earthen Dam of Repair a Breach in the Earthen Dam of the Storing Reservoir of the New Bedford Waterworks." William J. McAlpine. 1, 57 (1872).

"An Alternative Line for the Niearagua Canal: and a Proposed New Method of Dam Construction." J. Francis Le Baron (With Discussion.) L, 23 (1903).

"Arched—" B. A. Smith. LXXXIII, 2027 (1919-20). Discussion: Chauncy Wernecke, L. R. Jorgensen, and William Cain, LXXXIII, 2078.

"Backwater in Streams as Produced by—."

"Backwater in Streams as Produced by —."
De Volson Wood. (With Discussion.)
II, 255 (1873).

II, 255 (1873).
"Black Eagle Falls Dam, Great Falls, Montana." Maurice S. Parker. (With Discussion.) XXVII, 56 (1892).
"Cause of the Failure of the South Fork Dam." Report of the Committee. (With Discussion.) XXIV, 431 (1891).
Cohoes Dam across Mohawk River, XXXII,

407 (1894).

"Construction Methods Used in Building the Lower Reservoir Dam of the Bal-morhea Project." Vernon L. Sullivan. (With Discussion.) LXXXIII, 305 (1919-20).

"Construction of a Cheap Dam across the Roanoke River, near Salem, Va." Oscar Saabye, XXVII, 565 (1892), "Construction of a High-Service Reservoir at Baltimore, Md." P. A. Beatty, LXXVI, 92 (1913).

Construction of Sodom Dam, Croton Water-Shed. XXVIII, 185 (1893).

"Construction of the Morena Rock Fill Dam, San Diego County, California." M. M. O'Shaughnessy. LXXV, 27 (1912). Discussion: George L. Dillman, George F. Maddock, J. D. Galloway, H. Hawgood, and F. B. Mattby, LXXV, 52.

Cost of Huacal Concrete Arch Dam. LXXVIII, 599 (1915).

Dam for improved water-works, Columbus.

Dam for improved water-works, Columbus, Ohio. LXVII, 214 (1910). — at the Falls of St. Anthony. XII, 405

(1883).

"- on Sand Foundations: Some Principles on Sand Foundations: Some Principles Involved in Their Design, and the Law Governing the Depth of Penetration Required for Sheet-Piling." Arnold C. Koenig. LXXIII, 175 (1911). Discussion: W. G. Price, Alexander Potter, T. Kennard Thomson, G. E. P. Smith, Allen Hazen, and R. C. Beardsley, LXXIII, 190 190.

Data in relation to the Calaveras Dam. LXXXIII, 1720 et seq. (1919-20). Definition of the term "hydraulic-fill dam." LXXXIII, 1755 (1919-20).

Description of construction of the Hinck-ston Run Dam, especially the grouting. LXXVIII, 520 (1915).

Description of dam, Lock 12 Development, Alabama Power Company, LXXVIII, 1432, 1452 (1915).

"Description of the Work of Constructing a Dam across the Potomac River for Increasing the Water Supply of Washington, D. C." Samuel H. Chittenden. XVIII, 50 (1888).

Design for structural steel dam. XXXVIII,

302 (1897).

"Designing an Earth Dam Having a Gra-"Designing an Earth Dam Having a Gravel Foundation, with the Results Obtained in Tests on a Model." James B. Hays. LXXXI, 1 (1917). Discussion: W. G. Bligh, J. C. Oakes, C. E. Grunsky, H. T. Pease, Malcolm Elliott, Edward Wegmann, E. C. La Rue, George M. Bacon, H. A. Petterson, D. C. Henny, and Joseph Jacobs, LXXXI, 25. "Defention Reservoirs with Spillway Outlets as an Agency in Flood Control." II. M. Chittenden. (With Discussion.) LXXXI, 1473 (1918)

II. M. Chittenden. (17.28).
LXXXII, 1473 (1918).
Dimensions of a number of earth—.
LXXXIII, 1734 (1919-20).

934 (1914).

934 (1914).

Earth — LXXXIII, 305 (1919-20).

Effect of San Francisco earthquake on earth and concrete — LIX, 245 (1907).

"Excavation and Embankment by Water Power." Edward Bates Dorsey. (With Discussion.) XV, 348 (1886).

Fallure of the reinforced concrete Ambursen dam across Stony River, West Virginia. LXXVII, 1069 (1914).

"Fremantle Graving Dock: Steel Dam Con-

"Frematle Graving Dock: Steel Dam Con-struction for North Wall." Joshua Fiel-den Ramsbotham. (With Discussion.)

den Ramsbotham. (With Discussion.)
LXXVI, 1942 (1913).

"General Notes on the Great Kanawha
Improvement, Tripping Bars and Improved Hurters on Chanoine Wicket—
etc." Addison M. Scott. (With Discussion). XXXI, 539 (1894).

"Grouted Cut-Off for the Estacada Dam."
Harold A. Rands. LXXVII, 447 (1915).
Discussion: S. Howard Rippey, S. C.
Hulse, Frank R. Fisher, H. L. Coburn,

DAMS-(Continued).

William H. Cushman, V. H. Hewes, Lazarus White, Frederic V. Abbot, J. F. Ramsbotham, Harrison Sonder, and

Charles H. Paul, LXXVIII, 483.
Grouting under the foundations of—and dikes, Catskill Water Supply. LXXXIII,

Grouting under the date Supply. LXXXIII, dikes, Catskill Water Supply. LXXXIII, 1042 (1919-20).

"High Walls or—to Resist the Pressure of Water." James B. Francis. (With Discussion.) XIX, 147 (1888).

"Huacal Dam, Sonora. Mexico" (Concrete dam) H. Hawgood. LXXVIII,

tuacal Dam, Sonora, Mexico" (Concrete arch dam). H. Hawgood. LXXVIII, 564 (1915). Discussion: Charles W. Sher-man, M. M. O'Shaughnessy, L. R. Jor-gensen, and L. J. Mensch, LXXVIII,

"Hydraulic-Fill—." Allen Hazen. LXXXIII, 1713 (1919-20). Discussion: LXXXIII, 1713 (1919-20). Discussion: C. E. Curtis, Richard D. Chase, G. A. M. Elllott, J. M. Howells, D. C. Henny, A. T. Goldbeck, George L. Dillman, H. B. Muckleston, H. F. Dunham, William H. Burr, M. M. O'Shaughnessy, Arthur E. Morgan, H. de B. Parsons, George Sidney Binckley, Charles H. Paul, John E. Field, J. Albert Holmes, H. W. Swanitz, and Joel D. Justin, LXXXIII, 1746. "Hydraulic-fill—of the Necaxa light and power plant. LVIII, 39, 240 (1907). Hydraulic-fill, diversion dam. LXXXI, 309, 335 (1917).

335 (1917).

"Improvement of the Black Warrior, War-

"Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama," R. C. McCalla, (With Discussion.) XLIX, 212 (1902).
"Improving Arch Action in Arch —." L. R. Jorgensen, LXXXIII, 316 (1919-20). Discussion: W. P. Creager, S. H. Woodard, and W. H. R. Nimmo, LXXXIII, 329.

332.
Lake Cheesman Dam and Reservoir."
Charles L. Harrison and Silas H. Woodard. LIII, 89 (1904). Discussion: Joseph P. Frizell, Burr Bassell, F. B. Maltby, E. Sherman Gould, E. W. Harrison, Frank C. Horn, Charles S. Gowen, Edward Wegmann, J. Waldo Smith, E. Kuichling, R. Shirreffs, George Y. Wisner, Edwin Duryea, Jr., and G. S. Williams, LIII, 133. "Lake

liams, LIII, 133.

"Memoir of the Construction of a Masonry Dam." J. James R. Croes. III, 337 (1874). Discussion, IV, 310 (1875).

Models of crests of — LXXVII, 1202 (1914).

"Movable —" B. F. Thomas. (With Discussion.) XXXIX. 431 (1898).

Movable — used on American rivers. LIV, Part F, 274, 287 (1905).

"Multiple-Arch — on Rush Creek, California." L. R. Jorgensen. LXXXI, 850 (1917). Discussion: F. O. Blackwell, A. D. Flinn. F. W. Scheidenhelm, Edward Wegmann, Walter J. Douglas, Edwin Duryea, L. H. Nishkian, Gardner S. Williams, and George W. Howson, LXXXI, 882. LXXXI, 882.

LXXAI, 882.

Natural Waterways. Discussion on Inter.
Eng. Cong. Papers, 1904. LIV, Part D,
449 (1905).

New York City water supply, Brief description of—for. LXXVI, 1787 (1913).

"Notes on High Masoury—." John D. Van
Buren. (With Discussion.) XXXIV,
493 (1805) 493 (1895).

"Notes upon the Construction of a Water System for Placer Mining, and Sugges-tions for a New Method of Dam Build-ing." Robert Brewster Stanton. (With Discussion.) XXXV, 70 (1896).

DAMS—(Continued).

"On the Failure of the Worcester Dam."
Report of the Committee. (With Discussion.) V, 244 (1876).
"On the Flow of Water over—." George
W. Rafter. (With Discussion.) XLIV,

220 (1900).

"On the Work Done for the Preservation of the Dam at Holyoke, Mass., in 1885, and on Some Studies for a New Stone Dam for the Same Place." Clemens Herschel. XV, 543 (1886).

Practical examples of arch—: Salmon Creek and Lake Spaulding—. LXXVIII, 708 (1915).

708 (1915).

"Provision for Uplift and Ice Pressure in Designing Masonry —." C. L. Harrison, LXXV, 142 (1912). Discussion: G. M. Braune, Edward Godfrey, Allen Hazen, Charles E. Waddell, Rudolph Hering, M. G. Barnes, Howard J. Cole, M. H. Gerry, Jr., Edward Wegmann, Charles M. G. Barnes, Howard J. Cole, M. H. Gerry, Jr., Edward Wegmann, Charles E. Gregory, Orrin L. Brodie, H. F. Dunham, C. Elmore Smith, J. C. Meem, W. J. Douglas, Lindsay Duncan, Arthur P. Davis, William Cain, J. W. Ledoux, and L. J. Le Conte, LXXV, 146, 1128, 2014 (10), 200.

Quicksand

1739 (1919-20).

"Recent Practice in Hydraulic-Fill Dam
"Schuyler," Schuyler, Construction." James D. Schuyler. LVIII, 196 (1907). Discussion: Clemens Herschel, William L. Butcher, T. G. Dabney, Frederic P. Stearns, and J. M. Howells, LVIII, 253; LX, 101 (1908). Ridgeway Reservoir Dam. LXXXIII, 612

(1919-20).

(1919-20).

River diversion weir, Prewitt Reservoir, Colo. LXXVII, 111 (1914).

Rock filled —. XXXV, 82 (1896).

"Rolling —." K. E. Hilgard. (Inter. Eng. Cong. 1904.) LIV, Part D, 439 (1905).

Stresses in —. LXXVII, 770 (1914).

"Stresses in Masonry—." William Cain. LXIV, 208 (1909). Discussion: E. G. Walker, LXIV, 224.

Tables giving characteristics of constructed arch —. LXXVIII, 566, 603, 627 (1915).

arch — LAXVIII, 566, 603, 627 (1915).

"Temperature Changes in Mass Concrete."
Charles H. Paul and A. B. Mayhew.
(With Discussion.) LXXIX, 1225 (1915).

"The Action of Water under —." J. B. T.
Colman. LXXX, 421 (1916). Discussion: H. B. Muckleston, Warren B. Travell, Malcolm Elliott, James B. Hays,
W. P. Creager, Edward Wegmann,
H. W. King and Robert E. Horton,
W. B. Raddrin Wisonen, John C. Ockos W. P. Creager, Edward Wegmann, H. W. King and Robert E. Horton, W. R. Baldwin-Wiseman, John C. Oakes, LXXX, 453.

"The Analytical Determination of the Dimensions of the Gravity Resisting Parts of Masonry —." Maurice G. Parsons.

LXXV, 877 (1912).

"The Bohio Dam." George S. Morison. XLVIII, 235 (1902). Discussion: Frederic P. Stearns, Allen Hazen, Edward P. North, Boyd Ehle, Theodore Paschke, William H. Burr, A. G. Menocal, H. N. Pharr, Edwin Duryea, Jr., C. A. Sundstrom, Edward Wegmann, Philipp Forcheimer, J. L. Campbell, and J. T. Ford. XLVIII, 259.

"The Changes at the New Croton Dam." Charles S. Gowen. LVI, 32 (1906). Discussion: William R. Hill, Frederic P. Stearns, Alfred Craven, George S. Rice, and Edwin Duryea, Jr., LVI, 45.

"The Compensating Works of the Lake Superior Power Company." G. F. Stick-LXXV, 877 (1912). The Bohio Dam."

DAMS-(Continued).

(With Discussion.) L1V, 346 (1905).

"The Constant-Angle Arch Dam." Lars R. Jorgensen. LXXVIII, 685 (1915). Discussion: D. C. Henny, Edward Wegmann, Orrin L. Brodie, and R. G. Clifford, LXXVIII, 722.

The Construction of a Water-Tight Masonry Dam." Walter McCulloh. XXVIII, 185 (1893). Discussion, XXVIII,

"The The Construction of the Sweetwater Dam." James D. Schuyler. (With Discussion.) XIX, 201 (1888).

"The Control of Hydraulic Mining in California by the Federal Government."
William W. Harts. (With Discussion.) William W. H LVII, 1 (1906).

"The Design of a Drift Barrier across White River, near Auburn, Washington." H. H. Wolff. (With Discussion.) LXXX, 2061 (1916).

The Design of the New Croton Dam." Edward Wegmann. LVIII, 398 (1907). Discussion: Charles S. Gowen, George L. Dillman, Luther Wagoner, and William Caim LVIII, 435 Cain, LVIII, 435.
"The Dunning's Dam, near Scranton, Pa."

The Dunning's Dam, near Scranton, Pa. E. Sherman Gould. (With Discussion) XXXII, 389 (1894).

The East Canyon Creek Dam." A. F. Parker. LXXXIII, 574 (1919-20). Discussion: Edward Godfrey, Samuel Fortier, A. J. Wiley, and Herbert E. Bellamy, LXXXIII, 599. "The

amy, LXXXIII, 599.

"The Economic Improvement of the Coosa and Alabama Rivers, in Georgia and Alabama." D. M. Andrews. (With Discussion.) L, 363 (1903).

"The Economical Top Width of Non-Overflow—" William P. Creager. LXXX, 723 (1916). Discussion: Orrin L. Brodie, Edward Wegmann, and H. L. Coburn. wilnam P. Creager. LXXX, 723 (1916). Discussion: Orrin L. Brodie, Edward Wegmann, and H. L. Coburn, LXXX, 735.

"The Effect of Temperature Changes Masonry," Charles S. Gowen. (V

Masonry." Charles S. Gowen. (With Discussion.) LNI, 399 (1908).
"The Failure of the Dam on Mill River." Report of the Committee. III, 118 (1874). Discussion, III, 122; IV, 310

(1875).

"The Failure of the Yuba River Débris
Barrier, and the Efforts Made for Its
Maintenance," H. H. Wadsworth.
LXXI, 217 (1911). Discussion: William
W. Harts, W. C. Hammatt, and Thomas
C. Atwood, LXXI, 228.

"The Foundations of the New Croton Dam." Charles S. Gowen. (With Discussion.) XLIII, 469 (1900).
"The Gatun Dam." C. D. Ward. LIII, 36 (1904). Discussion: Charles L. Harrison, LIII, 41.

"The Halligan Dam; A Reinforced Masonry Structure." G. N. Houston. LXXV, 112 (1912). Discussion: Maurice G. Parsons, Lars R. Jorgensen, S. G. Swigart, Lars R. Jorgensen, S. G. Swigart, Charles B. Buerger, Maurice C. Couchot, L. J. Mensch, and Edward L. Sayers, LXXV, 129.

"The Hydraulic Jump, in Open-Chaunel Flow at High Velocity." Karl R. Ken-nison. (With Discussion.) LXXX, 338

(1916).

Improvement of the Ohio River." William L. Sibert. (With Discussion.) LXIII, 388 (1909).
The North Dike of the Wachusett Reservoir. XLVIII, 254, 259 (1902).

DAMS-(Continued).

"The Panama Canal." George S. Morison. (With Discussion.) L, 155 (1903).
"The Power Plant, Pipe Line and Dam of

"The Power Plant, Pipe Line and Dain of the Pioneer Electric Power Company at Ogden, Utah." Henry Goldmark. (With Discussion.) XXXVIII, 246 (1807). "The Reconstruction of the Stony River Dam." P. W. Scheidenhelm, LXXXI, 907 (1917). Discussion: J. W. Ledoux, 907 (1917). Discussion: J. W. Leuoux, J. K. Finch, P. P. Rutenberg, Fred F. Moore, W. S. Downs, H. L. Coburn, H. F. Dunham, Orrin L. Brodie, William F. Dunham, Orrin L. Brodie, William Cain, Charles E. Gregory, Kenneth C. Grant, L. R. Jorgensen, Edward Wegmann, Irving P. Church, M. M. O'Shaughnessy, Joel D. Justin, and Ross M. Riegel, LXXXI, 1024.

The Six-Mite Creek Dam. LHI, 183 (1904).

"The Water-Works of Syracuse, N. Y."

William R. Hill. (With Discussion.)

William R. Hill. XXXIV, 23 (1895).

XXXIV, 23 (1895).
"Two Earth—of the United States Reclamation Service." D. C. Henny. LXXIV, 38 (1911). Discussion: James Dix Schuyler, LXXIV, 87.
Various types of —, XXXII, 411 (1894).
"Wing — in the Mississippi above the Falls of St. Anthony." Edward P. North. VI, 268 (1877).

DEPRECIATION.

See VALUATION.

DIAGRAMS.

See GRAPHICAL CHARTS.

DIKES.

Concrete dike for preservation of Falls of St. Anthony. XII, 401 (1883). "Provincetown Dike." James B. Francis.

1, 329 (1872).
"Some Notes on the Holland —." William Starling. (With Discussion.) XXVI, 559 (1892).

The North Dike of the Wachusett Reservoir. XLV111, 254, 259 (1902).

See also LEVEES.

DISEASE.

"Caisson—and Its Prevention." Henry Japp. LXV, 1 (1909). Discussion: J. S. Haldane, Frederick L. Keays, Albert J. Loomis, William L. Saunders, Walton I. Aims, Seward Erdman, and T. Kennard Thomson, LXV, 24.
a is son—at Colorado River siphon.

Thomson, LXV, 24.
Caisson—at Colorado River siphon.
LXXVII, 23 (1914).
"Self-Purification of Flowing Water and
the Influence of Polluted Water in the
Causation of—." Charles G. Currier.
(With Discussion.) XXIV, 21 (1891).
Statistics of typhoid fever and similar
diseases in Washington, D. C., and their
causation. LVII, 364 et seq. (1906).
Statistics of typhoid fever in Washington,
D. C. LXXII, 316 (1911).
Typhoid fever death rates in large cities
of the United States. LXXII, 371 (1911).
"Typhoid Mortality in South Belbhehem,
Pa." Mansfield Merriman and Winter
L. Wilson. LVIII, 511 (1907).
Typhold statistics for St. Louis. LX, 210
(1908).

(1908).

"Water Supply." An Informal Discussion, George W. Fuller and others. L1X, 367 (1907).

DISKS.

"An Investigation to Determine the Strains in a Hollow Cast-Iron Disk, Cooled from

DISKS—(Continued).

the Interior." G. Leverich. XVIII, 43 (1888).

DISTILLATION.

"On the Application of a New System of—with Conservation of Heat." Thomas Prosser. 1, 79 (1872).

DOCKS.

**Portish Railroad Terminals." William Theodore Foxlee. (Inter. Eng. Cong. 1904). LIV, Part F, 441 (1905). "Dock Improvements at Liverpool." George Cecil Kenyon. LII, 36 (1904). Discussion: Alfred Noble, L. J. Le Conte, and Emile Low, LII, 65. "Fremantle Graving Dock: Steel Dam Construction for North Wal." Joshua Fielden Ramsbotham. LXXVI, 1942 (1913). Discussion: A. R. Archer, and Herbert E, Bellamy, LXXVI, 1971. New York City — Brief description of. LXXVI, 1670 (1913). "Notes upon — and Harbors." Luther Wag-

"Notes upon—and Harbors." Luther Wag-oner. LXII, 135 (1909). Discussion: W. B. Ruggles, E. P. Goodrich, Howard J.; Cole, and Rudolph Hering, LXII, 149.

Reinforced Concrete—; Foreign and American Structures. Failures, Costs, and General Considerations." Harrison S. Taft. (With Discussion.) LXXVIII,

S. Taft. (With Discussion.) LXXVIII, 1058 (1915).
"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912).

See also WHARVES.

DOCKYARDS.

See SHIPYARDS.

DOMES.

"The Iron Work for the Dome of the Proposed Government Building, World's

Proposed Government Building, World's Columbian Exposition, Chicago, Ill."
James C. McGuire. XXVI, I (1892).
"Theory of the Spherical Dome with a Homogeneous Surface, and of the Framed Dome; also Notes on the Construction of Masoury and Mctal—." E. Schmitt. LII, 262 (1904). Discussion: Irving P. Church, and H. H. Wadsworth, LII, 309.
"Theory of the Spherical or Conical Dome."

"Theory of the Spherical or Conical Dome of Reinforced Concrete or Metal." William Cain. LV, 201 (1905).

DRAINAGE.

DRAINAGE.

"A Method of Determining Storm-Water Run-Off," Charles B. Buerger, LXXVIII, 1139 (1915). Discussion: R. C. Strachan, Kenneth Allen, W. W. Horner, Charles W. Sherman, Robert E. Horton, C. E. Grunsky, Samuel D. Bleich, Charles E. Gregory, Samuel A. Greeley, W. E. Fuller, and George W. Fuller, LXXVIII, 1165.

Area of waterway for railroad bridges and culverts. LI, 441 (1903), Cure of a small laud-slide by —. LXXXIII, 1289 (1919-20).

 for Yale Bowl. LXXXI, 264 (1917).
 of Astoria Gas Tunnel. LXXX. LXXX. (1916).

of foundation soil, Stony River Dam. LXXXI, 988 et seq. (1917). of tunnels, approaches, and yards, PennDRAINAGE .- (Continued).

sylvania Railroad Terminal, New York. LXIX, 117, 129, 147, 180, 323 (1910). - tunnels to stop a land slide. LXXXII,

767 (1918)

Excessive Rainfalls Considered with Es-"Excessive Rainfalls Considered with Especial Reference to Their Occurrence in Populous Districts." R. L. Hoxie. (With Discussion.) XXV, 70 (1891). "Rainfall, and Run-Off in Storm-Water Sewers." Charles Emerson Gregory. (With Discussion.) LVIII, 458 (1907). "Some Notes on the Holland Dikes." William Starling. (With Discussion.)

"Some Notes on the Holland Dikes." William Starling. (With Discussion.) XXVI, 559 (1892).
"Some Specialties of the System for Flushing the New Sewers of the City of Mexico." Roberto Gayol. (With Discussion of the Company of the City of Mexico." Roberto Gayol.

ing the New Sewers of the City of Mexico." Roberto Gayol. (With Discussion.) LV, 262 (1905).
"Tequixquiac Tunnel. Valley of Mexico." Albert Johnstone Campbell and Frederick William Abbot. XXXII, 171 (1894). Discussion, XXXII, 267.
"The — of the Valley of Mexico." Francisco de Garay. XII, 153 (1883).
"The Relation Between the Rainfall and the Discharge of Sewers in Populous Districts." Emil Kuichling. (With Discussion.) XX, 1 (1889).
"The St. John Levee and — District of Missouri." R. M. Strohl. (With Discussion.) LXXIX, 493 (1915).
"The Sewer System of San Francisco, and a Solution of the Storm-Water Flow Problem." C. E. Grunsky. (With Discussion.) LXV, 294 (1909).
"The Single Trap System of House—." Latham Anderson. (With Discussion.)

"The Single Trap System of House—."
Latham Anderson. (With Discussion.)
XXV, 394 (1891).
"The Subsidence of Muck and Peat Soils
in Southern Louisiana and Florida."
Charles W. Okey. LXXXII, 396 (1918).
Discussion: Arthur E. Morgan, Orrin
Randolph, Rudolph Hering, J. F. Coleman. William T. Lyle. William H. Kimball, and S. H. McCrory, LXXXII, 420.
"The Water Supply,—and Sewerage of the
Lawrenceville School." Frederick S.
Odell. XVI, 66 (1887).

See also LAND RECLAMATION

See also LAND RECLAMATION.

DRAW-BRIDGES.

"A Four-Track, Center-Bearing, Railroad Draw Span." Louis H. Shoemaker. LXXV, 711 (1912). Discussion: A. H. Markwart, Howard J. Cole, and L. J. Le Conte, LXXV, 720.

"A Graphical Method for the Solution of

Le Conte, LXXV, 720.

"A Graphical Method for the Solution of Stresses in the Continuous Girder, as Applied to —." George F. Barton. (With Discussion.) XLVIII, 72 (1902).

"A New Swing Bridge at Copenhagen, Denmark." H. C. V. Moeller. (With Discussion.) LV, 129 (1905).

"A Novel Method of Repairing a Swing Bridge." Herbert C. Keith. (With Discussion.) LXXXIII, 1080 (1919-20).

"An Account of the Erection of a Draw-Bridge without False Works." C. S. Maurice. II, 330 (1873).

"Construction Problems, Dumbarton Bridge. Central California Railway." E. J. Schneider. LXXVI, 1572 (1913). Discussion: L. J. Le Conte, R. D. Coombs, O. E. Hovey, Lewis D. Rights, and Theodore Belzner, LXXVI, 1614.

"Deflections of Beams with Variable Moments of Inertia." C. W. Hudson. (With Discussion.) LI, 1 (1903).

"Draw-Spans and Their Turn-Tables."

DRAW-BRIDGES-(Continued).

DRAW-BRIDGES—(Continued).

C. Shaler Smith. III, 129 (1874). Discussion, III, 139; IV, 203 (1875).

"Experimental Determination of the Rolling Friction in Operating the Draw of the Thames River Bridge, together with Method for Determining Power to Operate—" Alfred P. Boller, Jr., and H. J. Schumacher. (With Discussion.) XXV, 638 (1891).

Harlem River Bridge, Manhattan Elevated Railway. LXXXII, 605, 682 (1918).

Lift rail and rail-locking device, Hackensack Draw-Bridge, Pennsylvania Railroad. LXVIII, 81 (1910).

Lift-rail for Dumbarton Point Draw-Bridge. LXXVI, 1618 (1913).

"Movable Bridges." C. C. Schneider. LX, 258 (1908). Discussion: C. R. Dart. J. R. Worcester, Albert Henry Smith, H. D. Hess, J. E. Greiner, Martin Gay, Ralph Modjeski, Wilbur J. Watson, W. M. Hughes, J. P. Snow, Theodore Cooper, James Christie, J. W. Schaub, George Gibbs, and R. Murray, LX, 296.

"Notes on the Replacing of the Superstructure of the Harlem Ship Canal Bridge." Horace J. Howe. (With Discussion.) LXVII, 1 (1910).

"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving—Having Two Spans or Openings, and Built as Continuous Girders, More Especially as Continuous Funcel Girders." Clemens Herschel. III, 395 (1874). Discussion, IV, 203 (1875).

"The Utica Lift Draw-Bridge." Squire Whipple. III, 190 (1874). Discussion, III, 194; IV, 203 (1875).

See also BRIDGES: LIFT BRIDGES.

DRAWINGS.

"Copyright in — of a Technical Character."
D. A. Usina. LXV, 38 (1909).

DREDGES.

See DREDGING.

DREDGING.

"A Desirable Method of — Channels through River Bars." S. P. Maximoff. LII, 215 (1904). Discussion: Rudolph Hering, William W. Harts, E. L. Corthell, A. W. Robinson, L. J. Le Conte, F. B. Maltby, William Gerig, and F. H. Hilliard, LII,

"Crane and Ladder Dredges." T. Kobayashi. (Inter. Eng. Cong. 1904.) LIV, Part C, 335 (1905).
Description of dredges used at Oakland Harbor, Cal. XIII, 10 (1884).

"Description of the Lower Weser and Its Improvement." L. Franzius. XXIX, 173 (1893). Discussion, XXX, 483 (1893). "Dredges and – on the Mississippi River."

J. A. Ockerson. (With Discussion.)

XL, 215 (1898).

XL, 215 (1898).

Dredges: Their Construction and Performance. Discussion on Inter. Eng. Cong. Papers, 1904. A. W. Robinson, L. J. Le Conte, George Higgins, William Mayo Venable. C. W. Sturtevant, Lewis M. Haupt, William M. Hall, W. B. Gregory, F. B. Maltby, and J. C. Sanford. LIV, Part C, 479 (1905).

"Dredges: Their Construction and Performance: Review of General Practice."

A. W. Robinson. (Inter. Eng. Cong. 1904.) LIV, Part C, 271 (1905).

DREDGING-(Continued).

"Dredges: Their Construction and Per-formance: Review of General Practice." Jean Hersent. (Translated from the Jean Hersent. (Translated from the French by Paul A. Seurot. (Inter. Eng. Cong. 1904.) LIV, Part C, 327 (1905). — and dredges. Cape Cod Canal. LXXXII,

24 (1918).

at Boston Harbor. VII, 41 (1878).
in harbors. LIV, Part A, 165 (1905).
in reclamation of Potomac Flats. XXXI,

(1894)Ocean Bars." J. C. Sanford. (Inter. Eng. Cong. 1904.) LIV, Part C, 303

"Hydraulic — on the Mississippi River." F.

B. Maltby. (Inter. Eng. Cong. 1904.) LIV, Part C, 391 (1905). "Plant and Material of the Panama Canal." William Plumb Williams. XIX, 273

(1SSS).

"Principles of Tidal Harbor Improvement as Applied at Wilmington, Cal." Clinton B. Sears. V. 388 (1876). Discussion, VI, 189 (1877). "Recent — Operations at Oakland Harbor, California." L. J. Le Conte. XIII, 9

(1884).

"Removal of Rock 40 Ft. below Surface of Water, North River, N. Y." John A. Bensel. (With Discussion.) XXXII, 231 (1894).

231 (1894).

Rock removal and — in Pacific coast harbors. LXXVI, 187, 194 et seq. (1913).

Submarine rock excavation. XXIX, 137 (1893); XXX, 478 (1893).

"The Control of Hydraulic Mining in California by the Federal Government."

William W. Harts. (With Discussion.) LVII, 1 (1906).

"The Improvement of the Channels at the Entrance to the Harbor of New York."
Joseph Edwards. XXV, 573 (1891).
"The Reclamation of River Deltas and Salt Marshes." J. Francis Le Baron. (With Discussion.) LIV, 51 (1905).
"The Three 15-Cubic Yard Dipper-Dredges, Gamboo Paraiso and Cascade as Sun-

Camboa, Paraiso, and Cascadas, as Supplied and Used on the Panama Canal."
Ray W. Berdeau. LXXXII, 515 (1918).
Discussion: Charles Evan Fowler, Arthur W. Manton, A. W. Robinson, and William M. Rosewater, LXXXII, 529.

DRIFT BARRIERS.

"The Design of a Drift Barrier across White River, near Auburn, Washing-ton." H. H. Wolff. (With Discussion.) LXXX, 2061 (1916).

DRILLING.

Average unit — and blasting quantities for Astoria Gas Tunnel. LXXX 617 (1916). — North River Tunnels, Pennsylvania Rail-

road. LXVIII, 180 (1910).

Method of — used at Rogers Pass Tunnel.

LXXXI, 464 (1917).

Methods and cost of —, Lexington Ave-

etnods and cost of—, Lexington Avenue Subway, New York City. LXXXI, 343 (1917).

Methods and results of — Bergen Hill Tun-nels, the New York Tunnel Extension of Pennsylvania Railroad. LXVIII, 87

"The Use of Cement for Excluding Water from Oil Sands in—Wells." Paul M. Paine. LXXVI, 1644 (1913).

DRIVEN WELLS.

See WELLS.

DRY DOCKS.

"A New Graving Dock at Nagasaki, Japan." Naoji Shiraishi. LVI, 73 (1906). Discussion: E. P. Goodrich, M. Otagawa, Charles M. Jacobs, R. C. Hollyday, L. J. Le Conte, Charles Albertson, and L. F. Bellinger, LVI, 79. Dockyards in Japan. LIV, Part D, 58

(1905).

"Dry ry Docks." Cuthbert A. Brereton. (Inter. Eng. Cong. 1904.) LIV, Part F, 379 (1905).

Titler, Fig. Cong. 1807.)

1379 (1905).

Dry Docks. Discussion on Inter. Eng. Cong. Papers, 1904. E. P. Goodrich, Sir William H. White, and V. E. Timonoff. LIV, Part F, 409 (1905).

—of France. XXIX, 54 (1893).

—of France." A. Joly, (Inter. Eng. Cong. 1904.) LIV, Part F, 385 (1905).

—: Stone vs. Wood." An Informal Discussion. W. L. Catheart, George W. Melville, M. T. Endieott, R. G. Packard, P. C. Asserson, J. G. Tait, John Kennedy, James Ritchie, Francis Collingwood, Charles H. Haswell, Francis T. Bowles, Alfred P. Boller, and Edward Mohun. XLI, 554 (1899).

"Fremantle Graving Dock: Steel Dam Construction for North Wall." Joshua Fielden Ramsbotham. (With Discussion.) LXXVI, 1942 (1913).

den Ramsbotham. (With Discussion.)
LXXVI, 1942 (1913).

"Pearl Harbor Dry Dock." H. R. Stanford. LXXX, 223 (1916). Discussion:
Charles Evan Fowler, Harrison S. Taft,
W. F. Frear, P. L. Reed. Frederic R.
Harris, Leonard M. Cox, W. H. Pretty,
J. R. Baterden, Herbert E. Bellamy, B.
C. Laws, and Edward Box. LXXX, 295.

"Temporary—for Rapid Construction."
V. E. Timonoff. (Inter. Eng. Cong.
1904). LIV, Part F. 397 (1905).

"The Construction of the Lorain Dry Dock
and Shipyard of the Cleveland ShipBuilding Company." James Ritchle.

and Shipyard of the Cleveland Ship-Building Company." James Ritchie. XXXIX, 323 (1898).
"The Naval Floating Doek; Its Advantages, Design and Construction." Leonard M. Cox. LVIII, 97 (1907). Discussion: George B. Rennie, J. R. Baterden, Cecil H. Peabody, C. Colson, A. C. Cunningham, Lyonel Clark, Edward Box, B. C. Laws, L. J. Le Conte, W. H. Pretty, L. F. Bellinger, and H. T. Hansson, LVIII, 151; LX, 110 (1908).

DYNAGRAPH.

Train resistance experiments by P. H. Dudley. V, 341 (1876).

DYNAMOMETERS.

"Permanent Transmitting Dynamometer." Charles A. Smith, XV, 357 (1886).

EARTH PRESSURES.

EARTH PRESSURES.

"Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion." William Cain. LXXX, 1315 1916). Discussion: Clifford Richardson, F. W. Green, and E. P. Goodrieh, LXXX, 1326.

"—: A Practical Comparison of Theories and Experiments." L. D. Cornish. LXXXI, 191 (1917). Discussion: William Cain. G. M. Braune, and F. N. Menefee, LXXXI, 202.

"Experiments on Retaining Walls and Pressures on Tunnels." William Cain. LXXII, 403 (1911). Discussion: J. R. Worcester, and J. C. Meem, LXXII, 449.

EARTH PRESSURES—(Continued).

"Hydraulic-Fill Dams." Allen Hazen. (With Discussion.) LXXXIII, 1713

(1919-20).

(1919-20).

"Lateral—and Related Phenomena." E. P. Goodrich. LIII, 272 (1904). Discussion: M. F. Bonzano, V. H. Hewes, H. F. Dunham, Robert Brewster Stanton, and Richard Lamb, LIII, 305.

Measurement of pressures transmitted through granular matter by the soil pressure cell. LXXXIII, 1763 (1919-20).

"Notes on Tunnel Lining for Soft Ground."
S. Johannesson and B. H. M. Hewett. (With Discussion.) LXXXIII, 1822 (1919-20).

(1919-20).

"Pressure, Resistance, and Stability of Earth." J. C. Meem. LXX, 352 (1910). Discussion: T. Kennard Thomson, Charles E. Gregory, Francis W. Perry,

Charles E. Gregory, Francis W. Perry, E. P. Goodrich, Francis L. Pruyn, and Frank H. Carter, LXX, 389.

"The Bracing of Trenches and Tunnels, with Practical Formulas for —." J. C. Meem. LX, 1 (1908). Discussion: Horace J. Howe, C. W. Birch-Nord, Lazarus White, E. G. Haines, F. T. Llewellyn, T. Kennard Thomson, Ernst F. Jonson, Francis L. Pruyn, R. A. Shailer, H. P. Moran, Eugene W. Stern, G. L. Jonson, Francis L. Pruyn, R. A. Shailer, H. P. Moran, Eugene W. Stern, G. L. Christian, V. H. Hewes, E. P. Goodrich, J. F. O'Rourke, O. F. Nichols, Walter H. Gahagan, Milo S. Ketchum, Charles F. Marsh, F. L. Cranford, Jason Paige, and L. R. Gifford, LX. 24.

"The Failure and Righting of a Million-Bushel Grain Elevator." Alexander Allaire. (With Discussion.) LXXX, 799 (1916).

(1916).

EARTHQUAKES.

"Effect of Earthquake Shock on High

Buildings." R. S. Chew. (With Discussion.) LXI, 238 (1908).
"Notes on the Guatemala—, and Earthquake-Proof Construction." S. Vilar y Boy. LXXXIII, 1689 (1919-20). Discussion: Marsden Manson, and A. W. Buel LXXXIII, 1700

Buel, LXXXIII, 1700.

The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of Members of the American Society of Civil Engineers. LIX, 208 (1907). Discussion: Edwin Duryea, Jr., Franklin Riffle, H. H. Wadsworth, E. G. Perrot, Luther Wagoner, Eugene W. Stern, J. K. Freitag, W. W. Harts, E. A. Rix, W. F. Whitaker, A. M. Bienenfeld. Arthur L. Adams, S. G. Hindes, Loren E. Hunt. B. Bienenfeld, J. P. Carlin, Charles E. Goad, R. B. Green, C. E. Moore, A. L. A. Himmelwright, Langdon Pearse, Charles Derleth, Jr., and J. D. Galloway, LIX, 264. "The Effects of the San Francisco Earth-

EARTHWORK.

EARTHWORK.

Canal embankments. XXXIX, 208 (1898).
— and embankment in the construction of reservoirs. LXXX, 691, 716 (1916).

"Economic Canal Location in Uniform Countries." Lyman E. Bishop. (With Discussion.) LXXIV, 178 (1911).

"Excavation and Embankment by Water Power." Edward Bates Dorsey. (With Discussion.) XV, 348 (1886).

"On Form of Railway Excavations and Embankments." D. J. Whittemore. (With Discussion.) XXXII, 255 (1894).

EARTHWORK—(Continued).

"The Compressibility of Salt Marsh under the Weight of Earth Fill." Eugene R. Smith. (With Discussion.) XXXVII, 213 (1897).

The compressibility of soils. LIII, 272

(1904).

"Uniformity of Requirement and Clearness of Specification in Agreements for the Graduation of Railroads." W. F. Dennis. (With Discussion.) LVIII, 321 (1907).

ECONOMICS.

"A Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. (With Discussion.) LXXXI, 413 (1917). "Depreciation as an Element for Consideration in the Appraisal of Public Service Properties." C. E. Grunsky. (With Discussion.) LXXIX, 727 (1915). "Final Report of the Special Committee to Ecompulate Principles and Methods for the

Formulate Principles and Methods for the Valuation of Railroad Property and Other Public Utilities." (With Discussion.) LXXXI, 1311 (1917).

Cinal Report of the Special Committee

to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." (With Discussion.) LXXXI, 1207 (1917).

"Fundamental Principles of Public Utility Valuation." John W. Alvord. (With Discussion.) LXXIX, 117 (1915). "The—of Steel Arch Bridges." J. A. L. Waddell. (With Discussion.) LXXXIII,

1 (1919-20).

1 (1919-20).

"The Just Value of Monopolies, and the Regulation of the Prices of Their Products." Joseph Mayer. (With Discussion.) LXXV, 455 (1912).

"The Philosophy of Engineering." Maurice Concerns. (With Discussion.)

G. Parsons. (With Discussion.)

LXXVII, 38 (1914).

Fine Valuation of Public Utility Property." J. H. Gandolfo. (With Discussion.) LXXIX, 842 (1915). "The

See also VALUATION.

EDUCATION.

"Electro Science, as a part of the—of Civil Engineers." Stephen Chester. (With Discussion.) II. 63 (1873) "Engineering—." Calvin M. Woodward

(Inter .Eng. Cong. 1904.) LIV, Part A, 483 (1905).

"Engineering —." Robert Fletcher. (Inter. Eng. Cong. 1904.) LIV, Part A, 455

Eng. Cong. 1904.) LIV, Part A, 455 (1905).

"Engineering —." An Informal Discussion. George F. Swain, Harold Bouton, George W. Rafter, Edgar Marburg, Gardner S. Williams, Olin H. Landreth, Bernard R. Green, Edwin F. Wendt, A. N. Talbot, F. R. Coates, and Bassett Jones, Jr. LVII, 141 (1906).

Engineering —. Discussion on Inter. Eng. Cong. Papers, 1904. J. L. Van Ornum, D. H. Ray, Frank O. Marvin, H. N. Ogden, Alfred Chatterton, Sir William H. White, Robert Fletcher, and Calvin M. Woodward. LIV, Part A, 497 (1905).

"Engineering — in its Relation to Training for Engineering Work." Ernest McCullough. LXXV, 1079 (1912). Discussion: N. B. Garver, George B. Pillsbury, F. H. Constant, Arthur B. Green, Alexis Saurbrey, J. X. Cohen, George F. Swain,

EDUCATION-(Continued).

William J. Boucher, Almon H. Fuller, Walter Hinds Allen, C. H. Stengel, Charles Warren Hunt, Arthur H. Blan-chard, Philip W. Henry, John C. L. Rogge, Charles H. Higgins, and Charles B. Buerger, LXXV, 1092. Technical—in Japan. LIV, Part D, 79

"The—of Civil Engineers." Thomas C. Clarke. III, 255 (1874). Discussion, III, 259, 288.

EFFLORESCENCE.

"The Relative Effects of Frost and the Sulphate of Soda — Tests on Building Stones." Lea McI. Luquer. (With Dis-cussion.) XXXIII, 235 (1895).

ELECTRIC ENGINEERING. See ENGINEERING.

ELECTRIC GOVERNORS.

Electric governor for regulation of water power. XXXVII, 17 (1897).

ELECTRIC LIGHTING.

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).
Comparative cost of electric and gas light.

Comparative cost of electric and gas light, XVIII, 145 (1888).

Effect of San Francisco earthquake on—plants. LIX, 257 (1907).

Electric light plant at Philadelphia and Reading Terminal. XXXIV, 149 (1895).—at Ontarlo, California. LV, 173 (1905).

"—at Topeka. Kansas." Lewis Kingman. (With Discussion.) XXVI, 427 (1892).—of the station, tunnels and yards, Pennary Political Terminal New York.

or the station, tunnels and yards, Pennsylvania Railroad Terminal, New York, LXIX, 269, 292, 299, 328 (1910). Lighting of modern office buildings. XLVIII, 7 et seq. (1902). Lighting of the Washington Terminal Station. LXXI, 50 (1911). "Test of an Edison Incandescent — Plant." John W. Hill. (With Discussion.)

John W. Hill. XVIII, 142 (1888). The Delancey Slip rubbish incinerator and
- station, New York City. LVII, 69

(1906)."The Electric Station of the Citizens' Light and Power Company of Rochester, N. Y." Robert Cartwright. (With Discussion.) XXXI, 335 (1894).
"The Guadalajara Electric Light Installation."

The Guadalajara Electric Light Installation, Utilizing the Famous Juanacatlán Water-Falls, 28 Km. Distant from Guadalajara." Rafael M. de Arozarena. XXIX, 689 (1893).

"The Necaxa Plant of the Mexican Light and Power Company." F. S. Pearson and F. O. Blackwell. (With Discussion.) LVIII, 37 (1907).

"The Theory of Agua Ammonia Project.

"The Theory of Aqua Ammonia Engines. with Results of Tests upon an Engine of

with Results of Tests upon an Engine of this Type Operating an Edison Incandes-cent Lighting Plant." Edward E. Ma-govern. XIX, 127 (1888). "The Twenty-Eighth Street Central Sta-tion of the United Electric Light and Power Company." II. W. York. (With Discussion.) XXXV, 429 (1896).

ELECTRIC LOCOMOTIVES.

in use at Pennsylvania Railroad Terminal, New York. LXIX, 358, 421, 422, 426, 432 (1910).

ELECTRIC MACHINERY.

"Specifications for Metal Railroad Bridges Movable in a Vertical Plane." B. R. Leffler. (With Discussion.) LXXVI, 370 (1913).

ELECTRIC POWER.

High-Voltage Power Transmission." M. H. Gerry, Jr. (With Discussion.) L, 212 (1903).

212 (1903).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

"Construction of the Power-House of the Rochester Power Company, adjacent to Genesee Falls, Rochester, N. Y." Robert Cartwright. XXVIII, 19 (1893).

"Electrical Power: Generating Stations and Transmission." L. B. Stillwell. (Inter. Eng. Cong. 1904.) LIV, Part D, 357 (1905). Discussion: G. Puente, Z. T. Daniel, and N. A. Eckart, LIV, Part D, 397. 397.

Electrification of De LXXIV. 350 (1911). Detroit River Tunnel.

"Hydro-Electric Power in Canada." Cecil B. Smith. (With Discussion.) LXV, 154 (1909).

Power house, Astoria, Oregon, Water-Works. XXXVI, 35 (1896).
Power house equipment at South Boston Terminal. XLIII, 150 (1990).
Power plant for Washington Passenger Terminals. LXXI, 76 (1911).

Power plants at Ontario, California. LV, 173 (1905).

173 (1905).

"The Design of Hydro-Electric Power Plants." J. D. Galloway. (With Discussion.) LXXIX. 1000 (1915).

"The Electric Station of the Citizens' Light and Power Company of Rochester, N. Y." Robert Cartwright. (With Discussion.) XXXI, 335 (1894).

"The Hydraulic Plant of the Puget Sound Power Company." Edwin H. Warner. (With Discussion.) LV, 228 (1905).

"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company." A. H. Van Cleve. LXII, 199 (1909). Discussion: John C. Parker, and William J. Boucher, LXII, 238. LXII, 238

LXII, 238.

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama."
E. L. Sayers and A. C. Polk. (With Discussion.) LXXVIII, 1409 (1915).

"The Necaxa Plant of the Mexican Light and Power Company." F. S. Pearson and F. O. Blackwell. (With Discussion.) LVIII, 37 (1907).

"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs. LXIX, 226, 434 (1910). (1910)

"The Ninety-Sixth Street Power Station of the Metropolitan Street Railway Com-pany, of New York City." L. G. Mon-tony. (With Discussion.) XLIV, 119

(H900).

(4900).

"The Power Plant, Pipe Line and Dam of the Pioneer — Company at Ogden, Utah." Henry Goldmark. (With Discussion.) XXXVIII, 246 (1897).

"The Relative Merits of Working Hoisting Machinery by Steam, Water and Electricity." George A. Goodwin. XXIX, 695 (1892).

695 (1893).
"The Twenty-Eighth Street Central Station

of the United Electric Light and Power

ELECTRIC POWER—(Continued).
Company." H. W. York. (With Discussion.) XXXV, 429 (1896).

See also POWER TRANSMISSION.

ELECTRIC RAILWAYS.

"A New Suspension for the Contact Wires of — Usling Slide Bows," Joseph Mayer, LXI, 1 (1908), Discussion: R. D. Coombs, and Charles Rufus Harte, LXI, 27.

"Bibliography on Valuation of Utilities," LXXVI, 2133 (1913).

"Bibliography on variation of Utilities." LXXVI, 2133 (1913).
"Catenary Trolley Construction." Oliver S. Lyford, Jr. LXII, 157 (1909). Discussion: Joseph Mayer, Charles Rufus Harte. W. K. Archbold, Theodore Varney, George N. Cole. W. S. Murray, and R. D. Coombs. LXII, 175.
"Comparative Tests of an Electric Motor and a Steam Locomotive on the Man

and a Steam Locomotive on the Manhattan (Elevated) Railway, New York."
Lincoln Moss. (With Discussion.) XXIII,

193 (1890).

"Electric Railways." An Informal Discussion. George Gibbs, W. W. Follett. and J. T. Noble Anderson. LIX, 330

(1907).

"— in the Ohio Valley between Steuben-ville, Ohio, and Vanport, Pennsylvania." George B. Francis. LXIII, 73 (1909). Discussion: F. Lavis, George B. Pres-ton, J. Martin Schreiber, and William

J. Boucher, LXIII, 91.

"Electricity versus Steam for Branch Railroad Lines." An Informal Discussion. H. S. Haines, H. G. Prout, Oberlin Smith. W. B. Reed, G. S. Davison, W. L. Webb, J. James R. Croes, W. J. Baldwin, D. C. Jackson, Gustav Lindenthal, Edward Wegmann, Robert Moore, C. W. Buchholz, A. P. Davis, and Charles H. Davis, XLJI, 375 (1899). "Motive Power for Street Railways." Alfred F. Sears. XXVII, 313 (1892). Discussion. XXVII, 574. "Overhead Construction for High-Teusion Electric Traction or Transmission." R. D. Coombs. (With Discussion.) LX, 505 (1908). "Electricity versus Steam for Branch Rail-

505 (1908).

"Steam Locomotive and Electric Operation

"Steam Locomotive and Electric Operation for Trunk-Line Traffic: A Comparison of Costs and Earnings." Joseph Mayer. (With Discussion.) LVII, 455 (1906). "Test of Power Required to Drive Electric Street Cars, and Total Efficiency of Motor." Louis B. Bonnett, XXVII, 307 (1892). Discussion. XXVII, 675. "The Electrification of the Suburban Zone of the New York Central and Hudson River Railroad in the Vicinity of New York City." William J. Wilgus. LXI, 73 (1908). Discussion: G. R. Heuderson, George Gibbs. Arthur M. Waitt, Nelson P. Lewis, H. M. Brinckerhoff, George B. Francis, Edwin B. Katte, W. S. Murray, George A. Harwood, W. B. Potter, Frank J. Sprague, and Henry G. Stott, LXI, 106.

Frank J. Sprague, and Henry G. Stott, LXI, 106.

"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road. Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs, LXIX, 226, 434 (1910).

"The Substitution of Electricity for Steam as a Motive Power." Alexander Siemens. (Inter. Eng. Cong. 1904.) LIV, Part E, 51 (1905).

"The Substitution of Electricity for Steam as a Motive Power." J. G. White.

ELECTRIC RAILWAYS-(Continued).

(Inter. Eng. Cong. 1904.) LIV, Part E, 3 (1905).

The Substitution of Electricity for Steam as a Motive Power. Discussion on Inter. as a Motive Power. Discussion on Inter. Eng. Cong. Papers. 1904. Gustav Schimpff, L. B. Stillwell. and J. G. White. LIV. Part E. 59 (1905).

"The Substitution of Electricity for Steam as a Motive Power for Suburban Traffic." John Findley Wallace. (With Discussion.) XXXVII, 133 (1897).

ELECTRIC TRANSMISSION. See POWER TRANSMISSION.

ELECTROLYSIS.

- of metal reinforcement: Progress Report of Special Committee on Concrete and Reinforced Concrete. LXXVII, 403

ELEVATED RAILROADS.

"A Study in the Designing and Construction of —, with Special Reference to the Northwestern Elevated Railroad and

the Northwestern Elevated Railroad and the Union Loop Elevated Railroad of Chicago, Ill." J. A. L. Waddell. (With Discussion.) XXXVII, 308 (1897). Brief History of — in New York City. LXXXII, 748 (1918). "Manhattan Elevated Railway Improvements." F. W. Gardiner and S. Johannesson. LXXXII, 551 (1918). Discussion: Clarence E. Carpenter, George H. Pegram, T. Kennard Thomson, Edward Wegmann, and Howard Constable. LXXXII, 745. "On the Construction of the Second Ave-

"On the Construction of the Second Avenue Line of the Metropolitan Elevated Railway of New York." G. Thomas Hall. X, 107 (1881).

"The Detroit Union Depot Viaduct." (With Discussion.) XXVIII, Schaub. 309 (1893).

"The Elevation of the Tracks of the Phila-"The Elevation of the Tracks of the Philadelphia Germantown and Norristown Railroad, Philadelphia, Pa. Samuel Tobias Wagner. (With Discussion.)
"The Merchants' Bridge Terminal Railway Viaduct at St. Louis, Mo." Robert Moore, XXXI, 500 (1894).
"The Myrtle Avenue Improvement on the Brooklyn Elevated Railroad." O. F. Nichols. (With Discussion.) XXXII, 363 (1894).

Michols. (With Discussion) Assert, 363 (1894).
"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912).

ELEVATORS.

ELEVATORS.

— and lifts, Pennsylvania Railroad Station, New York. LXIX, 261 (1910).

Hydraulic passenger—, Weehawken Viaduct. XXVII, 12 (1892).

"Passenger—," Thomas E. Brown. (Inter. Eng. Cong. 1904.) LIV, Part B, 133 (1905). Discussion: Reginald Pelham Bolton, Burt S. Harrison. William II. Bryan, and Samuel G. Homfray, LIV. Part B, 187.

"The Operation of Passenger—" Register.

"The Operation of Passenger—." Regi-nald Pelham Bolton. LXIV, 231 (1909). Discussion: F. Lavis, Robert Brewster Stanton, and William J. Boucher, LXIV,

ELEVATORS—(Continued).

"The Weehawken—and Viaduct." Thomas E. Brown, and George H. Blakeley. XXVII, 1 (1892).

Transportation in modern office buildings. XLVIII, 10 et seq. (1902).

ELEVATORS, GRAIN. See GRAIN ELEVATORS.

ELLIPSE.

"The False — Reduced by Equations of Condition." Arthur S. C. Würtele. XXIV, 540 (1891).

EMBANKMENT.

Canal embankments. XXXIX, 208 (1898).
"Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion." Will. iam Cain. (With Discussion.) 1315 (1916).

Earthwork and — in the construction of reservoirs. LXXX, 691, 716 (1916).
— of Prewitt Reservoir, Colo. LXXVII,

100 (1914).

"Excavation and — by Water Power." Edward Bates Dorsey. (With Discussion.)

ward Bates Dorsey. (With Discussion.) XV, 348 (1886).
"On Form of Railway Excavations and Embankments." D. J. Whittemore. (With Discussion.) XXXII, 256 (1894).
Tests of model—. LXXXI, 506, 546, 548

(1917).

"The Compressibility of Salt Marsh Under the Weight of Earth Fill." Eugene R. Smith. (With Discussion.) XXXVII,

213 (1897).
"The Yale Bowl." Charles A. Ferry. (With Discussion.) LXXXI, 249 (1917).

EMBOSSING.

"Platen Presses for Letter-Press Printing, —, Cutting and Scoring." John Thom-son. XXXII, 493 (1894).

EMPLOYMENT.

"Final Report of the Special Committee to Investigate the Conditions of — of, and Compensation of, Civil Engineers." (With Discussion.) LXXXI, 1207 (1917).

ENGINEERING.

ENGINEERING.

"A Century of Civil—." Presidential Address at the Annual Convention at Niagara Falls, N. Y., June 25th, 1901.

J. James R. Croes. XLV, 599 (1901).

"A Memoir of American—." John B. Jervis. V1, 39 (1877).

"Address at the Annual Convention in Baltimore, Md., June 2d, 1914. Hunter McDonald. LXXVII, 1737 (1914).

"Address at the Annual Convention in Pittsburgh, Pa., June 37th, 1916ff" Clemens Herschel. LXXX, 1306 (1916).

"Address at the Annual Meeting, January 16th, 1918." George H. Pegram. LXXXII, 158 (1918).

16th, 1918." George H. Pegram. LXXXII, 158 (1918). "American—at the Paris Exposition of 1878." (Report of the Committee on the 1878." (Report of the Committee on the Exhibition made by this Society.) George S. Morison. Edward P. North and John Bogart. VII, 317 (1878). Ancient bydraulic —. XXIV, 317 (1891). "Carbon and its Uses in Electrical —." Clarence M. Barber. XXIX, 680 (1893). "Civil —! Practice: Shall It be Regulated by Law?" An Informal Discussion. Samuel Whinery, Poster Crowell, F. C. Os-

ENGINEERING—(Continued).

born, II. W. Brinckerhoff, Frank A. Hinds, William R. Hutton, John F. Wallace, Edward A. Bond, and J. P. A. Maignen. XLVI, 129 (1901).
Discussion of the derivation of the word Engineer. LXXVII, 1740 (1914).
"Electro Science, as a part of the Education of Civil Engineers." Stephen Chester. (With Discussion). H. 62

Chester. (With Discussion.) (1873).

"Engineering." W. Milnor Roberts. II, 69

(1873)- Achievements and Activities of New York City." Alfred D. Flinn. LXXVI, 1653 (1913).

(Inter. Eng. Cong. 1904.) LIV, Part A, 483 (1905).

"— Education." Rob Eng. Cong. 1904.) (1905). Robert Fletcher. (Inter. 904.) LIV, Part A, 455

Education." An Informal Discussion. George F. Swain and others. LVII, 141 (1906).

- Education. Education. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part A, 497 (1905).

- Education in its Relation to Training for - Work." Ernest McCullough, (With

for — Work." Ernest McCullough. (With Discussion.) LXXV, 1079 (1912).

"— Patents." An Informal Discussion. D. A. Usina. and J. P. A. Maignen. LVII, 83 (1906).

"— Progress in the United States." President Address read on the Property of the Control of of the

dential Address read at the Twelfth Annual Convention of the Society held at St. Louis, Mo., May 25th, 1880; prepared by O. Chanute, Vice-President. IX, 217 (1880).

"Engineers in Courts of Law." Wm. J. Mc-Alpine. I, 226 (1872).
History of — in America. XLI, 597 (1899).
"Idealism and Art in —." Address at the Annual Convention, in San Francisco.

Cal., September 16th, 1915. Charles D. Marx. LXXIX, 1329 (1915).

"Is it Unprofessional for an Engineer to be a Patentee?" Archibald R. Eldridge, XLVIII, 314 (1902). Discussion: S. Whinery, James Owen, and W. C. Hammatt, XLVIII, 318.

"Preparious Expedients in Practice."

recarious Expedients in — Practice." John Hawkesworth. (With Discussion.) "Precarious

John Hawkesworth. (With Discussion.)
LXVII, 32 (1910).

"Presidential Address at the Annual Convention in St. Paul and Minneapolis,
Minn., June 17th, 1919." Fayette S.
Curtis. LXXXIII, 776 (1919-20).

Presidential Address at the 41st Annual
Convention, Bretton Woods, New Hampshire, July 6th, 1909. Onward Bates.
LXIV, 567.

"Road Construction and Maintenance:—

"Road Construction and Maintenance:—
Organizations for Highway Work": An
Informal Discussion. Willis Whited and
others. LXXVII, 1074 (1914).
"Science and—" Presidential Address at

"Science and —" Presidential Address at the Annual Convention at San Francisco, Cal., June 30th, 1896, Thomas Curtis Clarke, XXXV, 508 (1896).
"Some Tendencies and Problems of the Present Day and the Relation of the Engineer Thereto." Address at the Annual Convention, in Ottawa, Ontario, June 18th, 1913. George Fillmore Swain.

LXXVI, 1112 (1913).
"The Beginnings of—." J. Elfreth Wat-kins. (With Discussion.) XXIV, 309

ENGINEERING—(Continued).

"The Education of Civil Engineers." Thomas C. Clarke. III, 255 (1874). Dis-Thomas C. Clarke. III, 255 (1874). Discussion, III, 259, 288.
"The Engineer as a Professional Man."

Presidential Address at the Annual Convention in the City of Mexico, July 8th, 1907. George H. Benzenberg. LVIII, 515 (1907).

"The Engineer of the Twentieth Century."
Presidential Address at the Annual Convention at Washington, D. C., May 20th, 1902. Robert Moore. XLVIII, 227 (1902).
"The Philosophy of —." Maurice G. Parsons. LXXVII, 38 (1914). Discussion: Lewis M. Haupt, Charles Kirby Fox, A. H. Markwart, and Morgan Cilley. Markwart, and Morgan Cilley, LXXVII, 53.

LXXVII, 53.

"The Position of the Constructing Englneer, and his Duties in Relation to Inspection and the Enforcement of Contracts." Albert J. Himes. (With Discussion.) LVI, 104 (1906).

"The Regulation of — Practice by a Code of Ethics." An Informal Discussion. George A. Soper, J. A. Ockerson, Benjamin M. Harrod, J. James R. Croes, F. W. Dalrymole. Charles G. Darrach, and Dalrymple, Charles G. Darrach, and W. Hildenbrand. XLIX, 45 (1902).

See also CIVIL ENGINEERS: MARINE ENGINEERING: MILITARY ENGI-

NEERING.

ENGINEERING GLOSSARIES.

Definition of terms used in the valuation of public utilities. LXXXI, 1524 et seq. (1917).

Definitions of highway engineering terms. LXXXII, 1420 et seq. (1918).

ENGINEERING LIBRARIES.

Classification for an engineering library. LXXXII, 1616, 1618 (1918). History of the Library of the American Society of Civil Engineers. LXXXII, 1589 (1918).

ENGINEERING SOCIETIES.

facts Certain rtain facts relating LXXVII, 1743 (1914). foreign ---.

See also AMERICAN SOCIETY OF CIVIL ENGINEERS.

ENGINES.

"A Practical Method for Reducing the Internal Wastes of the Steam-Engine." Robert H. Thurston. XXIII, 39 (1890). Discussion, XXV, 15 (1891). "An Automatic or Governor Cut-off for Steam—." William Arthur. II, 81

(1873).

(1873).

"Compound and Non-Compound — Steam—Jackets, etc." Charles H. Emery. III, 368 (1874). Discussion, IV, 229 (1875).

"Cost and Work of Pumping —:" Report of the Committee. IV, 142 (1875). Discussion, IV, 223.

"Cushioning the Reclprocating Parts of Steam —:" John W. Hill. VII, 183 (1878).

Discussion, IX, 111 (1880).

—for dredges used on Panama Canal. LXXXII, 520 (1918).

"Gas —:" An Informal Discussion. James Christie. Robert Heywood Fernald. Tim-

Christie, Robert Heywood Fernald, Tim-oleon Geelen, and J. M. Buchanan. LIX, 402 (1907).

"Marine Engineering." W. F. Durand. (Inter. Eng. Cong. 1904.) LIV, Part C,

183 (1905).

ENGINES-(Continued).

Marine Engineering. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part C, 261 (1905).

"Marine Engineering in France." V. Day-mard and R. Lelong. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part C, 243

"Municipal Water-Works Pumping -." Irving H. Reynolds. (Inter. Eng. Cong. 1904.) LIV, Part D, 513 (1905).
Pumping—for dry docks. LIV, Part F,

431 (1905).

43Î (1905).
Pumping Machinery. Discussion on Inter.
Eng. Cong. Papers, 1904. Carl George
de Laval, W. F. M. Goss, R. C. P.
Coggeshall, H. F. Dunham, Richard J.
Flinn, Elmo G. Harris, W. B. Gregory,
George Higgins, James Alex. Smith,
J. N. Chester, Charles A. Hague, J. T.
Fanning, M. L. Holman, G. O. M. Olsson, Otto H. Mueller, William Mayo
Venable, and Irving H. Reynolds. LIV,
Part D, 533 (1905).
"Rebuilding Three Large Pumping—"
Charles B. Buerger. LXXV, 649 (1912).
"Steam Engine Economy. A Uniform Basis

Charles B. Buerger. LXXV, 649 (1912).

"Steam Engine Economy. A Uniform Basis for Comparison." Charles E. Emery. VII, 60 (1878). Discussion, VII, 193.

"The Present-Day Pumping Engine for Water-Works." Charles Arthur Hague, LXXIV, 15 (1911). Discussion: John H. Gregory, Charles B. Buerger, George A. Orrok, and Kenneth Allen, LXXIV, 32.

"The Pumping Plant of the Morenci Water Company." W. L. Du Moulin. LXXIX, 1268 (1915). Discussion: Alexander Potter, Lindsay Duncan, and H. Hawgood, LXXIX, 1319.

ter, Lindsay Duncan, and H. Hawgoon, LXXIX, 1319.

"The Theory of Aqua Ammonia—, with Results of Tests upon an Engine of this Type Operating an Edison Incandescent Lighting Plant." Edward E. Magovern, XIX, 127 (1888).

XIX, 127 (1888). "Triple Thermic Motor: Description, Operaripie Inferimic Motor: Description, Operation and Results of a Single Expansion, Non-Condensing Steam Engine, Supplemented by the Evaporation of the Bisulphide of Carbon and Expansion of its Vapor, at Brush Electric Light Company, Cleveland, Ohio," Charles H. Henrich XVIII 102 (1977) Haswell. XVII, 193 (1887). See also STEAM.

EROSION.

"— of River Banks on the Mississippi and Missouri Rivers." J. A. Ockerson. XXVIII, 396 (1893). Discussion, XXXI, 1 (1894).

"The Preservation of Sandy Beaches in the Vicinity of New York City." Elliott J. Dent. (With Discussion.) LXXX, 1786 (1916).

ESTHETICS.

Architectural treatment of Cherry Street
Bridge, Toledo, Ohio. LXXX, 752 (1916).
— considered in design of Hell Gate Arch
Bridge, LXXXII, 863 (1918).

"The Arch Principle in Engineering and
Esthetic Aspects, and Its Application
to Long Spans." C. R. Grimm. (With
Discussion.) LXXI, 233 (1911).

ETHICS.

"Precarious Expedients in Engineering Practice." John Hawkesworth, LXVII, Practice." John Hawkesworth, LXVII, 32 (1910), Discussion: Eugene W. Stern, ETHICS—(Continued).

W. W. Crosby, J. S. Braune, Andrews Allen, Guy B. Waite, and J. H. Gandolfo,

LXVII, 46.

"Some Tendencies and Problems of the Present Day and the Relation of the Engineer Thereto." Address at the Annual Convention, In Ottawa, Ontario, June 18th, 1913. George Fillmore Swain. LXXVI, 1112 (1913).

"The Philosophy of Engineering." Maurice G. Parsons. (With Discussion.) LXXVII,

38 (1914).

"The Regulation of Engineering Practice by a Code of —." An Informal Discus-sion. George A. Soper and others. XLIX, 45 (1902).

EVAPORATION.

"A Study of the Depth of Annual—from Lake Conchos, Mexico." Edwin Duryea, Jr., and H. L. Haehl. LXXX. 1829 (1916). Discussion: T. K. Mathewson, E. F. Chandler, William S. Post, John E. Stirling Thorpe, Chas. H. Lee, Robert Follansbee, L. R. Jorgensen, Adolph F. Mayer H. Hawgood Charles W. Com-Ing Thorpe, Chas. R. Lee, Robert For-lansbee, L. R. Jorgensen, Adolph F. Meyer, H. Hawgood, Charles W. Com-stock, C. E. Grunsky, H. A. Whitney, M. Hegly, Robert E. Horton, and J. W. Ledoux. LXXX, 1902. "Computing Run-Off from Rainfall and Other Physical Data." Adolph F. Meyer. (With Discussion.) LXXIX, 1056 (1915). "Evaporation". Desmond EttzGerald, XV.

"Evaporation." Desmond FitzGerald. XV, 581 (1886). -experiments, Salton Sea. LXXVI, 1516

(1913). from water and ground surfaces in experiments at Owens Valley, California. LXXVIII, 176 (1915). from water surface. LXXVII, 1622

- from (1914).

- in San Bernardino Basin, California. LXXXII, 818 (1918). - records for Oregon and California.

- records for Oregon and California. LXXXIII, 219, 254, 268 (1919-20). "Hydrology of the Panama Canal." Caleb Mills Saville. (With Discussion.) LXXVI, 871 (1913).

"Water Supply for the Lock Canal at Panama." Julio F. Sorzano. (With Dis-cussion.) LXVII, 61 (1910).

EXCAVATION.

"A Method of Taking Cross-Sections in Deep Rock Cuts by Triangulation." F. W. Watkins. XXII, 386 (1890). "Construction of a High-Service Reservoir at Baltimore, Md." P. A. Beatty.

at Baltimore, Md." P. A. Beatty. LXXVI, 92 (1913). "—and Embankment by Water Power."

Edward Bates Dorsey. sion.) XV, 348 (1886). (With Discus-

- by dredges on Panama Canal. LXXXII, 524 (1918).

the Cape Cod Canal. LXXXII, 21 (1918).

(1918).

"Freezing as an Aid to—in Unstable Material." James H. Brace. (With Discussion.) LII, 365 (1904).

Method of—in Rogers Pass Tunnel. LXXXI, 448 (1917).

Methods used in excavating tunnels for Lexington Avenue Subway. New York City. LXXXI, 341 (1917).

"On Form of Railway Excavations and Embankments." D. J. Whittemore. (With Discussion.) XXXII, 255 (1894).

"Pressure, Resistance, and Stability of

EXCAVATION—(Continued).

Earth." J. C. Meem. (With Discussion.) LXX, 352 (1010). "Quicksand in—." Charles L. McAlpine.

Quicksand in —." Charles L. McAlpine.
(With Discussion.) X, 275 (1881).
"Removal of Rock 40 Ft. below Surface of
Water, North River, N. Y." John A.
Bensel. (With Discussion.) 231 (1894).

281 (1894).

281 (1894).

282 pek — for 1,000 ft. pier. LXXXI, 528

Rock - for

(1917).

"Secure Subway Supports." A. B. Lueder and W. J. R. Wilson. (With Discussion.) LXXX, 914 (1916).

Submarine rock —. XXX, 478 (1893). XXIX,

XXX, 478 (1893).
"The New York Tunnel Extension of the Pennsylvania Railroad. The Site of the Terminal Station." George C. Clarke. LXVIII, 340 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The Terminal Station-West." B. F. Crosson, Jr. LXVIII, 303 (1910).

EXCAVATORS.

'Plant and Material of the Panama Canal." William Plumb Williams. XIX, 273 (1888).

EXPLOSIVES.

"A New Safety Explosive." Richard T. Dana. L. 382 (1903). Discussion: A. McC. Parker, L. 393.
"Blasting with Nitro-Glycerine." Edward P. North. I, 13 (1872).

P. North. I, 13 (1872).
"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).
"Nitro-Glycerine: Its Manufacture and Use." Stephen Chester, I, 117 (1872).
"Some Recent Experiments with Dynamite on an Ocean Bar." O. M. Carter, (With Discussion.) XXV, 442 (1891).

See also AMMUNITION: BLASTING.

EXPOSITIONS.

"American Engineering at the Paris Exposition of 1878." (Report of the Committee on the Exhibition made by this Society.) George S. Morison, Edward P. North, and John Bogart. VII, 317 (1878)

"Lighthouse Engineering as Displayed at the Centennial Exhibition." J. G. Bar-

nard, VIII, 55 (1879).
"The Approaches and Transportation Facilities of the Paris Exposition of 1900."
E. L. Corthell, XLI, 298 (1899).

EXTENSOMETERS.

Description of -. LXXVIII, 104 (1915).

used in measuring stress in railroad track. LXXXII, 1216 et seq. (1918).

used in measuring stresses on Hell Gate Arch Bridge, LXXXII, 1047, 1077, 1085 (1918).

Strain gauges used in revision of the Niagara Railway Arch Bridge, LXXXIII, 1943 (1919-20).

EYE-BARS.

"An Instructive Eye-Bar Test." A. C. Cunningham. (With Discussion.) 415 (1894).

"Approximate Determination of Stresses in the Eye-Bar Head," William H. Burr.

EYE-BARS-(Continued).

EYE-BARS—(Continued).
VI, 127 (1877). Discussion, VI, 263;
VII, 189 (1878).
"New Facts about—." Theodore Cooper.
LVI, 411 (1906). Discussion: Henry B.
Seaman, Mansfield Merriman, Albert J.
Himes, A. W. Carpenter, John Thomson,
Mace Moulton, John D. Van Buren, J. W.
Schaub, and H. de B. Parsons, LVI, 429.
"Nickel-Steel—for Blackwell's Island
Bridge." William R. Webster. (With
Discussion.) LXIV, 289 (1909).
"Nickel Steel for Bridges." J. A. L. Waddell. (With Discussion.) LXIII, 101
(1909).

(1909).

(1909).

"Proportions of Eye-Bar Heads and Pins, as Determined by Experiment." (Discussion on Paper No. 140, Vol. VI, p. 127.) C. Shaler Smith. VI, 263 (1877).

"Proportions of the Heads of—." Charles Macdonald. II, 333 (1873). Discussion, II, 337; III, 285 (1874).

"Tests of Bridge Irons." J. Dutton Steele. (With Discussion.) II, 223 (1873).

Tests of—and of eve-bar steel. XVII, 156

Tests of - and of eye-bar steel. XVII, 156

(1887).

Tests of—for Hell Gate Arch Bridge. LXXXII, 907 (1918). Tests of—for Sibley Bridge. XXI, 126

(1889).

"The Results Obtained from Tests of Full-Sized Steel—." Frederick H. Lewis. (With Discussion.) XXVII, 358 (1892).

FANS.

"Theory of Centrifugal Pumps and —: Analysis of Their Action, with Suggestions for Designs." Elmo G. Harris. (With Discussion.) L1, 166 (1903).

Use of — for tunnel ventilation. XXIII,

288 (1890).

FATIGUE FORMULAS.

FATIGUE FORMULAS.

"The Effects of Straining Structural Steel and Wrought Iron." Henry S. Prichard.

(With Discussion.) LXXX, 1429 (1916).

"The Launhardt Formula, and Railroad Bridge Specifications." Henry B. Seaman. XLI, 140 (1899).

"Wheel Concentrations and—in Bridge Design." An Informal Discussion. Gustav Lindenthal, Palmer C. Ricketts, W. A. Doane, George S. Morison, W. L. Cowles, E. M. Scofield, Henry B. Seaman, J. P. Snow, Edwin Thacher, J. A. L. Waddell, O. E. Selby, Henry S. Prichard, Charles B. Wing, and Edgar Marburg, XLII, 189 (1899).

FERRIES.

"Landing Arrangements for a Car Ferry on the Mississippi River." Robert Moore, XIII, 247 (1884). "The Ferry Bridge Across the Ship Canal at Duluth, Minnesota." C. A. P. Turner.

at Dittuth, Manager Liv, 322 (1905).

"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912).

"The Railroad Ferry Steamer Solano." Robert L. Harrls. XXII, 247 (1890).

FIRER.

time Sulphite — Manufacture in the United States." O. E. Michaelis. (With Discussion.) XX, 263 (1889). "Lime

FILTERS.

See FILTRATION.

FILTRATION.

"A High-Speed Gravity Filter Bed." A. McL. Hawks. (Wlth Discussion.) XXXV,

41 (1896).

"A Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing." Joseph W. Ellms and J. S. Gettrust. LXXX, 1342 (1916). Discussion: George W. Fuller, F. H. Stephenson, E. G. Manahan, George E. Willcomb, H. Malcolm Pirnie, John H. Gregory, F. A. Barbour, George A. Johnson, and James W. Armstrong, LYVY 1389 LXXX, 1382.

"Automatic Modules for Regulating the Speed of—." Charles Anthony, Jr. LI, 136 (1903). Discussion: John H. Greg-ory, W. R. Copeland, and J. W. Hill, LI, 145.

LI, 145.
Comparison of well-water supply with filtered supply. LXXXI, 773 (1917).
Filter, Denver, Colo., Water-Works. XXXI, 157 (1894).
"—for Public Water Supplies, with Especial Reference to the Double—Plant at Bremen. Germany." Eugeu Goetze. LIII, 210 (1904). Discussion: W. Kiersted, Howard W. Underwood, William B. Fuller, George A. Soper. T. H. Wiggin, Morris Knowles, Allen Hazen, John H. Gregory, William R. Copeland, L. J. Le Conte, J. P. A. Maignen, George W. Fuller, William B. Bryan, and Rudolph Hering, LIII, 228.
"—of Water for Public Use." An Informal Discussion. Rudolph Hering, George F.

"—of Water for Public Use." An Informal Discussion. Rudolph Hering, George F. Deacon. George W. Fuller, Samuel Rideal, Henry Davey, J. N. Greene, Ad. Kemna, K. E. Hilgard, Walter Hunter, Philip H. Palmer. E. Perrett, Andrew Johnston, H. Alfred Roechling, and Nicholas Simin. XLIV, 399 (1900). "On Sedimentation." Allen Hazen. (With Discussion.) LIII, 45 (1904). "Purification of Sewage and of Water by —." Hiram F. Mills. XXX, 350 (1893). Discussion, XXX, 702. "Purification of Water for Domestic Use: American Practice." Allen Hazen. (Inter. Eng. Cong. 1904). LIV, Part D, 131 (1905). Purification of Water for Domestic Use.

Purification of Water for Domestic Use, Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part D, 191 (1905).

"Purification of Water for Domestic Use: European Practice." Adolph Kenna. (Inter. Eng. Cong. 1904.) LIV, Part D, 1557 (1905). 155 (1905).

"Purification of Water for Domestic Use: French Practice." M. Bechmann. (Translated from the French by Allen Hazen.) (Inter. Eng. Cong. 1904.) LIV, Part D. TS3 (1905).
"Some Questions Concerning the — of Water." W. Kümmel. XXX, 330 (1893). "Stream Contamination and Sewage Purification." An Informal Discussion. R. E. McMath and others. XLII, 160 (1899).

(1899).

B. Weston. (With Discussion.) XLIII, 69 (1900). "Test of a a Mechanical Filter." Edmund

"The Albany Water — Plant." Allen Hazen, (With Discussion.) XLIII, 244

"The Construction of Gravity Sand Fil-ters at Nyack, N. Y." G. N. Houston. (With Discussion.) XLV, 476 (1901). "The—Works of the East Jersey Water Company, at Little Falls, New Jersey."

FILTRATION—(Continued).

George W. Fuller. L. 394 (1903). Discussion: Allen Hazen, J. P. A. Maignen, C. L. Harrison, J. Waldo Smith, R. S. Weston, G. C. Whipple, W. B. Fuller, L. L. Tribus, Langdon Pearse, John H. Gregory, and L. J. Le Conte, L. 444.

The flow of underground water through sand crayel etc. as in seepage or perfection.

sand, gravel, etc., as in seepage or per-colation. LXXIII, 176 (1911).
"The Groined Arch as a Covering for Res-

"The Groined Arch as a Covering for Reservoirs and Sand Filters: Its Strength and Volume." Leonard Metcalf. (With Discussion.) XLIII, 37 (1900).
"The Improved Water and Sewage Works of Columbus, Ohio." John H. Gregory. (With Discussion.) LXVII, 206 (1910).
"The Lawrence, Mass.. City Filter: A History of Its Installation and Maintenance." Marris Knowless and Charles Gil.

The Lawrence, Mass., City Filter: A History of Its Installation and Maintenance." Morris Knowles and Charles Gilman Hyde, XLVI, 258 (1901). Discussion: Allen Hazen, Robert Spurr Weston, George I. Bailey, Leonard M. Wachter, M. F. Collins, George W. Fuller, George A. Soper, George C. Whipple, Louis L. Tribus, John H. Gregory, Charles E. Fowler, and William B. Fuller, XLVI, 309.
The Purification of Ground-Waters Containing Iron and Manganese." Robert Spurr Weston. (With Discussion.) LXIV, 112 (1909).

Spurr Weston. (With Discussion.) LXIV, 112 (1909).

"The Purification of the Water Supply of Steelton, Pennsylvania." James H. Fuertes. LXVI, 135 (1910). Discussion: H. V. Hinckley, William R. Copeland, James E. Little, Samuel Rideal, Gavin N. Houston, D. G. Thomas, Joseph A. Sargent, George C. Whipple, Morris Knowles, George W. Fuller, and J. M. Diven, LXVI, 199.

"The Vicksburg Settling Basins." Clarence Delafield. XXI, 88 (1889).

"Water Purification Plant, Washington, D. C., Results of Operation." E. D. Hardy. (With Discussion.) LXXII, 301 (1911).

(1911)

"Water Supply." An Informal Discussion. George W. Fuller and others. LIX,

367 (1907).

"Works for the Purification of the Water Supply of Washington, D. C." Allen Hazen and E. D. Hardy. LVII, 307 (1906). Discussion, LVII, 364; LVIII, 511 (1907).

See also SEWAGE DISPOSAL.

FINANCE.

FINANCE.

"A Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. (With Discussion.) LXXXI, 413 (1917). "Comparison of Water Supply Systems from a Financial Point of View." J. Leland FitzGerald. (With Discussion.) XXIV, 247 (1891).

Financing and franchise of New York Connecting Railroad. LXXXII, 1000 (1918). "The Financial Management of Water-Works." E. Kuichling. (With Discussion.) XXXVIII, 1 (1897). "The Going Value of Water-Works." Leonard Metcalf and John W. Alvord. (With Discussion.) LXXIII, 326 (1911). "The Valuation of Public Service Corporation Property." Henry Earle Riggs. (With Discussion.) LXXIII, 1 (1911). "Valuation of Water-Works Property." Wynkoop Kiersted. (With Discussion.) XXXVIII, 115 (1897).

FINANCE—(Continued).

"Water-Works Valuation and Fair Rates, in the Light of the Maine Supreme Court Decisions in the Waterville and Brunswick Cases." Leonard Metcalf. (With Discussion.) LXIV, 1 (1909).

FIRE-PROOFING.

"Can Buildings be Made Fire-Proof?"
Corydon T. Purdy. (With Discussion.)
XXXIX, 121 (1898).

XXXIX, 121 (1898).

"Cinder Concrete Floor Construction Between Steel Beams." Harold Perrine and George E. Strehan. (With Discussion.) LXXIX, 523 (1915).

"Cinder Concrete Floors." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).

"Fire-Resistant Construction of Buildings."

LXX, 190 (1910).

"Fire-Resistant Construction of Buildings."
An Informal Discussion. Herbert M.
Wilson and others. LXV, 274 (1909).

Progress report of Special Committee on Concrete and Reinforced Concrete.
LXXVII, 412 (1914).

"Tests of Fire-Proof Flooring Material."
George Hill. XXXIV, 542 (1895). Discussion, XXXV, 125 (1896).

"The Economical Design of Reinforced Concrete Floor Systems for Fire-Resisting Structures." John S. Sewell. (With Discussion.) LVI, 252 (1906).

"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committee and of Six Special Committees of the San Francisco Association mittees of the San Francisco Association of Members of the American Society & Civil Engineers. (With Discussion.) LIX, 208 (1907).

FIRE PROTECTION.

"Description of Some Experiments on the Description of Some Experiments on the Flow of Water Through 2½-Inch Rubber Hose, and Nozzles of Various Forms and Sizes, made on the Providence, R. I., Water-Works. Also Results of Investigations Relating to the Height of Jets of Water." Edmund B. Weston. XIII, 376 (1884).

"Experiments Relating to Hydraulics of Fire Streams." John R. Freeman. (With Discussion.) XXI, 303 (1889). —for contractors' plant, Pennsylvania Railroad Tunnels, New York. LXIX, 35 (1910).

- for yards and power station. Pennsylvania Railroad Terminal, New York. LXIX, 326, 334 (1910).

— in high buildings. XLIV, 460 (1900). "Fire-Resistant Construction of Buildings." An Informal Discussion, Herbert M. Wilson, R. W. Lesley, Richard L. Humphrey, and S. Whinery, LXV, 274 (1909).

Fire streams. XXXVIII, 14 (1897). New York City high-pressure system, Brief description of. LXXVI, 1809 (1913). Oakland, California,—system. LXXX, 98

(1916).

(1916).
"On the Comparative Liability to, and Danger from Conflagrations, in London and in American Cities." Edward B. Dorsey. XIII, 172 (1884).
"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special

FIRE PROTECTION—(Continued).

Committees of the San Francisco Association of Members of the American

Society of Civil Engineers. (With Discussion.) LIX, 208 (1907).
Use of sprinklers. XXXIX, 153 (1898).
Use of water mains for fire purposes.
XIX, 114 (1888).

FIRES.

See CONFLAGRATIONS.

FLASH BOARDS.

- and supports, spillway, S Dam. LXXXI, 1006 (1917). Stony River

FLATS.

"Reclamation of the Potomac—at Washington. D. C." Peter C. Hains. XXXI, 55 (1894). Discussion, XXXI, 489.
"The Improvement of the South Boston—by the Harbor Commissioners of the State of Massachusetts." Edward S. Philbrick. VII, 17 (1878).

FLEXURE.

See STRESS.

FLOOD WAVES. See WAVES.

FLOODS.

Application of the theory of flow through

Application of the theory of flow through contractions to the design of the flood-prevention works of the Miami Conservancy District. LXXXIII, 1205 (1919-20). "Characteristics of the Ravine du Sud in the Island of Hayti, and Plan for Avertting its Overflow." J. Foster Crowell. XXIV, 470 (1891). Discussion, XXIV, 478; XXV, 343 (1891). "Control of the Colorado River as Related to the Protection of Imperial Valley." J. C. Allison. (With Discussion.) LXXXI, 297, (1917). "Detention Reservoirs with Spillway Out-

297, (1917).

"Detention Reservoirs with Spillway Outlets as an Agency in Flood Control."

H. M. Chittenden. (With Discussion.)

LXXXII, 1473 (1918).

"Final Report of the Special Committee on—and Flood Prevention." (With Discussion.) LXXXI, 1218 (1917).

Flood flows. LXXIX, 1134 (1915).

"Flood F I ow s." Weston E. Fuller.

LXXVII, 564 (1914). Discussion: Arthur
E. Morgan, H. V. Hinckley, E. F. Chand-

E. Morgan, H. V. Hinckley, E. F. Chandler, Allen Hazen, Morris Knowles, Herbert E. Bellamy, E. Kuichling, Robert E. Horton, and G. B. Pillsbury, LXXVII, 618.

Chagres River. LXXVI, 944. 987 – in

(1913).

in the Santa Catarina River, at Mon-terrey, Mexico. LXXII, 522 and 563

(1911).

"Hydraulic Phenomena and the Effect of Spreading of Flood Water in the San Bernardino Basin, Southern California."

A. L. Sonderegger, (With Discussion.)

A. L. Sonderegger. (With Discussion.)
LXXXII, 802 (1918).
"Irrigation and River Control in the Colorado River Delta." H. T. Cory. (With Discussion.) LXXVI, 1204 (1913).
Methods of diverting and spreading flood water of the Santa Ana River at San Bernardino, Cal. LXXXII, 815 (1918).
"Physiography of Water-Sheds and Channels, and Analysis of Stream Action of Southern California Rivers, with Ref-

FLOODS—(Continued).

erence to the Problems of Flood Control." A. L. Sonderegger. (With Discussion.) LXXXIII, 1111 (1919-20).
Records of flood flow considered in designing spillway for Stony River Dam. LXXXI. 926 (1917).
"The Design of a Drift Barrier Across White River, near Auburn, Washington."
H. H. Wolff. (With Discussion.) LXXX, 2061 (1916).
"The Flood of March, 1907 in the Sagara-

2061 (1916).

"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." W. B. Clapp, E. C. Murphy, and W. F. Martin. (With Discussion.)

LXI, 281 (1908).

"The Flood of March 22d, 1912, at Pittsburgh, Pa." Kenneth C. Grant, LXXVI, 302 (1913). Discussion: L. J. Le Conte, William R. Copeland, Jean de Pulligny, J. Waldo Smith, and Morris Knowles. LXXVI, 326.

"The—of the Mississippi Delta: Their

"The - of the Mississippi Delta: Causes, and Suggestions as to Their Control:" William D. Pickett. LXIII,

tron: William D. Fickett. Exit, 53 (1909).

"The Redemption of the Great Valley of California." A. D. Foote. (With Discussion.) LXVI, 229 (1910).

"The Storage of Flood-Waters for Irrigation."

tion: A Study of the Supply Available from Southern California Streams." A. M. Strong. (With Discussion.) LXXVII, 67 (1914).

FLOOR BEAMS.

See BEAMS.

FLOORING.

"Tests of Fire-Proof — Material." George Hill. XXXIV, 542 (1895). Discussion, XXXV, 125 (1896).

FLOORS.

"Cinder Concrete Floor Construction Between Steel Beams." Harold Perrine and George E. Strehan. LXXIX, 523 (1915). Discussion: K. M. Boorman, T. Hugh Boorman, Myron S. Falk, Guy B. Wolfe Albert Oliver. Publ. Pered Voy. (1915). Discussion: K. M. Boorman, T. Hugh Boorman, Myron S. Falk, Guy B. Waite, Albert Oliver, Emile Reed Low, Arthur H. Diamant, Ira H. Woolson, J. R. Worcester, Gardner S. Williams, A. L. A. Himmelwright, and John B. Hutchings, Jr., LXXIX, 622.

"Cinder Concrete —." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914).

"Hollow Tile —. Past and Present." Fr. von Emperger. XXXIV. 521 (1895).

"Kinetic Effects of Crowds." C. J. Tilden. (With Discussion.) LXXVI, 2107 (1913).

"Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. (With Discussion.) LXXXI, 1689 (1916).

"Shearing Strength of Construction Joints in Stems of Reinforced Concrete T-Beams, as shown by Tests." Lewis J. Johnson and John R. Nichols. (With Discussion.) LXXVII, 1499 (1914).

"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat Slab —." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).

Steel Stresses in Flat Slabs." H. T. Eddy. (With Discussion.) LXXVII, 1838 (1914).

FLOORS—(Continued).

"The Economical Design of Reinforced Concrete Floor Systems for Fire-Resisting Structures." John S. Sewell. (With Discussion.) LVI, 252 (1906).
"The Mexican Method of Making Hard Lime—." Theo, G. Ellis. (With Discussion.) II, 179 (1873).
"The Structural Design of Buildings." Charles C. Schneider. (With Discussion.)

Charles C. Schneider. (With Discussion.) LIV, 371 (1905).

See also BRIDGE FLOORS.

FLOW OF WATER. See WATER, FLOW OF.

FLUMES.

"American Irrigation Engineering." Herbert M. Wilson. XXV, 161 (1891). (With Discussion.)

Economic construction of - for hydro-elec-

ric plants. LXXIX, 1010 (1915).

"Experiments on the Flow of Water Through Contractions in an Open Channel." E. W. Lane. (With Discussion.) LXXXIII, 1149 (1919-20).

of Bear Valley Irrigation Company, California. XXXIII, 99 (1890).

used in determining effects of designs.

- used in determining effects of designs of bridge piers on flow of water. LXXXII, 338 (1918). Merits of weirs and — for the measurement of water. XLIV, 160 (1900). "Surges in an Open Canal." R. D. Johnson. (With Discussion.) LXXXI, 112 (1917). "The Hydraulic Jump, in Open-Channel

"The Hydraulic Jump, in Open-Channel Flow at High Velocity." Karl R. Ken-nison. (With Discussion.) LXXX, 338 (1916).

FLUSH TANKS.

"The Separate Sewer System without Automatic—." F. S. Odell. (With Discussion.) XXXIV, 223 (1895). Use of—in small pipe sewers. XL, 1

FOG SIGNALS.

See LIGHTHOUSES.

FORESTS.

"—and Reservoirs in Their Relation to Stream Flow, with Particular Refer-ence to Navigable Rivers." H. M. Chit-tenden. (With Discussion.) LXII, 245 (1909).

Reforestation as a method of flood control. LXXXI, 1223 (1917).

"The Floods of the Mississippi Delta: Their Causes, and Suggestions as to Their Control." William D. Pickett. LXIII, 53 (1909).

"The Preservation of —." F. Collingwood. XIV, 361 (1885). Discussion, XIV, 388.

FORTIFICATIONS.

ions." George W. Goethals. Eng. Cong. 1904.) LIV, Part "Fortifications." (Inter. Eng. A, 57 (1905).

FOUNDATIONS.

"A Few Pacts about the Caissons of the East River Bridge." F. Collingwood. (With Discussion.) I. 353 (1872). "A Few Remarks on —." L. L. Buck, LV,

169 (1905).

Bridge Substructure and—in Nova Scotia." Martin Murphy. XXIX, 620 (1893). Discussion, XXX, 567 (1893). "Bridge

FOUNDATIONS-(Continued).

"Cohesion in Earth: The Need for Com-prehensive Experimentation to Deter-mine the Coefficients of Cohesion." William Cain. (With Discussion.)

William Cain. (With Discussion.)
LXXX, 1315 (1916).

"Concerning—for Heavy Buildings in New York City." Charles Sooysmith. (With Discussion). XXXV, 459 (1896).

"Construction of Substructure for Lonesome Valley Vinduct, Knoxville, Cumberland Gap and Louisville Rallroad." Gustave R. Tuska. (With Discussion.) XXXIV, 247 (1895).

"Construction Problems, Dumbarton Bridge, Central California Railway." E. J. Schneider. (With Discussion.) LXXVI, 1572 (1913).

"Cylindrical—for a Quay Wall in the Harbor of Delfzyl." W. F. Druyvesteyn. (Inter. Eng. Cong. 1904.) LIV, Part E, 125 (1905). Discussion: O. E. Mogensen, and K. E. Hilgard, LIV, Part E, 125. (1905). Discussion: O. E. Mogensen, and K. E. Hilgard, LIV, Part E, 135. "Dams on Sand—: Some Principles Involved in Their Design, and the Law Governing the Depth of Penetration Required for Sheet-Piling." Arnold C. Koenig. (With Discussion.) LXXIII, 175 (1911).

175 (1911).

"Description of the 'Plenum Pneumatic "Description of the 'Plenum Pneumatic Process' as Applied in Founding the Piers of the Illinois and St. Louis Bridge, at St. Louis, Mo." W. Milnor Roberts. 1, 259 (1872). Design and construction of bridge piers. LXXVII, 704 (1914). "Designing an Earth Dam Having a Gravel Foundation, with the Results Obtained in Tests on a Model." James B. Hays. (With Discussion.) LXXXI, 1 (1917). "Pailure of a Masonry Pier and a Rock

"Failure of a Masonry Pier and a Rock Foundation." Wm. Barclay Parsons. (With Discussion.) XXXI, 580 (1894). "Fall of the Western Arched Approach to

South Street Bridge, Philadelphia, Pa." D. McN. Stauffer. VII, 264 (1878). Dis-South Street Bruge, Finhadelphia, A. D. McN. Stauffer. VII, 264 (1878). Discussion, IX, 319 (1880).

and shoring for structures on Manhattan Elevated Railways. LXXXII, 634 (1918).

for elevated railways. XXXVII, 321

- for

(1897).

"-for the New Singer Building, New York City." T. Kennard Thomson. LXIII, 1 (1900). Discussion: O. F. Semseh, Engene W. Stern, and Edwin S. Jarrett, LXIII, 21.

"-under Water." Gabriel Jordan. (With Discussion.) 11, 309 (1873).

"Fremantle Graving Dock: Steel Dam Con-struction for North Wall." Joshua Field-en Ramsbotham. (With Discussion.) Ramsbotham. LXXVI, 1942 (1913).

"Grouted Cut-Off for the Estacada Dam."
Harold A. Rands. (With Discussion.)
LXXVIII, 447 (1915).

"History of Little Rock Junction Railway Bridge, of the St. Louis, Iron Mountain and Southern Railway Company, Over the Arkansas River at Little Rock, Arkansas, 1883-1914." C. E. Smith, LXXIX. I (1915). Discussion: Henry H. Quimby, M. L. Byers, Lee Highley, Theodore Belzner, Robert H. P. Ford, C. D. Purdon, and F. G. Jonah, LXXIX,

"Improved Method of Constructing — under Water by Forcing Cement into Loose Sand or Gravel by Means of Air Pres-sure." Fr. Neukirch. XXIX, 639 (1893). Discussion, XXX, 579 (1893).

of the College

FOUNDATIONS—(Continued).

Masonry towers and—, Hell Gate Arch
Bridge, LXXXII, 872, 882 (1918).

"Method Pursued in Replacing a Stone
Pier on a Pile Foundation." J. Albert
Monroe. III, 58 (1874). Discussion, IV, 205 (1875).

"Multiple-Arch Dams on Rush Creek, California." L. R. Jorgensen. (With Discussion.) LXXXI, 850 (1917).
"On the Mode of Underpinning Adopted for the Croton Lake Bridge, N. Y. C. & N. R. R., during the Repairs to the Masonry Piers." Alfred P. Boller. XI, 150 (1882).

Piers for bridges over Cape Cod Canal. LXXXII, 46 (1918). "Pneumatic —." William Sooy Smith.

(With Discussion.) II, 411 (1873).
"Recent Developments in Pneumatic — for Buildings." D. A. Usina. LXI, 211 (1908). Discussion: F. W. Skinner, T. Kennard Thomson, Louis L. Brown, and J. C. Meem, LXI, 222.

"Red Rock Cantilever Bridge: —." S. M.
Rowe. XXV, 662 (1891): "General Specifications." S. W. Robinson. XXV, 697;
"Superstructure." Henry H. Quimby.
XXV, 704. (With Discussion.)
"Reinforced Concrete — over Excavations on Paved Streets." John McNeal. LX, 217 (1998).

on Paved Streets." John McNeal. LX, 217 (1908).

"Remarks on the Causes of Fall of the Western Arched Approach to the South Street Bridge, Philadelphia." (Discussion on Paper No. 171, Vol. VII, p. 264.)

J. G. Barnard. IX, 319 (1880).

"Renewal of the Foundation, and Transfer of a Light-House in Pascagoula Harbor." J. W. Putnam. (With Discussion.) X, 14 (1881).

"Report on Cause and Correction of Foundation Troubles of Box Factory at Natchez, Mississippi." C. E. Smith. LXXXIII, 1289 (1919-20). Discussion: Charles H. Miller, J. E. Willoughby, and George L. Dillman, LXXXIII, 1310.

"Some Notes on Foundation Experiences." A. P. Boller. XXVII, 471 (1892).

"Sub-Aqueous Underpinning." A. G. Menocal. XI, 181 (1882).

"Substructure of Piscataquis Bridge, and Analysis of Concrete Work." G. A. Hersey. (With Discussion.) LXI, 377 (1908).

(1908).

"The Changes at the New Croton Dam." Charles S. Gowen. (With Discussion.)

Charles S. Go LVI, 32 (1906).

"The Fallure and Righting of a Million-Bushel Grain Elevator," Alexander Al-laire. (With Discussion.) LXXX, 799 (1916).

"The—for the Brooklyn Anchorage of the East River Bridge." Francis Colling-wood, III, 142 (1874). Discussion, IV,

205 (1875).
"The — of the New Capitol at Albany,
N. Y." William J. McAlpine. II, 287 N. Y. (1873).

"The — of the New Croton Dam." Charles S. Gowen. (With Discussion.) XLIII,

469 (1900).
"The Reconstruction of a Portion of the Substructure of the Johnsonville Bridge. Walter H. Gahagan. (With Discussion.) XXXI, 587 (1894).

"The Reconstruction of the Stony River Dam." F. W. Scheidenhelm. (With Discussion.) LXXXI, 907 (1917). "The Removal of a Defective Pivot Pier,

FOUNDATIONS—(Continued).

and its Reconstruction." Howard G. Kelley. XXXI, 277 (1894).
"The Renewal of the Channel Pier of the Cincinnati and Muskingum Valley Railway Bridge over the Scioto River."

Morton L. Byers. (With Discussion.)

way Bridge over the Scioto River."
Morton L. Byers. (With Discussion.)
XXXI, 361 (1894).

"The Sinking of the Piers for the Grand
Trunk Pacific Bridge at Fort William,
Ontario, Canada." H. L. Wiley. LXII,
113 (1909). Discussion: C. R. Fickes,
George B. Francis and Robert A. Marshall, and F. W. Skinner, LXII, 120.

"The Substructure of Marsh River Bridge."
Herbert J. Wild. LII, 451 (1904). Discussion: George B. Francis, LII, 465.

"The Ultimate Load on Pile—: A Static
Theory." John H. Griffith. LXX, 412
(1910). Discussion: Luther Wagoner,
LXX, 442.

"The Underpinning of Heavy Buildings."
Jules Breuchaud. (With Discussion.)
XXXVII, 31 (1897).

"The Use of Compressed Air in Tubular—
and its Application at South Street
Bridge Philodelphia, Pa." D. McN.

and its Application at South Street
Bridge, Philadelphia, Pa." D. McN.
Stauffer. VII. 287 (1878). Discussion,
VIII, 186 (1879).
Timber crib pier foundation for the Chest-

nut Street Bridge, Philadelphia. LXXIX,

107 (1915).

Juderpinning the Cambridge Building, New York City." T. Kennard Thomson. LXVII, 553 (1910). Discussion: Henry Gorton Opdycke, E. A. Yates, Ogden Merrill, Oscar Lowinson, and J. C. Meem, LXVII, 565. "Underpinning

"Underpinning Trinity Vestry Building for Subway Construction." H. de B. Par-sons. (With Discussion.) LXXXI, 74

(1917).

See also UNDERPINNING.

FRAMEWORKS.

"On a New Principle in the Theory Structures." George F. Swain. (W Discussion.) LXXXIII, 622 (1919-20) (With

Discussion.) LXXXIII, 622 (1919-20).
"The Exact Design of Statically Indeterminate—. An Exposition of Its Possibility, but Futility." Frank H. Cilley. (With Discussion.) XLIII, 353 (1900).
"The Theory of — with Rectangular Panels, and Its Application to Buildings Which Have to Resist Wind." Ernst F. Jonson. LV, 413 (1905). Discussion: H. T. Forchhammer, LV. 424.

FRAZIL.

See ICE.

FREEZING PROCESS.

Experiments with —, Pennsylvania Rail-road Tunnels, New York. LXVIII, 24

(1910).

"Freezing as an Aid to Excavation in Un-stable Material." James H. Brace. LII, 365 (1904). Discussion: George E. Tho-mas, D. E. Moran, E. L. Abbott, T. Kennard Thomson, Werner Boecklin, H. J. Campbell, A. Gobert, and Charles Sooysmith, LII, 437.

See also REFRIGERATOR SYSTEMS.

FREIGHT.

Classification of—handled by railroads. XXXI, 181 (1894).
Commercial importance of river improvements. XLIX, 277 et seq. (1902).

FREIGHT—(Continued).

and freight rates, on canals and rail-roads. XIV, 43 (1885).

on waterways and railroads. LIV, Part B. 475 (1905)

97 (1893); XXX, 457 - rates. XXIX,(1893).

rates and ton-mileage in United States.

XXXV, 9 (1896). - rates, etc., on Great Lakes, XLV, 208

(1901).

"How can Railways be made more Efficient in the Transportation of —?" (Discussion on Paper No. 248, Vol. XI, p. 365.) William P. Shinn. XII, 189 (1883). Discussion, XII, 339.

Net registered tonnage at Saily 1875 (1991).

Net registered tonnage at Sault Ste. Marie, 1855-1899. XLV, 277 (1901). "Notes on the Classification of Railroad Accounts and the Analysis of Railroad Rates." Gratz Mordecai. XVIII, 62

Rates. (1888).

"On the Increased Efficiency of Railways for the Transportation of —," Wm. P. Shinn. XI. 365 (1882). Discussion, XII, 126, 180, 189, 339 (1883).

"Railroad Discrimination against New York, and the Remedy." Abel E. Blackmar. (With Discussion.) XLVI, 182

(1901).
"Rapid Transit and Terminal — Facilities."

"Rapid Transit and Terminal — Facilities."
Report of the Committee. IV, 1 (1875).
Discussion, IV, 240, 251, 252.
"Rivers and Railroads in the United
States." William W. Harts. (With Discussion.) LXXIX, 919 (1915).
"The Elements of Cost of Railroad —
Traffic." O. Chanute. II, 381 (1873).
"The Problem of the Lower West Side
Manhattan Water-Front of the Port of
New York." B. F. Cresson, Jr. (With
Discussion.) LXXV, 226 (1912).
"The Production of Traffic and the Trans-

"The Production of Traffic and the Transportation of—and Passengers." Martin Coryell. (With Discussion.) II, 240 (1873).

Tonnage of Port of Montreal. XXXV, 15 (1896).

(1896).
Tonnage on Erie, Suez and St. Mary's Falls Canals. XXXV, 13 (1896).
Weight of machinery per square foot of floor space. XXXI, 184 (1894).
Weight of various materials as usually shipped. XXXI, 183 (1894).

FREIGHT CARS. See ROLLING STOCK.

FREIGHT TRAINS. See TRAIN LOADS.

FRICTION.

"Air Resistances to Trains in Tube Tun-nels." J. V. Davies. (With Discus-sion.) LXXV, 982 (1912). Experimental Determination of the Roll-

resperimental Determination of the Rolling—in Operating the Draw of the Thames River Bridge, together with Method for Determining Power to Operate Draw-Bridges." Alfred P. Boller, Jr., and H. J. Schumacher. (With Discussion.) XXV, 638 (1891).
"Experiments on the Resistances of Rolling Stock." A. M. Wellington. VIII, 21 (1872).

ing Stoc. 21 (1879).

Experiments with New Apparatus on Journal—at Low Velocities." A. M. Wellington. (With Discussion.) XIII, "Experiments 409 (1884).

"- Coefficient for Riveted Steel Pipe." An

FRICTION—(Continued).

Informal Discussion. A. McL. Hawks. XLII, 155 (1899). - Rollers." C. L.

XLII, 155 (1899).

"Rollers," C. L. Crandall and A. Marston. XXXII, 99 (1894). Discussion, XXXII, 127, 270.

Prictional resistance of various soils. LXXXI, 947, 1044 (1917).

"Some Facts in Relation to —, Waste and Loss of Water in Mains." Charles B. Brush. (With Discussion.) XIX, 89 (1889). (1888).

"Tests ests of — of Hydraulic Cupped-Leather Packing." Theodore Cooper. XVI, 30 (1887).

FROG POINTS.

"The Relation of Wheels to — and to Guard Rails." Archibald A. Schenck. (With Discussion.) XXXI, 509 (1894).

FROST

FROST.

"Experimental Tests of Building Stones."
Robert G. Hatfield. II, 145 (1873).

"The Action of—on Cement and Cement
Mortar, Together with Other Experiments on These Materials." Ernest R.
Matthews and James Watson. (With
Discussion.) LXIV. 320 (1909).

"The Relative Effects of—and the Sulphate of Soda Efflorescence Tests on
Building Stones." Lea McI. Luquer.

(With Discussion.) XXXIII, 235 (1895).

FUEL.

"Efficiency of Furnaces Burning Wet as Determined by Experiments on a Large Scale," R. H. Thurston. III, 290 (1874). Discussion, III, 316, 334;

1V, 88 (1875).

"Federal Investigations of Mine Accidents, "Federal Investigations and Fuels." Her-Structural Materials, and Fuels," Her-bert M. Wilson. (With Discussion.) LXX, 190 (1910),

and combustion in marine boilers. LIV.

Part C, 183 (1905).

See also COAL: COKE: GAS AND GAS-WORKS.

FURNACES.

"Efficiency of - Burning Wet Fuel, Determined by Experiments on a Large Scale." R. H. Thurston. III, 290 (1874). Discussion, III, 316, 334; IV, 88 (1875).

GABIONS.

"Improvement of Entrance to Galveston Harbor." Charles W. Howell. VI, 223 (1877).

GARBAGE DISPOSAL. See REFUSE DISPOSAL.

GAS AND GAS-WORKS.

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

Comparative cost of electric and gas light, XVIII, 145 (1888).

Description of foundation for gas holder. XXVII, 471 (1892).

Effect of San Francisco earthquake on gas plants. LIX, 256 (1907).

"Gas Engines." An Informal Discussion, Lames Christic and others LIX (1998). James Christie and others, LIX, 402 (1907).

'inal Report of the Special Committee to Formulate Principles and Methods for the Valuation of Rallroad Property and Other Public Utilities." (With Dis-cussion.) LXXXI, 1311 (1917). "Final

GAS AND GAS-WORKS-(Continued).

"The Astoria Tunnel under the East River for Gas Distribution in New York City." John Vipond Davies. (With

River for Gas Distribution in New York City." John Vipond Davies. (With Discussion.) LXXX, 594 (1916).
"The Production of Toluol from Gas Plants." Myron S. Falk. (With Discussion.) LXXXIII, 904 (1919-20).
"The Valuation of Public Service Corporation Property." Henry Earle Riggs. (With Discussion.) LXXII, 1 (1911).

GAS DISTRIBUTION.

"The Astoria Tunnel under the East River for—in New York City." John Vipond Davies. (With Discussion.) LXXX, 594 (1916).

GAS ENGINES.

See ENGINES.

Comparison of cost of construction of railroads with various gauges. LXXVIII, 353 (1915).

Comparison of cost of operation on broad, medium. and narrow — railroads. LXXVIII, 362 (1915).

CAXVIII, 302 (1915).
Cost of converting meter to medium or broad — LXXVIII, 358 (1915).
"Early History of Railways and Origin of —." J. Dutton Steele. (With Discussion.) II, 53 (1873).
"On the Gauges of Railroad Track in General, with Special Consideration of Narrow — Railroads." E. A. Ziffer. (Translated from the Common by Welfgrang G.

row—Railroads." E. A. Ziffer. (Translated from the German by Wolfgang G. Triest.) XXIX. 453 (1893). Discussion, XXX, 537 (1893).

"The—of Railways, with Particular Reference to Those of Southern South America." F. Lavis. LXXVIII, 312 (1915). Discussion: Philip W. Henry. James J. Hill. T. A. Corry. Frank Foster, H. Deane, G. F. F. Osborne, and James Alexander Smith, LXXVIII, 424.

GAUGES.

Differential — XLVII, 71 et seq. (1902); XLIX, 140 et seq. (1902). Float — LXXXIII, 1209 (1919-20).

Piezometer observations on 48-in, pipe. XXXV, 241 (1896).

Piczometers used in Ogden. Utah. experiments. XL, 472 (1898); XLIV. 35 (1900).
Pressure-difference gauge. XXVI, 439 (1892).

GAUGING.

"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX. 951 (1916). "—of Cedar River. Washington." Theron A. Noble. (With Discussion.) XLI, 1

Of Potomac River. XXVIII, 211 (1893).

— of Potomac River. XXVIII, 211 (1893).

— of Streams." A Discussion. David M. Greene. V. 251 (1876).

Gangings of Missouri River at Great Falls, Mont. XXVII. 65 (1892).

"Rainfall and River-Flow." Cvrus C. Babb. (With Discussion.) XXVIII, 323 (1892). (1893).

"The Automatic Volumeter." E. G. Hop-son. (With Discussion.) LXXX, 572 (1916).

"The — of Streams." VII, 236 (1878). Clemens Herschel.

GAUGING—(Continued)

"The Hydrography of the Potomac Basin."

Cyrus C. Babb. (With Discussion.) XXVII, 21 (1892). Twenty Years' Run-Off, at Holyoke, Mass., of the Connecticut River." Cle-"Twenty (With Herschel. mens Discussion.) LVIII, 29 (1907).

See also WATER, FLOW OF, IN OPEN CHANNELS.

GEOGRAPHY.

Southern South America: General description of its topography, physical characteristics, business conditions, and the development and present situation of its railways. LXXVIII, 403 (1915).

GEOLOGY.

"A Few Remarks about the Niagara Gorge." L. L. Buck. (With Discus-sion.) XXXII, 205 (1894). Geological and foundation conditions at Stony River Dam. LXXXI. 918 (1917). Geological clues to flood heights. LXXXI. 1270 (1917).

Geological conditions of Ohio Valley near Parkersburg, W. Va. LXXXI, 753 Parkersburg, W. (1917).

—in Its Relations to Topography." John C. Branner. (With Discussion.) XXXIX, 53 (1898).

of San Bernardino Basin, California, in relation to flow of underground water. LXXXII, 802 (1918). of slate producing regions. XXXII, 529

(1894).

strata - of under East River. LXXX,

of strata under East River. LXXX, 616, 624 (1916).

of underground reservoirs. LXXVIII, 151 (1915).

New York City geological maps, sections, etc. LXXVI, 1654 (1913).

"Physiography of Water-Sheds and Channels, and Analysis of Stream Action of Southern California Rivers. with Reference to the Problems of Flood Control."

A. L. Sonderegger. (With Discussion.) LXXXIII, 1111 (1919-20).

"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of Members of the American Society of Civil Engineers. (With Discussion.) LIX, 208 (1907).

"The Lower Colorado River and the Salter Pacify." C. F. Cruseky. (With Discussion.)

"The Lower Colorado River and the Salton Basin." C. E. Grunsky. (With Discussion.) LIX, 1 (1907).
"The Sandrock Sewers of St. Paul, Minn."
George L. Wilson. (With Discussion.)

George L. Wilson XXXII, 195 (1894).

GIRDERS.

"A Direct Method of Spacing Rivets and Finding the Position, etc., of Stiffeners in Plate—." E. Schmitt. (With Discussion.) XLV. 550 (1901).
"A Graphical Method for the Solution of Stresses in the Continuous Circles."

Stresses in the Continuous Girder, as Applied to Draw-Bridges." George F. Barton. (With Discussion.) XLVIII, 72 (1902).

Graphical Solution of the Prob-New lem. What Position a Train of Concentrated Loads Must Have in Order to Cause the Greatest Stress in any Given Part of a Bridge Truss or Girder." Henry T. Eddy. XXII, 259 (1890). GIRDERS-(Continued).

"Application of the Theory of Continuous — to Economy in Bridge Building." Charles Bender. V, 147 (1876). Discussion, V, 219.

cussion, V. 219.
Bibliography relating to continuous—,
1854-1874. III, 446 (1874).
"Economy in Rectangular Panels, Using
Beams of Constant Cross-Section." J. S.
Branne. (With Discussion.) LXXIV, 166 (1911).

"Experimental Strains upon a Bowstring Trussed Girder." Theo. G. Ellis. II,

107 (1873).

"Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. (With Discussion.) LXXX, 1689 (1916).
"On a New Principle in the Theory of Structures." George F. Swain. (With Discussion.) LXXXIII, 622 (1919-20).
"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving Drawbridges Having Two

Revolving Drawbridges Having Two Spans or Openings, and Built as Continuous—, more especially as Continuous Panel—." Clemens Herschel. III, 395 (1874). Discussion, IV, 203 (1875). late girder proportioning. XXVI, 106

Plate

"The Continuous Girder as a Tipper."
C. H. Lindenberger. XXVI, 469 (1892).
"The Theorem of Three Moments." J. P. J.
Williams. (With Discussion.) LXXVI, 785 (1913).

See also BEAMS: BRIDGES.

GLASS.
"Some Experiments on the Transverse
Breaking Strain of Plate —." G. W.
Plympton. XXV. 223 (1891). Discussion, XXV, 226, 635.

GLOSSARIES.

See ENGINEERING GLOSSARIES.

GOVERNORS.

"An Automatic or Governor Cut-Off for Steam Engines." William Arthur. II, 81 (1873).

Electric governor for regulation of waterpower. XXXVII, 17 (1897).

GRADE CROSSINGS.

"History of the Pennsylvania Avenue Sub-

"History of the Pennsylvania Avenue Subway, Philadelphia, and Sewer Construction Connected Therewith." George S. Webster and Samuel Tobins Wagner. (With Discussion.) XLIV, 1 (1900). "Inspection and Maintenance of Railway Structures." A Discussion. John A. Wilson, Willard S. Pope, George H. Pegram, G. Bouscaren, W. S. Lincoln, Joseph M. Wilson, James G. Dagron, J. A. L. Waddell, Edward S. Philbrick, A. Bryson, Robert A. Shailer, W. A. Haven, John M. Goodwin, Albert Lucius, E. P. Dawley, C. A. Marshall, D. J. Whittemore, Theodore Cooper, H. Stanley Goodwin, A. M. Wellington, Percival Roberts, Jr., C. C. Schneider, C. Frank Allen, John Bogart, Frederic Graff, Robert I. Sloan, J. Foster Flagg, J. J. R. Croes, William Kent, Robert Moore, and William J. McAlpine. XVII, 259 (1887). "The Elevation of the Tracks of the Philadelphia Germantown and Norristown

delphia Germantown and Norristown

GRADE CROSSINGS-(Continued).

Railroad, Philadelphia, Pa." Samuel Tobias Wagner. (With Discussion.) LXXVI, 1819 (1913).

"The Rearrangement of the Railway Terminal System at Altona, with Special Reference to the Avoidance of —." R. Caesar. (Translated from the German by Wm. H. Searles.) XXIX, 295 (1893). Discussion, XXX, 512 (1893).

GRADES.

GRADES.

"Locomotive Performance on — of Various Lengths." Beverly S. Randolph. (With Discussion.) LXX, 321 (1910).

"Street—and Cross-Sections in Asphalt and Gement." Robert P. Woods. (With Discussion.) XLII, I (1899).

"The Approximate Value of a Reduction of Ruling or Maximum —, Especially for the Use of Engineers on Location of Rallroads." John G. Clarke. (With Discussion.) II, 399 (1873).

"The Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains, and the Performance of Locomotives on its Steep—." James D. Burr. (With Discussion.) VIII, 295 (1879).

(1879).

"The Location of the Knoxville, La Follette and Jellico Railroad, of the Louisville and Nashville System." W. D. Taylor. (With Discussion.) LII, 467 (1904).

(1904).

"The Maximum Weights of Slow Freight Trains." C. S. Bissell. (With Discussion.) LXIV. 303 (1909).

"The Proper Compensation for Railroad Curves." William R. Morley. (With Discussion.) XIII, 181 (1884).

"The Traction of Freight Trains at Different Speeds." Clinton S. Bissell. (With Discussion.) LXVI. 58 (1910).

"Virtual—for Freight Trains." A. C. Dennis. (With Discussion.) L, 1 (1903).

Dennis. (With Discussion.) L, 1 (1903).

GRAIN ELEVATORS.

"American Grain —." E. Lee Heldenreich. XXIX, 644 (1893). Discussion, XXX, 583 (1893).

"The Failure and Righting of a Million-Bushel Grain Elevator." Alexander Allaire. LXXX, 790 (1916). Discussion: David Gutman, W. R. Phillips, and E. P. Goodrich, LXXX, 833.

GRANDSTANDS AND STADIA.

Stadium at Tacoma, Wash. LXXXI, 289

(1917)

"The Yale Bowl." Charles A. Ferry. LXXXI, 249 (1917). Discussion: Thomas C. Atwood, J. B. French, H. C. Kelth, H. F. Dunham, Henry C. Hitt, and Alexander S. Lynch, LXXXI, 280.

GRAPHICAL CHARTS.

"Nomographic Solutions for Formulas of Various Types." R. C. Strachan. LXXVIII, 1359 (1915). Discussion: Allen Hazen, Carl B. Andrews, J. O. Eckers-ley, Paul C. Nugent, W. M. Ellot, and F. W. Green, LXXVIII, 1381.

GRAVEL.

-roads. LXXXII, 1388, 1411 (1918). Cests of specific gravity, etc., LXXXII, 1438 (1918). Tests

GROUND-WATER.

Flow of —. LXXX, 421 (1916).
"Hydraulic Phenomena and the Effect of Spreading of Flood Water in the San Bernardino Basin, Southern California." A. L. Sonderegger. (With Discussion.) LXXXII, 802 (1918).

Laws of underground flow. LXXXI, 48

(1917).

"The Determination of Safe Yield of Under-The Determination of Sale Field of Underground Reservoirs of the Closed-Basin Type." Charles H. Lee. LXXVIII, 148 (1915). Discussion: James Owen, G. E. P. Smith, O. E. Meinzer, Kenneth Allen, and Robert E. Horton, LXXVIII, 219. "The Infiltration of — into Sewers." John N. Brooks. (With Discussion.) LXXVI, 1909 (1913).

1909 (1913).

"The Storage of Flood-Waters for Irrigation: A Study of the Supply Available from Southern California Streams." A. (With Discussion). LXXVII, M. Strong. p. 67 (1914).
"The Water Supply of Parkersburg, W. Va." William M. Hall. (With Discussion.) LXXXI, 749 (1917).

GROUTING.

Description of construction of the Hinckston Run Dam, especially the—. LXXVIII, 520 (1915). "Grouted Cut-Off for the Estacada Dam." Harold A. Rands. (With Discussion.) LXXVIII, 447 (1915). — on the line of the Catskill Aqueduct. LXXX, 678 (1916). "— Operations. Catskill Water Supply."

LXXX, 678 (1916).

"Operations, Catskill Water Supply."
James F. Sanborn and M. E. Zipser.
LXXXIII. 980 (1919-20). Discussion:
Robert Ridgway, J. Waldo Smith, Lazarus White. John P. Hogan, Francis
Donaldson, Waldo C. Briggs, A. J. Sackett, Andrew A. Cohill, A. J. Mayell,
Milton H. Freeman, C. L. Riker, Jr.,
Benjamin A. Howes, and Theodore Belzner, LXXXIII, 1058 (1919-20).
Injection of grout in construction of Astoria Gas Tunnel. LXXX, 628, et seq.
(1916).

(1916).

Machine for —. LXXVI, 1960 (1913).

Machine for —in a concrete arch dam.
LXXXIII, 322 (1919-20).

Pressure — under footings, Stony River
Dam. LXXXI, 987 (1917).

The use of grout for stopping leaks in
shafts and tunnels. LXXIII, 404 (1911).

GROYNES.

See SHORE PROTECTION.

GUARD GATES.

"Description of—at the Point Street Bridge at Providence, R. I." William D. Bullock. XX, 78 (1889).

GUARD RAILS.

"The Relation of Wheels to Frog Points and to —." Archibald A. Schenck. (With Discussion.) XXXI, 509 (1894).

GULF STREAM.

See OCEAN CURRENTS.

GUN-CARRIAGES.

"Seacoast Gun-Carriage Design and Con-struction." Edward P. O'Hern. (Inter. Eng. Cong. 1904.) LIV, Part B, 257 (1905).

GUNS.

See ORDNANCE.

HARBORS.

"A Brief Account of the Building of Leixões Harbor." Alfonso Joaquim No-gueira Soares. XXIX, 194 (1893). Dis-cussion, XXX, 490 (1893). Ancient — XXIV, 323 (1891). Columbia River, — on. LXXVI, 161 et seq.

(1913).

"Commercial Cities: The Law of Their Birth and Growth." Alfred F. Sears. (With Discussion.) XIV, 19 (1885).

"Concrete Blocks at Osaka Harbour Works, Japan." S. Shima. (Inter. Eng. Cong. 1904.) LIV, Part A, 221 (1905).

"Description of Coos Bay, Oregon, and the Improvement of Its Entrance by the Government." William W. Harts. XLVI, 482 (1901). Discussion: Lewis M. Haupt, W. M. Black, H. C. Ripley, and C. H.

Government." William W. Harts. XLVI, 482 (1901). Discussion: Lewis M. Haupt, W. M. Black, H. C. Ripley, and C. H. McKinstry, XLVI, 507.

"Harbor Works at Copenhagen, Denmark." H. C. V. Moller. XIV, 212 (1885).

Harbors. Discussion on Inter. Eng. Cong. Papers, 1904. L. J. Le Conte, Lewis M. Haupt, W. Henry Hunter, P. W. Meik, H. H. Wadsworth, John H. Darling, J. L. Van Ornum, Clarence Coleman, A. E. Carey, E. L. Corthell, W. Matthews, P. Vedel, and Cassius E. Gillette. LIV, Part A, 339 (1905).

"— of Great Britain." William Matthews. (Inter Eng. Cong. 1904.) LIV, Part A, 159 (1905).

159 (1905).

"— on Lake Superior, Particularly Duluth-Superior Harbor." David DuB. Gall-lard. (Inter. Eng. Cong. 1904.) LIV, Part A, 263 (1905).

"- on Lakes Erie and Ontario." Dan C. Kingman. (Inter. Eng. Cong. 1904.) LIV, Part A, 237 (1905).

"Harbour Development in Holland." H.

Wortman. (Inter. Eng. Cong. 1904.) LIV, Part A, 181 (1905). "History of the Conversion of the River Clyde into a Navigable Water-Way, and of the Progress of Glasgow Harbour from its Commencement to the Present Day." James Deas. XXIX, 128 (1893). Discussion, XXX, 478 (1893). "Improvement of Entrance to Galveston "Horbor"." Observing Will 1993.

nt of Entrance to Galveston Charles W. Howell. VI, 223 Harbor."

(1877).

"Improvement of Gray's Harbor, Wash."
Bolton W. DeCourcy. (With Discussion.) XXXII, 477 (1894). Improvement of Honolulu Harbor, XXXVI,

125 (1896).

Improvement of various—on the Pacific Coast. XXXVI, 109 (1896).
"Improving the Entrance to a Bar Harbor by a Single Jetty." T. W. Symons. (With Discussion.) XXXVI, 109 (1896).

"Island—and the Accumulations of Material Caused by Detached Works." P. Vedel. (Inter. Eng. Cong. 1904.) LIV, Part A, 139 (1905).

"Jetty—of the Pacific Coast." Thomas W. Symons. XXVIII, 155 (1893). Dis-cussion, XXVIII, 372.

Angeles Harbor, Description

LXXVI, 160 et seq. (1913).

'Maritime Ports of France." Baron E. T.
Quinette de Rochemont. (Translated
from the French by Foster Crowell.)
(Inter. Eng. Cong. 1904.) LIV, Part 'A, 199 (1905),

HARBORS-(Continued).

"Method Used to Secure the Stability of a Quay Wall at the Port of Altona, on the Elbe, in Germany, which had Shifted its Position after Completion." Berthold Stahl. XXX, 284 (1893). Discussion,

Stahl. XXX, 284 (1893). Discussion, XXX, 687.

"Modern Pier Construction in New York Harbor." Charles W. Staniford. (With Discussion.) LXXVII, 503 (1914).

"Navigation Works Executed in France from 1876 to 1891." F. Guillian. (Translated from the French by C. L. Crandall, assisted by C. W. Sherman.) XXIX, 1 (1893).

New York Harbor, Brief description of. LXXVI, 1654, 1666 (1913).

"Notes on the Bar—at the Entrances to Coos Bay, and Umpqua and Siuslaw Rivers, Oregon." Morton L. Tower. LXXI, 349 (1911). Discussion: Lewis M. Haupt, LXXI, 360.

"Notes on the Improvement of River and

"Notes on the Improvement of River and Harbor Outlets in the United States. D. A. Watt. (With Discussion.) LV D. A. Watt. (With 28 (1905).
"Notes upon Docks and —." Luther Wagoner. (With Discussion.) LXII, 135

"On the Straits of Juan de Fuca, Puget Sound; and Government Improvements on the Pacific Coast." Bolton D. De-Courcy. (With Discussion.) XXV, 420 (1891).

Portland, Ore., Harbor, Description of, LXXVI, 175 et seq. (1913). "Ports of the Pacific." H. M. Chitteuden, Assisted by A. O. Powell. LXXVI, 155 (1913). Discussion: L. J. Le Conte, E. P. Goodrich, and Lewis H. Haupt, E. P. Goods LXXVI, 221.

Prince Rupert, B. C., Harbor, Description of. LXXVI, 165 et seq. (1913)

"Principles of Tidal Harbor Improvement as Applied at Wilmington, Cal." Clinton B. Sears. V, 388 (1876). Discussion, VI, 189 (1877).

"Provincetown Dike." James B. Francis.

I, 329 (1872).

Puget Sound, Description of — on. LXXVI, 163 et seq. (1913).
"Recent Dredging Operations at Oakland Harbor, California." L. J. Le Conte. Harbor, California." L. J. Le Conte. XIII, 9 (1884). San Diego Harbor, Description of. LXXVI,

160 et seq. (1913).

Too et seq. (1913).

San Francisco Bay and Harbor, Description of. LXXVI, 159 et seq. (1913).

"Seacoast—in the United States." Cassius E. Gillette. (Inter. Eng. Cong. 1904.)

LIV, Part A, 297 (1905).

Seattle Harbor, Description of. LXXVI, 179 et seq. (1913).

"Some Observations on the Subject of the

"Some Observations on the Subject of the "Some Observations on the Subject of the Improvement of Several of the Rivers of the Atlantic Coast." W. P. Craighill. (With Discussion.) XIX, 233 (1888). "Some Recent Experiments with Dynamite on an Ocean Bar." O. M. Carter. (With Discussion.) XXV, 442 (1891). Tacoma Harbor, Description of. LXXVI, 182 et seq. (1913). "The Brazos River Harbor Improvement." George Y. Wisner. XXV, 519 (1891). Discussion, XXV, 537; XXVI, 518 (1892). "The Breakwater at Buffalo, New York." Emile Low. (With Discussion.) L11, 73 (1904).

73 (1904).

The Causes of the Formation of Bars at the Mouths of Rivers, as Shown in an Examination of the Connectleut "The

HARBORS—(Continued). Theodore G. Ellis.

River." (1873).

"The Delaware, Sandy Bay and San Pedro Breakwaters." C. H. McKinstry. Inter. Eng. Cong. 1904.) LIV, Part A, 325

"The Development of Quay-Cranes in the Port of Hamburg." Chr. Nehls. XXX,

"The Development of Quay-Cranes in the Port of Hamburg." Chr. Nehls. XXX, 258 (1893).
"The Improvement of —on the South Atlantic Coast of the United States." William Murray Black. XXIX, 223 (1893). Discussion, XXX, 498 (1893).
"The Improvement of the Channels at the Entrance to the Harbor of New York." Joseph Edwards. XXV, 573 (1891).
"The Improvement of the Harbor of Quebec." J. Vincent Browne. IX, 455 (1880).
"The Improvement of the South Boston Flats by the Harbor Commissioners of the State of Massachusetts." Edward S. Philbrick. VII, 17 (1878).
"The Improvement of the Water Front of the City of New York." John D. Van Buren. (With Discussion.) III, 172 (1874).

(1874).

"The Plant of Maritime Commercial Ports of France." H. Despres. (Translated of France." II. Despres. (Translated from the French by Charles Warren Hunt. XXX, 235 (1893).
"The Preparation and Use of Concrete Blocks for Harbour Works." I. Hiroi. (Inter. Eng. Cong. 1904.) LIV, Part A, 211 (1965).

(Inter. Eng. Cong. 1904.) LIV, Part A, 211 (1905).

"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. LXXV, 226 (1912). Discussion: S. W. Hoag, Jr., H. McL. Harding, James Forgie, Edlow W. Harrison, Charles H. Higgins, M. Lewinson, T. Kennard Thomson, Calvin Tomkins, Ernest C. Moore, Reginald Pelham Bolton, Henry B. Seaman, J. H. Gandolfo, E. De V. Tompkins, A. W. Robinson, and Augustus Smith, LXXV, 247. 247.

"The Reaction Breakwater as Applied to the Improvement of Ocean Bars.'

the Improvement of Ocean Bars." Lewis M. Haupt. XLII, 485 (1899). Discussion, XLII, 501; XLIII, 93 (1900).
"The South Pass Jetties. Ten Years' Practical Teachings in River and Harbor Hydraulics." E. L. Corthell. XIII, 313 (1884). Discussion, XV, 223 (1886).
"Tidal Phenomena in the Harbor of New York." H. de B. Parsons. LXXVI, 1979 (1913). Discussion: Allen Hazen, T. Kennard Thomson, James Owen, and Kenneth Allen, LXXVI, 2094.
Vancouver, B. C., Harbor, Description of. LXXVI, 195 et seq. (1913).

HEAD-GATES.
—, Colorado River siphon. LXXVII, 25 (1914).

-, inlet canal, Prewitt Reservoir, Colo. LXXVII, 107 (1914).

irrigation canals, Imperial Valley, California. LXXVI, 1302 et seq. (1913).
on irrigation canals. LXXVII, 943 -- 011 (1914).

-on the (337 (1917) Colorado River, LXXXI, 302,

"Hoisting Apparatus of the Canal—at Sewall's Fails, N. H." John R. Free-man. (With Discussion.) XXXII, 278 (1894).

HEAT.

"Note Relating to Rumford's Determina-

HEAT—(Continued).

tion of the Mechanical Equivalent of —."
Robert H. Thurston. II, 289 (1873).
"On the Application of a New System of
Distillation with Conservation of —."
Thomas Prosser. I, 79 (1872).
Transmission of — through balsa wood,
LXXXI, 149 (1917).

HEATING.

"District Steam Systems." Charles E. Emery. XXIV, 188 (1891). Discussion. XXIV, 216.

"Expansion of Pipes." Ralph C. Taggart. (With Discussion.) LXX, 1 (1910).

"Experiments with a New Method of—and Ventilation." Charles Carroll Gilman. XXXVII, 59 (1897).

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).

—and ventilating South Boston Terminal.

- and ventilating South Boston Terminal.

XLIII, 156 (1900). and ventilation of the Pennsylvania Railroad Station, New York. LXIX, 270 — and (1910).

(1910).

"Mechanical Installation in the Modern
Office Building." Charles G. Darrach.
(With Discussion.) XLVIII, 1 (1902).

"Steam—." Wm. E. Worthen. (With
Discussion.) XXIV, 206 (1891).

"Tests of Condensation in Cast-Iron Radiators." William J. Baldwin. XXXII, 34
(1894)

(1894).

The - of halls of audience. X, 53 (1881).

HIGHWAYS.

"American —." An Informal Discussion.
W. G. B. Thompson, H. Eltinge Breed,
Eugene W. Stern, Calvin Tomkins, H. F.
Dunham, and William E. Woolley,
LXXXIII, 550 (1919-20).
Definitions of highway engineering terms.
LXXXII, 1420 et seq. (1918).
"Subaqueous Highway Tunnels." George
Duncan Snyder. (With Discussion.)
LXXVIII, 252 (1915).

See also PAVEMENT: ROADS.

HOISTING MACHINERY.

"Hoisting Apparatus of the Canal Head-Gates at Sewall's Falls, N. H." John Gates at Sewall's Falls, N. H." John R. Freeman. (With Discussion.) XXXII,

R. Freeman. (With Discussion.) XXXII, 278 (1894).
"Tests of the Efficiency of Holsting Tackle." S. P. Mitchell. LI, 161 (1903).
"The Relative Merits of Working — by Steam, Water and Electricity." George A. Goodwin. XXIX, 695 (1893).

See also COAL-HANDLING MACHINERY.

HOSE.

Loss of head in —. XIII, 376 (1884).

HOUSE DRAINAGE.

"The Single Trap System of —." Latham Anderson. (With Discussion.) XXV, 394 (1891).

HYDRAULIC JUMP.

"Surges in an Open Canal." R. D. Johnson. (With Discussion.) LXXXI, 112

"The—, in Open Channel Flow at High Velocity." Karl R. Kennison. (With Discussion.) LXXX, 338 (1916).

HYDRAULIC LABORATORIES.

Description of —. LXXVII, 1272 (1914).

HYDRAULIC RAMS. See PUMPS.

HYDRAULICS.

See WATER, FLOW OF.

HYDRO-ELECTRIC POWER PLANTS. See POWER PLANTS.

HYDROGRAPHY.

"Surveying." Officers of the U. S. Coast and Geodetic Survey: John F. Hayford, W. C. Hodgkins, D. B. Wainwright, L. A. Bauer, Isaac Winston, and E. G. Fischer. (Inter. Eng. Cong. 1904.) LIV, Part B, 399 (1905).
"Surveying." Officers of the U. S. Geological Survey: Herbert M. Wilson, Edward C. Barnard, and John C. Hoyt. (Inter. Eng. Cong. 1904.) LIV, Part B, 419 (1905).

419 (1905). Surveying. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part B, 449 (1905).

"The — of the Potomac Basin." Cyrus C. Babb. (With Discussion.) XXVII, 21 (1892).

See also HYDROMETRY.

HYDROMETRY.

HYDROMETRY.

"Cheml-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. LXXX, 951 (1916). Discussion: G. Bertram Kershaw, George W. Fuller, W. D. Peaslee, W. L. Waters, Robert E. Horton, Thomas H. Wiggin, and W. S. Richmond, LXXX, 1276.

"—as an Aid to the Successful Operation of an Irrigation System." J. C. Stevens. LXXI, 314 (1911). Discussion: E. F. Chandler, C. E. Shipman, Clemens Herschel, and Robert Follansbee, LXXI, 342.

"Verification of the Bazin Weir Formula by Hydro-Chemical Gaugings." Floyd A. Nagler. (With Discussion.) LXXXIII, 105 (1919-20).

Discussion on anchor —. X, 193 (1881).

Formation of anchor —, XXXII, 306 (1894).

"Diversion, Hydraulic Models, and Hydraulic Similarity." Benjamin F. Groat.

LXXXII, 1138 (1918). Discussion: M. O. Leighton, J. Waldo Smith, Robert Fletcher, A. F. Parker, and E. E. R. Tratman, LXXXII, 1152.

"Stopping of Flow in a Water Main by

"Stoppage of Flow in a Water Main by Anchor—." James B. Francis. (With Discussion.) XVI, 171 (1887).

INCINERATORS.

See REFUSE DESTRUCTORS.

INCLINED RAILWAYS.

"Early Surveys and Reports in Reference to the Transmission of Trade across the Allegheny Mountains in the State of Pennsylvania, known as the Allegheny Portage." Moncure Robinson, XV, 181 (1886).

"Reminiscences and Experiences of Early Engineering Operations on Railroads, with Especial Reference to Steep In-clines." W. Milnor Roberts. VII, 197 (1878); Discussion, VII, 216.

INCLINED RAILWAYS-(Continued).

"The Abt System of Railway for Steep Inclines." Walton W. Evans. XV, 147

(1886).

"The American Line from Vera Cruz to the City of Mexico, via Jalapa, with Notes on the Best Methods of Surmounting High Elevations by Rail." A. M. Wellington. (With Discussion.) XV, 791 (1886).

"The Incline Plane Rallroad at Madison, Ind. Its History and Operation." M. J. Becker. VII, 68 (1878). Discussion,

INSPECTION.

INSPECTION.

"—and Maintenance of Railway Structures." A Discussion. John A. Wilson, Willard S. Pope, George H. Pegram, G. Bouscaren, W. S. Lincoln, Joseph M. Wilson, James G. Dagron, J. A. L. Waddell, Edward S. Philbrick, A. Bryson, Robert A. Shaller, W. A. Haven, John M. Goodwin, Albert Lucius, E. P. Dawley, C. A. Marshall, D. J. Whittemore, Theodore Cooper, II. Stanley Goodwin, A. M. Wellington, Percival Roberts, Jr., C. C. Schneider, C. Frank Allen, John Bogart, Frederic Graff, Robert I. Sloan, J. Foster Flagg, J. J. R. Croes, William Kent, Robert Moore, and William J. McAlpine. XVII, 259 (1887).

(1887).
"Inspectors and Daniel Wagner.
"Shias Wagner. and Bridge Work." Samuel Vagner. (With Discussion.)

Tobias Wagner. (With Discussion.) XVII, 318 (1887).

"The Position of the Constructing Engineer, and his Duties in Relation to—and the Enforcement of Contracts." Albert J. Himes. LVI, 104 (1906). Discussion: James Smith Haring, W. D. Lovell, Benjamin Thompson, S. Bent Russell, Willard Beahan, W. A. Aiken, Augustus Smith, and G. S. Bixby, LVI, 123.

INSULATION.

Insulating properties of balsa wood for cold storage. LXXXI, 149 et seq. (1917).

INTAKES.

Protection of — of power plants from floating ice, etc. LXXXII, 1138 (1918).

INTERLOCKING. See SIGNALING.

"A Note on the Resistance of Materials."
Robert H. Thurston. II, 239 (1873).
"An Analysis of the Cost and Description of the Methods of Mining Employed in the Marquette—Region, Lake Superior, Michigan." T. B. Brooks. II, 15 (1873).

"Compressive Strength of Steel and -."
Charles A. Marshall. XVII, 53 (1887).
"Corrosion of -." Wm. J. McAlpine. I,

23 (1872).

23 (1872).
"Experiments on the Tensile Strength of Bar—and Boiler-Plate." C. B. Richards. (With Discussion.) II, 339 (1873).
"Note on the Resistance of Materials." Robert H. Thurston. IV, 334 (1875).
"Notes on the Crushing Strength of American—" Thomas C. Clarke. (With Discussion.) II, 228 (1873).
"On a New Method of Detecting Overstrain in—and Other Metals, and on its Appliance."

in - and Other Metals, and on its Appli-

IRON—(Continued).

cation in the Investigation of the Causes of Accidents to Bridges and Other Con-structions." Robert H. Thurston, VII, 53 (1878).

53 (1878).
"Painting of — Structures Exposed to Weather." E. Gerber. (With Discussion.) XXXIII, 485 (1895).
"Qualities of — and Steel." William Metcalf. V, 323 (1876).
Resilience tests of — XXXIX, 237 (1898).
"Tests of Bridge Irons." J. Dutton Steele. (With Discussion.) II, 223 (1873).
"The Manufacture of Pig —." E. N. K. Talcott. I, 191 (1872).
"The Preservation of Materials of Construc-

"The Preservation of Materials of Construc-tion." An Informal Discussion. William An Informal Discussion. William Barclay Parsons and others. L, 293 (1903).

See also CAST IRON: WROUGHT IRON.

IRON WORK.

"The—for the Dome of the Proposed Government Building, World's Columbian Exposition, Chicago, Ill." James C. McGuire. XXVI, I (1892).
"The Protection from Corrosion, of—Used as Covering for Railroad Tunnels." James G. Dagron. (With Discussion.) XXVII, 324 (1892).

IRRIGATION.

"A Complete Method for the Classification of Irrigable Lands," F. H. Peters. LXXXI, 222 (1917). Discussion: T. Ken-nard Thomson, and G. N. Houston, LXXXI, 243.

Water-Meter for —." A. D. Foote.

"A Water-Meter XVI, 134 (1887).
"American — Engineering." Herbert M. Wilson. (With Discussion.) XXV, 161

"Colorado River Siphon." George Schobinger. (With Discussion.) LXXVII, 1 (1914).

"Control of the Colorado River as Related to the Protection of Imperial Valley." J. C. Allison. (With Discussion.) LXXXI, 297 (1917).

LXXXIII. for - purposes.

(1919-20).

"Determination of the Duty of Water by Analytical Experiment." W. C. Hammatt. LXXXIII, 200 (1919-20). Discussion: J. C. Van Reigersberg Versluys, W. L. Rockwell, J. C. Stevens, and S. T. Harding, LXXXIII, 251.

Duty of water in certain districts in California. LXXX, 58, 151, 167, et seq. 198

"Economic Canal Location in Uniform Countries." Lynnan E. Bishop. (With Discussion.) LXXIV, 178 (1911). "Hydraulic Phenomena and the Effect of Spreading of Flood Water in the San Bernardino Basin, Southern California."

A. L. Sonderegger. (With Discussion.) LXXXII, 802 (1918). "Hydrometry as an Aid to the Successful."

"Hydrometry as an Aid to the Successful Operation of an — System." J. C. Stevens. (With Discussion.) LXXI, 314

(1911).

"Irrigation." Edward Bates Dorsey. (With

"Irrigation." Edward Bates Porsey. (With Discussion.) XVI, 85 (1887). "Irrigation." An Informal Discussion. George G. Anderson, F. H. Newell, J. P. A. Maignen, A. L. Fellows, W. W. Follett, Gardner S. Williams, F. C. Fin-kle, Thomas H. Means, G. N. Houston,

IRRIGATION—(Continued).

Richard R. Lyman, and Arthur P. Davis, LXII, 1 (1909).

- and Hydraulic Motors Used in—in France." Paul Lévy Salvador. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part C. III (1905).

- and River Control in the Colorado River Delta." H. T. Cory. (With Discussion.) LXXVI, 1204 (1913).

LXXVI, 1204 (1913).

Irrigation. Discussion on Inter. Eng. Cong. Papers, 1904. Sir Thomas Higham, F. H. Rundall, C. J. Grant, Michael Elliott, Alfred Chatterton, Almon H. Fuller, H. D. Pearsall, L. J. Le Conte, David M. Duller, Sir Hanbury Brown, Paul Lévy Salvador, and J. E. de Meyier. LIV, Part C, 139 (1905).

"—in India." Herbert M. Wilson. (With Discussion.) XXIII, 217 (1890).

"—in Java." J. E. de Meyier. (Inter. Eng. Cong. 1904.) LIV, Part C, 33 (1905).

(1905).M. M.

-in the Hawaiian Islands." O'Shaughnessy. (Inter. Eng. Cong.

O'Shaughnessy. (Inter. Eng. Cong. 1904.) LIV, Part C, 129 (1905).

"—in the United States." Elwood Mead. (Inter. Eng. Cong. 1904.) LIV, Part (Theer, Eng. Cong. Roya, Dr.)
C. S3 (1905).
"—Studies." Elwood Mead. (With Discussion.) XLIV, 149 (1900).
"—under British Engineers." Sir Hanbury

"— under British Engineers." Sir Hanbury Brown. (Inter. Eng. Cong. 1904.) LIV, Part C, 3 (1905).
"Should the National Government undertake the Construction and Operation of — Works?" An Informal Discussion. Elwood Mead, T. M. Ripley, F. H. Newell, George H. Maxwell, J. James R. Croes, L. M. Haupt, and Charles G. Darrach. XLIX, 24 (1902).
"South African —" Francis Robert Johnson. LII, 1 (1904). Discussion: Augustine W. Wright, and L. J. Le Conte, LII, 27.

27.

"State and National Water Laws, with Detailed Statement of the Oregon System of Water Titles." John H. Lewis. (With Discussion.) LXXVI, 637 (1913).

"The Construction of the Sweetwater Dam." James D. Schuyler. (With Discussion.) XIX, 201 (1888).

"The Diversion of Irrigating Water from Arizona Streams." A. L. Harris. LXXVII, 932 (1914).

"The Duty of Water in the Pacific North-

"The Duty of Water in the Pacific Northwest." J. C. Stevens. LXXXIII, 2094 (1919-20). Discussion: Thomas H. Means, and Robert E. Horton, LXXXIII, 2114.

and Robert E. Horton, LXXXIII, 2114.

"The Economic Aspect of Seepage and Other Losses in — Systems." E. G. Hopson, LXXVI, 33G (1913). Discussion:
L. J. Le Conte, W. C. Hammatt, and Luther Wagoner, LXXVI, 364.

"The — System of Ontario, California — Its Development and Cost." F. E. Trask. LV, 173 (1905). Discussion: Arthur S. Hobby, LV, 180.

"The Laramie-Poudre Tunnel." Burgis G. Cov. (With Discussion.) LXXV, 724

Coy. (With Discussion.) LXXV, 724 (1912).

"The Lower Colorado River and the Salton Basin." C. E. Grunsky. (With Diston Basin." C. E. Grunsky. (With Discussion.) LIX, 1 (1907).

"The Prewitt Reservoir Proposition." J. C. Ulrich. LXXVII, 96 (1914).
"The Reclamation of River Deltas and Salt Marshes." J. Francis Le Baron. (With Discussion.) LIV, 51 (1905).

IRRIGATION—(Continued).

"The Redemption of the Great Valley of California." A. D. Foote, LXVI, 229 (1910). Discussion: William W. Harts, H. H. Wadsworth, Erle L. Veuve, Frederick Hall Fowler, George L. Dillman, C. E. Grunsky, A. T. Parsons, and D. C. Henny, LXVI, 246.
"The Sauta Ana Canal of the Bear Valley—Company." William Ham. Hall. XXXIII, 61 (1895). Discussion, XXXIII, 587.

XXXIII, 61 (1895). Discussion, XXXIII, 587.

"The Storage of Flood-Waters for—; A Study of the Supply Available from Southern California Streams." A. M. Strong. LXXVII, 67 (1914). Discussion: Charles H. Lee, LXXVII, 91.

"The Tieton Canal." E. G. Hopson. LXXI, 158 (1911). Discussion: Horace W. Sheley, and H. F. Dunham, LXXI, 185.

JETTIES.

JETTIES.

"Description of Coos Bay, Oregon, and the Improvement of Its Entrance by the Government." William W. Harts. (With Discussion.) XLVI, 482 (1901).

Harbors. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part A, 339 (1905). "How to Build a Stone Jetty on a Sand Bottom in the Open Sea." Henry C. Ripley. LXXV, 1040 (1912). Discussion: L. M. Haupt, Frederic V. Abbot, John Taylor, Morton L. Tower, Howard J. Cole, J. Francis Le Baron, and L. J. Le Conte, LXXV, 1049. "Improvement of Entrance to Galveston Harbor." Charles W. Howell. VI, 223 (1877).

(1877).

"Improvement of Gray's Harbor, Wash."
Bolton W. DeCourcy. (With Discussion.) XXXII. 477 (1894).
"Improving the Entrance to a Bar Harbor by a Single Jetty." T. W. Symons. (With Discussion.) XXXVI, 109 (1896).

- at Aransas Pass, Texas. XL, 96 (1898);

LXXVI, 234 (1913). - for Pacific coast harbors. LXXVI, 228

(1913).

"Jetty Harbors of the Pacific Coast." Thomas W. Symons, XXVIII, 155 (1893). Discussion, XXVIII, 372.

"Littoral Movements of the New Jersey Coast, with Remarks on Beach Protec-tion and Jetty Reaction." Lewis M. Haupt. (With Discussion.) XXIII, 123 (1890).

"Notes on the Bar Harbors at the Entrances to Coos Bay, and Umpqua and Siuslaw Rivers, Oregon." Morton L. Tower. (With Discussion.) LXXI, 349 (1911).

"Notes on the Improvement of the Mouth of the Mississippi." W. Milnor Roberts, IV, 321 (1875). Discussion, IV, 332; V, 275 (1876).

"Notes on the South Pass—." Max E. Schmidt. IX, 290 (1880).
"On the Straits of Juan de Fuca, Puget Sound; and Government Improvements on the Pacific Coast." Bolton W. De-Courcy. (With Discussion.) XXV, 420 (1891).

(1891).

"Origin of the Gulf Stream and Circulation of Waters in the Gulf of Mexico, with Special Reference to the Effect on Jetty Construction." N. B. Sweitzer. (With Discussion.) XL, 86 (1898).

"Principles of Tidal Harbor Improvement as Applied at Wilmington, Cal." Clin-

JETTIES—(Continued). ton B. Sears. V. 388 (1876). Discussion, VI, 189 (1877). "Seacoast Harbors in the United States." Cassius E. Gillette. (Inter. Eng. Cong. 1904.) LIV, Part A, 297 (1905). Come Notes on the Holland Dikes."

"Some Notes on the Holland Dikes."
William Starling. XXVI, 559 (1892).
"The Brazos River Harbor Improvement."
George Y. Wisner. XXV. 519 (1891).
Discussion, XXV, 537; XXVI, 518 (1892).
"The Delaware, Sandy Bay and San Pedro
Breakwaters." C. H. McKinstry. (Inter.
Eng. Cong. 1904.) LIV, Part A, 325

(1905).

(1905).

"The Delta of the Mississippi, Considered in Relation to an 'Open River Mouth.'"
John G. Barnard. IV, 104 (1875). Discussion, IV, 290, 297.

"The Improvement of Harbors on the South Atlantic Coast of the United States." William Murray Black. XXIX, 223 (1893). Discussion, XXX, 498 (1893).

"The Improvement of the Channels at the Entrance to the Harbor of New York."
Joseph Edwards. XXV, 573 (1891).

"The Preservation of Sandy Beaches in the Vicinity of New York City." Elliott J. Dent. (With Discussion.) LXXX, 1786 (1916).

"The Proper Profile for Resisting Wave

"The Proper Profile for Resisting Wave ion." (Abstract.) Robert Fletcher. Action.

XXXVI, 514 (1896).
"The Reaction Breakwater as Applied to the Improvement of Ocean Bars." Lewis M. Haupt. XLII. 485 (1899). Discussion. XLII. 501; XLIII, 93 (1900). "The South Pass—. Descriptive and Incidental Notes and Memoranda." E. L. Corthell. VII, 131 (1878). Discussion,

"The South Pass—. Notes on the Consolidation and Durability of the Works, with a Description of the Concrete Pleaks and Other Constructions of the Blocks and Other Constructions of the Last Year." Max E. Schmidt, VIII, 189 (1879).

"The South Pass — Ten Years' Practical Teachings in River and Harbor Hydrau-lics." E. L. Corthell, XIII, 313 (1884). Discussion, XV, 223 (1886).

See also BREAKWATERS: SHORE PRO-TECTION.

JOINTS.

Expansion and contract LXXXI, 1120 (1917). contraction - in concrete.

Expansion - in dams. LXXXI. 1060 (1917).

JOISTS.

See BEAMS.

JOURNAL FRICTION.

"Experiments on the Resistances of Rolling Stock." A. M. Wellington. VIII, 21 (1879).

"Experiments with New Apparatus on— at Low Velocities." A. M. Wellington. (With Discussion.) XIII, 409 (1884).

LABOR.

"The Anthracite Coal Trade and — Question, as Connected." Martin Coryell, 1, 367 (1872).

LAKES.

'A Study of the Depth of Annual Evaporation from Lake Conchos, Mexico."

LAKES-(Continued).

win Duryea, Jr., and H. L. Haehl. (With Discussion.) LXXX, 1829 (1916). Freight rates, etc., on Great —. XLV, 208

(1901).

Improvement of Great — XLV, 224 (1901).
 "Inland Transportation." F. A. Mahan.
 XXIX, 97 (1893). Discussion, XXX, 457

(1893).
"Reservoir System of the Great—of the St. Lawrence Basin: Its Relation to the Problem of Improving the Navigation of These Bodies of Water and of Their Connecting Channels." Hiram M. Chittenden. (With Discussion.) XL, 355 (1898).

"(1898).
"Temperature of Water at Various Depths in—and Oceans." Hamilton Smith. (With Discussion.) XHI, 73 (1884).
The Development of the Commerce of the Great—." Presidential Address at the Annual Convention at Asheville, N. C., June 9th, 1903. Alfred Noble. L, 327 (1903). (1903).

"The Low Stage of Lakes Huron and Michigan." C. E. Grunsky. LXIII, 31 (1909). Discussion: H. M. Chittenden, LXIII, 48.

"The Temperature of -. " Desmond Fitz-Gerald. (With Discussion.) XXXIV, 67 (1895).

LAND.

Classification of irrigable - LXXXI, 222

(1917).
"The Valuation of —." L. P. Jerrard.
(With Discussion.) LXXXI, 582 (1917).
Valuation of —. LXXXI, 1311 (1917). "The

LAND RECLAMATION.

"Levees, as a System for Reclaiming Low-lands." George W. R. Bayley. V, 115 (1876). Discussion, V, 299; VI, 305 (1877).

"Reclamation of the Potomac Flats at Washington, D. C." Peter C. Hains. XXXI, 55 (1894). Discussion, XXXI, 489.

"The Compressibility of Salt Marsh under the Weight of Earth Fill." Eugene R. Smith. (With Discussion.) XXXVII, 213 (1897).

"The Dangers Threatening the Navigation of the Mississippi River and the Reof the Mississippi River and the Re-clamation of its Alluvial Lands," B. M. Harrod. VII, 243 (1878).

Harrod. VII, 243 (1878).

"The Improvement of the South Boston Flats by the Harbor Commissioners of the State of Massachusetts." Edward S. Philbrick. VII, 17 (1878).

"The Reclamation of River Deltas and Salt Marshes." J. Francis Le Baron. LIV, 51 (1905). Discussion: E. L. Corthell, L. J. Le Conte, and Richard Lamb, LIV. 83.

"The St. John Levee and Drainage District of Missouri." R. M. Stfoll. (With Discussion.) LXXIX, 493 (1915).

"The Subsidence of Muck and Peat Soils in Southern Louisiana and Florida."

Southern Louisiana and Florida." Charles W. Okey. (With Discussion.) LXXXII, 396 (1918).

See also DRAINAGE.

LAND-SLIDES.

"A Phenomenal Land Slide." (at Portland, Ore.) D. D. Clarke. LIII. 322 (1904). Discussion: George L. Dillman, Arthur L.Adams, and James D. Schuyler, LIII. 398,

LAND-SLIDES-(Continued).

"A Phenomenal Land Slide — Supplement."
D. D. Clarke, LXXXII, 767 (1918), Discussion: George L. Dillman, LXXXII,

Cause of —. LIII, 307 (1904).
"Notes on a Mountain Slide." W. G. Curtis. (With Discussion.) XXIV, 556

"Remedies for—and Slips on the Kana-wha and Michigan Railway." R. P. Black. (With Discussion.) LXXI, 1 (1911).

"Report on Cause and Correction of Foundation Troubles of Box Factory at Natchez, Mississippi." C. E. Smith. (With Discussion.) LXXXIII, 1289 (1919-20).

LAW.

"Engineers in Courts of -." Wm. J. Mc-Alpine. I, 226 (1872).
"Fundamental Principles of Public Utility Valuation".

Valuation." John W. Alvord. (With Discussion.) LXXIX, 117 (1915). of special assessments. XXXVIII, 373 (With

(1897).

"Retracement-Resurveys — Court Decisions and Field Procedure." N. B. Sweitzer. (With Discussion.) LXXV, 393 (1912). "The Position of the Constructing Engineer, and his Duties in Relation to Instruction and the Engineer of Court

Inspection and the Enforcement of Contracts." Albert J. Himes. (With Discussion.) LVI, 104 (1906).

See also BUILDING LAWS: WATER LAWS.

LEAST SQUARES.

"Short and Easy Methods for Computing Probable Errors." E. A. Fuertes. XLVI, 251 (1901).

LEVEES.

"Bank Revetment on the Lower Mississippi." H. St. L. Coppée. (With Discussion.) XXXV, 141 (1896).

"Control of the Colorado River as Related to the Protection of Imperial Valley." J. C. Allison. (With Discussion.) LXXXVI, 297 (1917).

"Irrigation and River Control in the Colorado River Delta." H. T. Cory. (With Discussion.) LXXVI, 1204 (1913).

"Levee Theory Tested by Facts." Robert E. McMath. XIII, 331 (1884). Discussion, XIV, 219 (1885).

— as a method of flood control. LXXXI, 1226 (1917).

1226 (1917).

"—, as a System for Reclaiming Low-lands." George W. R. Bayley. V, 115 (1876). Discussion, V, 299; VI, 305

on Mississippi River. VII. 243 (1878).
"Standard Levee Sections." H. St. L.
Coppée. (With Discussion.) XXXIX, Coppée. 191 (1898).

"The Atchafalaya River: Some of Its Pe-culiar Physical Characteristics." J. A. Ockerson. (With Discussion.) LVIII, 1

"The Davis (Crevasse) Levee." Sidney F.

"The Davis (Crevasse) Levee." Sidney F. Lewis. XVII, 199 (1887). "The Improvement of Channels in Sedi-mentary Rivers." George H. Henshaw. XX, 109 (1889). Discussion, XX, 116,

229.
The Improvement of the Mississippi River.' William Starling, XX, 85 (1889). Discussion, XX, 229. "The

LEVEES-(Continued).

"The Levee Theory of the Mississippi River." An Informal Discussion. B. M. Harrod, L. W. Brown, J. A. Ockerson, L. M. Haupt, B. F. Thomas, Henry B. Richardson, and T. G. Dabney. LI, 331 (1903).

331 (1903).
"The—of the Mississippi River." Caleb G. Forshey, III, 267, 289 (1874). Discussion, IV, 85 (1875).
"The Lower Colorado River and the Salton Basin." C. E. Grunsky. (With Discussion.) LIX, 1 (1907).
"The Overflow of the Mississippi River." Lyman Bridges. (With Discussion.) XI 251 (1882).

"The

Tynian Bridges. (With Biscussion.) XI, 251 (1882). The St. John Levee and Drainage District of Missouri." R. M. Strohl. LXXIX, 493 (1915). Discussion: Vernon M. Eager, and J. S. Spiker, LXXIX, 519.

See also DIKES.

LEVELING.

"Experiments on the Stability of Bench Marks." George W. Cooley. (With Dis-cussion.) XX, 73 (1889).

cussion.) XX, 73 (1889).

"Recent Improvements in — Instruments."

Dunbar D. Scott. LXXVI, 1172 (1913).

"Spirit — of the United States Geological
Survey." Herbert M. Wilson. (With
Discussion.) XXXIX, 339 (1898).

"The Theory and Practice of Precise Spirit
—" David A. Molitor. (With Discussion.) XLV, 1 (1901).

"Topographical Surveys Made by the American Section of the International Boundary Commission United States and Mex-

ary Commission United States and Mexico." W. W. Follett. (With Discussion.) LXXVII, 989 (1914).

See also SURVEYING.

LEVELS.

"Errors in Railroad --." Howard V. Hinckley. (With Discussion.) XV, 893 (1886).

LIBRARY CLASSIFICATIONS. See ENGINEERING LIBRARIES.

LIBRARY SEARCHES.

"Classified List of Searches Made in the Library." January, 1901, to November, 1916." LXXX, 2086 (1916).

LIFT BRIDGES.

Bascule span of the Cherry Street Bridge, Toledo, Ohio. LXXX, 744, 780 (1916). Bridges across the Cape Cod Canal. LXXXII, 44 (1918). Harlem River End-Lift Bridge. XXXIII,

Harlem River End-Lift Bridge. XXXIII, 37 (1895).

"Maximum Stresses in Bascule Trusses." W. Watters Pagon. LXXVI, 73 (1913).

"Movable Bridges." C. C. Schneider. (With Discussion.) LX, 258 (1908).

"Specifications for Metal Railroad Bridges Movable in a Vertical Plane." B. R. Leffler. LXXVI, 370 (1913). Discussion. Angustus Smith, Charles H. Mercer, and P. J. Reich, LXXVI, 403.

"The Halsted Street Lift Bridge." J. A. L. Waddell. (With Discussion.) XXXIII, 1 (1895).

(1895).

The Utica Lift Draw-Bridge." Squire Whipple, III, 190 (1874). Discussion, III, 194; IV, 203 (1875).

LIGHTHOUSES.

"Coast Lighting in Great Britain." Tho-

LIGHTHOUSES—(Continued).

mas Matthews. (Inter. Eng. Cong. 1904.)
LIV, Part B, 25 (1905).
"Coast Lighting in the United States."
D. W. Lockwood. (Inter. Eng. Cong. 1904.) LIV, Part B, 43 (1905).
"Lighthouse Construction in the Philippines." Spencer Cosby. LVIII. 278 (1907). Discussion: Charles E. L. B. Davis, LVIII, 291.
"Lighthouse Engineering as Displayed at

Davis, LvIII, 291.

"Lighthouse Engineering as Displayed at the Centennial Exhibition." J. G. Barnard. VIII, 55 (1879).

and other Aids to Navigation. Discussion on Inter. Eng. Cong. Papers, 1904. D. and C. Stevenson, Nicholas G. Gedyc. Charles C. Wentworth, D. P. Heap, Alan Brebner, C. Ribière, Thomas Matthews, and D. W. Lockwood. LIV, Part B, 63 (1905). (1905).

of France.

of France. XXIX, 59 (1893).

"Minot's Ledge Lighthouse." B. S. Alexander. VIII, 83 (1879).

"Renewal of the Foundation, and Transfer of a Light-House in Passagoula Harbor." J. W. Putnam. (With Discussion.) X, 14 (1881).
"The Lighting of the Coasts of France." C. Ribière. (Translated from the French.) (Inter. Eng. Cong. 1904.)
LIV, Part B, 3 (1905).

LIGHT-SHIPS.

See LIGHTHOUSES.

LIME.

"The Mexican Method of Making Hard—Floors." Theo. G. Ellis. (With Discussion.) II, 179 (1873).

LIMNORIA:

"Marine Wood Borers." Charles H. Snow. (With Discussion.) XL, 178 (1898).

LOCK-GATES.

"The Distribution of Stresses in Mitering
—, with Special Reference to the Gates
on the Panama Canal." Henry Goldmark. LXXXI, 1621 (1917).

The distribution of stresses in mitering
—, with special reference to the gates
of the Panama Canal. Discussion by
David A. Molitor. LXXXII, 1469 (1918).

LOCKS.

"Improvement of the Black Warrior, War-

"Improvement of the Black Warrior, Warrior and Tombigbee Rivers, in Alabama." R. C. McCalla. (With Discussion.) XLIX. 212 (1902).

— not required for Cape Cod Canal. LXXXII. 11, 144 (1918).

"Ship Canal — Calculated for Operation by Steam." Ashbel Welch. IX, 293 (1889).
"The Economic Improvement of the Coosa and Alabama Rivers. in Georgia and Alabama." D. M. Andrews. (With Discussion.) L, 363 (1903).
"The Improvement of the Ohio River." William L. Sibert. (With Discussion.)

"Water Supply for the Lock Canal at Panama." Jullo F. Sorzano. (With Discussion.) LXVII, 61 (1910).

LOCOMOTIVES.

"American —." William Forsyth. (Inter. Eng. Cong. 1904.) LIV, Part D, 259 (1905). Brief description of some of the first

LOCOMOTIVES—(Continued).

American locomotives. LXXIV. (1911).

"Comparative Tests of an Electric Motor and a Steam Locomotive on the Manhattan (Elevated) Railway, New York."
Lincoln Moss. (With Discussion.) Mattan (Breated) Karlway, New 107K.
Lincoln Moss. (With Discussion.)
XXIII, 193 (1890).
"Distinctive Features and Advantages of
American Locomotive Practice." David
L. Barnes, XXIX, 385 (1893).
Early American locomotives, XXVI, 545

1892)

Electric locomotives in use at Pennsylvania

Electric locomotives in use at Pennsylvania Railroad Terminal, New York, LXIX, 358, 421, 422, 426, 432 (1910).
"Locomotive Performance on Grades of Various Lengths." Beverly S. Randolph, LXX, 321 (1910). Discussion: C. D. Purdon, and John C. Trautwine, Jr., LXX, 329.

Pardon, and John C. Frattwine, Jr., LXX, 329.

— and other Rolling Stock. Discussion on Inter. Eng. Cong. Papers, 1904. W. F. M. Goss, G. R. Henderson, A. Mallet, O. Busse, Karl P. Dahlstrom, and Henry S. Haines. LIV, Part D, 347 (1905).

— for Abt System of inclined railways. XV, 162 (1886).

— used in measuring stresses in railroad track. LXXXII, 1242 (1918).

Steam and gas—used on the light railways of the battle front in France. LXXXIII, 1235 (1919-20).

Tests to determine the effect of speed and counterbalance on stresses in rail. LXXXIII, 1414 (1919-20).

"The Balanced Compound Locomotive."
S. M. Vauclain. (Inter. Eng. Cong. 1904.)
LIV, Part D, 329 (1905).

"The Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains, and the Performance of Large Market and Connected."

Raton Mountains, and the Performance of Locomotives on its Steep Grades."
James D. Burr. (With Discussion.) VIII, 295 (1879).
Che DeWitt Clinton." G. H. Thomson.

XXIII, 44 (1890).

See also ROLLING STOCK.

LOGGING.

"Steam and Electric Cableways for—and Canal-Boat Towing." Richard Lamb. (With Discussion.) XXXII, 44 (1894).

LUBRICANTS.

"On the Real Value of — and on the Correct Method of Comparing Prices." Robert H. Thurston. XIII, 476 (1884).

MAGNETISM.

"Terrestrial — in North America." Charles A. Schott. XXX, 108 (1893). Discussion, XXX, 653.

MAPS.

"New Method of Making Conventional Signs on Original Topographical—." J. A. Ockerson. XIV, 399 (1885). "The Topographic Map of the United States." Herbert M. Wilson. XXXIII.

405 (1895).

MARINE BOILERS. See BOILERS.

MARINE ENGINEERING.
"Marine Engineering." W. F. Durand.
(Inter. Eng. Cong. 1904.) LIV, Part C. 183 (1905),

MARINE ENGINEERING—(Continued).

Marine Engineering. Discussion on Inter. Eng. Cong. Papers, 1994. W. Carlile Wadace. Sir William II. White. and Leslie S. Robertson. LIV, Part C, 261

-in France. V. Daymard and R. Lelong. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part C, 243 (1905).

MARSIL.

"The Compressibility of Salt—under the Weight of Earth Fill." Eugene R. Smith. (With Discussion.) XXXVII. 213 (1897).

"The Reclamation of River Deltas and Salt Marshes." J. Francis Le Baron. (With Discussion.) LIV, 51 (1905).

"A — Dam." John W. Hill. (With Discussion.) XVI, 261 (1887).
"A Proposed New Type of — Dam." George L. Dillman. (With Discussion.) XLIX 94 (1902).

Action of sea water on concrete bridge piers. LXXXI, 677 (1917).

"Bridge Substructure and Foundations in Nova Scotia." Martin Murphy. XXIX. 620 (1893). Discussion, XXX, 567 (1893).

"Compressive Strength of Cements and the

"Compressive Strength of Cements and the Compression of Mortars and Settlement of—." Report of Progress of the Committee. XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).
"Construction of Substructure for Lonesome Valley Viaduct, Knoxville, Cumberland Gap and Louisville Railroad." Gustave R. Tuska. (With Discussion.) XXXIV, 247 (1895).
"Description of the Plenum Pneumatic Process' as Applied in Founding the

"Description of the 'Plenum Pneumatic Process' as Applied in Founding the Piers of the Illinois and St. Louis Bridge, at St. Louis. Mo." W. Milnor Roberts. I. 259 (1872).
"Experimental Tests of Building Stones." Robert G. Hatfield. II, 145 (1873).
"Experiments for Making Brick—Impervious to Water, Tried on the Walls of the Back Bays of the Gate-Houses of the New Croton Reservoir in New York, and on the Brick Arch of High Bridge, in 1863." William L. Dearborn. I, 203 (1872).
"Failure of a—Pier and

(1872).

"Failure of a—Pier and a Rock Foundation." Wm. Barclay Parsons. (With Discussion.) XXXI, 580 (1894).

"Memoir of the Construction of a—Dam."
J. James R. Croes. III, 337 (1874).
Discussion, IV, 310 (1875).

"Method Pursued in Replacing a Stone Pier on a Pile Foundation." J. Aibert Manroe. III 58 (1874). Discussion. IV. III, 58 (1874). Discussion, IV, 205 (1875).

"Nomenclature of Building Stones and of Stone—." Report of the Committee. VI. 297 (1877). Discussion, VII, 284 (1878).

"Notes on High — Dams." John D. Van Buren. (With Discussion.) XXXIV, 493

"Notes on the - of the East River Bridge."

"Notes on the — of the East River Bridge. Francis Collingwood. VI, 7 (1877).
"On the Designing and Erection of the Oakley Arch." J. Foster Crowell. (With Discussion.) XXIII, 155 (1890).
"On the Mode of Underpinning Adopted for the Croton Lake Bridge, N. Y. C. &

N. R. R., during the Repairs to the-

MASONRY—(Continued).

MASONRY—(Continuea).

Piers." Alfred P. Boller. XI, 150 (1882).

"Relative Permanence of Steel and — Construction." An Informal Discussion.

Charles G. Darrach, Eugene W. Stern, George F. Swain, Charles C. Wentworth, Oberlin Smith, William R. Webster, James Owen, E. T. D. Myers, Jr., W. Hildenbrand, H. S. Haines, A. L. Johnson. F. Lynwood Garrison, and J. F. O'Rourke. XLIX, 74 (1902).

"Repairs of —." O. Chanute. X, 291 (1881).

(1881).

"Selection of Stone for—." George R. Eichbaum. II, 167 (1873).
"Some Railway Construction in Oklahoma."

A. G. Allan. (With Discussion.) L1, 424 (1903). "Stability of Stone Structures." William H. Searles. VIII, 238 (1879). Discussion. VIII, 251.

"The Analytical Determination of the Di-

"The Analytical Determination of the Dimensions of the Gravity Resisting Parts of — Dams." Maurice G. Parsons. LXXV, 877 (1912).
"The Cause and Prevention of the Decay of Building Stone." Thomas Egleston. (With Discussion.) XV, 647 (1886).
"The Construction of a Water-Tight — Dam." Walter McCulloh. XXVIII, 185 (1893). Discussion. XXVIII, 349.
"The Effect of Temperature Changes on —." Charles S. Gowen. LXI, 399 (1908). Discussion: George G. Honness, Thaddeus Merriman, and William Lowe Brown, LXI, 410.

deus Merriman, and William Lowe Brown, LXI, 410.

"The Relative Effects of Frost and the Sulphate of Soda Efflorescence Tests on Building Stones." Lea Mc1. Luquer. (With Discussion.) XXXIII, 235 (1895).

"The Removal of a Defective Pivot Pier, and its Reconstruction." Howard G. Kelley. XXXI, 277 (1894).

"The Renewal of the Channel Pier of the Cincinnati and Muskingum Valley Railway Bridge over the Scioto River." Morton L. Byers. (With Discussion.) XXXI, 361 (1894).

"The Semicircular — Arch." A. E. Lindau.

"The Semicircular - Arch." A. E. Lindau.

"The Semicircular — Arch." A. E. Lindau. LXI, 387 (1908).
"The Stability of Loaded — Arches." Arthur S. C. Wurtele. (With Discussion.) XXIII, 1 (1890).
"Three-Hinged — Arches; Long Spans Especially Considered." David A. Molitor. (With Discussion.) XL. 31 (1898).
"Vibration, or the Effect of Passing Trains on Iron Bridges, — and other Structures." James L. Randolph. (With Discussion.) XII, 444 (1883).

MATERIALS OF CONSTRUCTION.

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX, 190 (1910).

LXX, 190 (1910).

"On the Strength, Elasticity, Ductility and Resilience of Materials of Machine Construction, and on Various Hitherto Unobserved Phenomena, Noticed during Experimental Researches with a New Testing Machine, Fitted with an Autographic Registry." R. H. Thurston. II, 1349 (Section I) (1873); III, 1, (Section II) (1874). Discussion, IV, 265 (1875); V, 102 (1876). 102 (1876).

"The Preservation of —." An Informal Discussion. William Barclay Parsons, James Forgie, William R. Webster, Rudolph P. Miller, George Hill, Oscar LowMATERIALS OF CONSTRUCTION—(Con.) inson, Henry B, Scaman, George A. Just, A. Gideon, Franklin Riffle, Edward P.

A. Gideon, Frankin Kime, Edward P. North. Horace J. Howe, Theodore Belzner, William W. Crehore, and W. W. Kenly. L. 293 (1903).

"The Strength and Other Properties of —, as Deduced from Strain Diagrams Automatically Produced by the Autographic Recording Testing Machine." Robert H. Thurston. V, 9 (1876).

See also BRICK: BUILDING STONE: CAST IRON: CEMENT: CONCRETE: IRON: METALS: MORTARS: REIN-FORCED CONCRETE: STEEL: TIM-BER: WROUGHT IRON.

MATHEMATICAL TABLES.

"A Brief Review of Trlgonometrical -, and a Contemplation of the Specifications for Trigonometrical Tables for General Use." Virgil A. Eberly, LXXXII, 753 (1918). Discussion: William G. Raymond, Horace Andrews, and George A. Christensen, LXXXII, 758.

MATHEMATICS.

"Nomographic Solutions for Formulas of Varlous Types." R. C. Strachan. (With Discussion.) LXXVIII, 1359 (1915).

MEASURES.

MEASURES.

Frankfort Arsenal experimental measuring machine. X111, 1 (1884).

"Fundamental Units of Measure." T. C. Mendenhall. XXX, 120 (1893).

"Metrological Investigations." O. E. Michaelis. X111, 1 (1884).

"On the Metric System of Weights and —." A Discussion. Clemens Herschel, Joseph B. Davis, Coleman Sellers, Julius E. Hilgard, Theodore G. Ellis and Robert Briggs. V, 355 (1876).

"Weights and —." Fred Brooks. (With Discussion.) XI, 408 (1882).

MEMOIRS OF DECEASED MEMBERS.

Abbott, Job. XXXVI, 538 (1896). Abert, Sylvanus Thayer. LIX, 521 (Adams, Arthur Lincoln. LXXVII, 1831 (1914).

Adgate, George. LXV, 514 (1909). Africa, James Murray. LXXXIII, 2139 (1919-20). Agnew, Augustus Waterous. LXXXI, 1792 (1917).

Ainsworth, Danforth Hurlbut, LIV, 522

(1905).

Alden, John Ferris. LXXXI, 1674 (1917). Aldrich, James Colwell, XLV, 617 (1901). Alexander, Edward Porter. LXXXIII, 2414 (1919-20). Allen, Hermon Charles. LXXXIII, 2141

(1919-20).

Allen, William Albert. XXXVI, 539 (1896). Allen, William Frederick. LXXX, 2244 (1916).

Andrews, Daniel Marshall. LXXXII, 1669

(1918). nnear, Edgar Harold. LXXXIII, 2353 Annear. Annear, Edgar Harold, LXXXIII, 2303 (1919-20).
Anson, William Frederick Alfred, LXXXI, 1794 (1917).

Appleton, Thomas. LXXXI, 1676 (1917). Arango, Ricardo Manuel. LXXVII. 1841 (1914).

Archbald, James. LXXII, 586 (1911). Archer, William. LXXXIII, 2143 (1919-20).

MEMOIRS-(Continued).

Archibald, Peter Suther. LXXVI, 2199 (1913).Arnold.

William Harry. LXXXI, 1679 (1917). thur, Howard Elmer.

Arthur. LXXVII, 1843 (1914).

Aspinwall, Thomas. LXXXIII, 2144 (1919-

Aspinwall, William Howland, XXXVI, 598 (1896).

Atkinson, John Bond. LXXIV, 492 (1911). Atterbury, Charles De La Plane. LXXVI, 2252 (1913). Atwood, John Abiel. LXXXIII, 2145 (1919-

1920).

Bache. Alexander Dallas. XXXVI, 522

(1896). cot. William Sinclair. LXXXII, 1671 Bacot.

(1918). Bailey, George Irving. LXI Thomas Chalkley LXI, 556 (1908). Baily, Thomas Chalkley James, Jr. LXXVI, 2201 (1913). Baker, Holland Williams. LXXXIII, 2147 (1919-20).

Baldwin, Henry Furlong, LXVII, 621

(1910). Ball, Ernest Stearns. LXVI, 510 (1910)

Barnes, David Leonard, XLI, 618 (1890). Barnes, James, XXXVI, 540 (1896). Barriger, John Walker, Jr., LVI, 477 (1906). Becker, Max Joseph, XXXVII, 555 (1897). Belknap, William Richardson, LXXIX, 1494 (1915).

Alonzo Clarence. LXXXIII, 2149 (1919-20).

Bell, Andrew. LXXVI, 2203 (1913). Bell, George Joseph. LXXIV, 495 (1911). Bell, Henry Purdon. LXXIV, 496 (1911). Bell, Victor Hugo. LXXXIII, 2415 (1919). 1920).

Beresford, Frank. XXXVI, 594 (1896). Bergen, Van Brunt. LXXXII, 1672 (1918). Berger, Bernt. LXXXIII, 2355 (1919-20). Berrian, Richard Milford. LXII, 550 (1909). Biddle, William Foster. LXXI, 401 (1911). Bigelow, Edward Manning. LXXXI, 1681 (1917).

Birch-Nord, Carl William. LXVI, 509 (1910). Bishop, Thomas Sparks. XLI, 621 (1899). Blackwell, Charles. LIX, 531 (1907). Blaisdell, Authony Houghtaling. LVI, 464 (1906).

Bliss, Henry Isaac. XXXVI, 541 (1896). Blunden, Henry D. XXXVI, 542 (1896). Bogart, James Peter, L11, 545 (1904). Bond, Frederick Winn. L1, 452 (1903). Bonzano, Adolphus. LXXVII, 1845 (1914). Bonzano, Adolphus. LXXVII, 1845 (1914). Bouscareu, Louis Gustave Frederic. LIX, 533 (1907).

Bovyer, William Blair. LXXXIII, 2357 (1919-20).

Bowen, Walter Cox. LXXX, 2255 (1916). Bowman, Austin Lord. LXXXIII, 2150 (1919-20). Bowman, Daniel Wheeler. LXXXI, 1684

(1917)Boyle, Oliu McClintock, Jr. LXIV, 591

(1909).Boynton, Robert Hammond, LXXXI, 1796 (1917).

Brackett, Dexter. LXXX, 2109 (1916). Brainard, Owen. LXXXIII, 2154 (1919-20). Breckinridge, Cabell. LXV, 529 (1909). Briggs, Robert. XXXVI, 542 (1806). Bright, Charles Edwin. LXXXIII, 2358

(1919-20).Brinckerhoff, Henry Wailer. LXVI, 494

(1910). ink, Lawrence Calvin. LXXIX, 1466 Brink, 1915).

MEMOIRS—(Continued).

Brinsmade, Danlel Seymour. LXXVI, 2205 (1913)

Brodhead, Calvin Easton. LX, 579 (1908) Brooks, Frederick, LXXXIII, 2157 (1919) (1919 -

1920). Brown, Linus Weed, LXX, 470 (1910) Brown, Ralph Henry, LXXXIII, 21 -2159

Brown, Stephen Pearson, LXXXIII, 2161

(1919-20). owne, William Lyon, LXXXIII, 2163 Browne.

(1919-20), Brynn, Per. LVII, 528 (1906). Bryson, Andrew. LXXXIII, 2165 (1919-20). Buck, Leffert Lefferts. LXXIII, 493 (1911). Burns, Edward Cook. LXXIX, 1345 (1915). Burns, Justin. LVII, 529 (1906). Burton, Standish Barry, LV, 444 (1905). Buxton, Clifford. LXVII, 623 (1910). Caldwell, Charles Adolphus. LXXXI, 1687

(1917).Caldwell, George Bowers. LXXIII, 498 (1911)

Campbell, Albert Johnstone, LIX, 563 (1907)

Campbell, Charles Edward Henry, LII, 547 (1904).

Canfield, Edward, LXXXI, 1689 (1917). Carothers, Daniel Dawson, LXIV, 581 (1909).Carpenter, Clarence Allan. LXXI, 403

(1911)Carpenter, James Wilhelm. LXXIX, 1470

(1915).Carpenter, Rolla Clinton, LXXXIII, 2167

(1919-20).Carr, Walter Frank. LXXX, 2114 (1916). Carrel, Frederick Janvrin. XXXVII, 559

(1897).Alfred Ellsworth. Carter. LXXVI, 2207 (1913).

Cary, Edgar Sheldon. XLVI, 555 (1901) ss, George Washington, Jr. 599 (1896). Cass, XXXVI.

Chambers, Herbert James. LXXXII, 1674

Chambers, Herbert James. LXXXII, 1674 (1918).
Chanute, Octave. LXXIV, 483 (1911).
Chapin, Loomis Eaton. LXXX, 2116 (1916).
Chase, Dean. LXXXIII, 2416 (1919-20).
Chase, William Beverly. LXIII, 429 (1909).
Cheney, John Eugene. LIX, 537 (1907).
Childs, James Edmund. LXXVII, 1849

(1914)Chittenden, Hiram Martin. LXXXII, 1675

1918). Charles Titus. LXXXIII, 2170 Church.

(1919-20).

Church, George Earl. LXXI, 405 (1911). Cisneros, Francisco Javier. XLI, 622 (1899). Clapp, Lorenzo Russell. XLIX, 341 (1902). Clapp, Otis Francis. LXXXII, 1079 (1918). Clapp, William Billings. LXXV, 1148 (1912).

Clark, Ludlow Victor. LXXX, 2254 (1916). Clarke, Thomas Curtis. L, 495 (1903). Clayton, Henry Helm. LXXVII, 1924 (1914). Cleverdon, Henry Lawrence. L, 507 (1903). Cobb, Robert Linah. XXXVI, 545 (1896). Coburn, Howard Lincoln. LXXXIII, 2173 (1919-20).

William Watson. Coe, Willia (1919-20). LXXXIII, 2175

(1919-20).
Coffin, Amory. LXXX, 2118 (1916).
Coffin, Freeman Clarke, LVIII, 532 (1907).
Cohen, Mendes. LXXXI, 1656 (1917).
Coit, Edward Woolsey. LXXX, 2260 (1916).
Colburn, Zerah. XXXVI, 546 (1896).
Colby, Elmer Ellsworth. LXXXII, 1680 Colby, (1918) Cole, William Weeden. LXXX, 2120 (1916).

MEMOIRS—(Continued).

Coleman, Clarence. LXXXIII, 2177 (1919-1920). Comfort, Silas Gildersleeve. LXXI, 452

(1911).Conkling, Cloud Clifford. LXXX.

(1916).Connor, Addison. XXXVI, 551 (1896). Cook, Horace Arthur. LXXIX, 1471 (1915). Cooke, Saint George Henry. LXXIX, 1472

(1915).

Coombs, Philip Henry, LXXVI, 2210 (1913). Cooper, Samuel Lispenard, LXXVI, 2212 (1913)

Correa, Edward Arnold. XLV, 621 (1901). Corthell, Elmer Lawrence. LXXXI, 1658 (1917).

Cotton. Joseph Potter, LXXVII, 1851

(1914). Couchot, George John. LXXVII, 1911 (1914). LXXII, 589 (1911). Herbert Wheeler. LXXX, 2124 Cowan. (1916)

Coxe, Eckley Brinton. XXXVI, 552 (1896). Craighill, William Price. LXV, 517 (1909). Crandall, Charles Lee, LXXXII, 1682 (1918).

Crawford, George Lenox. LXXX, 2249 (1916). Crehore, William Williams. LXXXIII, 2181

1919-20). Croes, John James Robertson. LVIII, 524

Croes, John L. (1907). (1907). Crosby, Wilson. LXVII, 625 (1910). Crowell, Foster. LXXX, 2129 (1916). Crysler, Arthur Garfield. LXXVI.

Cunningham, Andrew Chase. LXXXI, 1691 (1917).

Cunningham, David West, LXXXI, 1695 (1917).

Cunningham, John Miller. LIV, 537 (1905). Cunningham, Paul Davis, LII, 556 (1904). Cuntz, William Cooper. LXXXI, 1825

(1917).
Curtis, William Giddings, XLV, 624 (1901).
Cushing (Samuel Barrett. XLIX, 343 (1902).
Cutshaw, Wilfred Emory, LXXI, 408 (1911).
Dakin, Robert Edward. LXXXIII, 2360 (1919-20)

Danforth, Frederic. LXXVII, 1853 (1914). Davenport, James Aubrey. LXXXII, 1685 (1918).

William Gomer. Davies. LXXIX. 1474 (1915)

Davis, Charles. LXXI, 411 (1911). Davis, Frank Leslie. LXXIII, 500 (1911). Davis, John Woodbridge, XLIX, 370 (1902). Davis, Joseph Baker. LXXXIII, 2183 (1919-1920)

Davis, Philip Chapin. LXXVII, 1912 (1914). Dawley, Edwin Peleg. LXXI, 413 (1911). Dean, Stanley. LXXXIII, 2362 (1919-20). Deans, John Sterling. LXXXIII, 2187 (1919-20).

Decker, John Hull. LXXXIII, 2365 (1919-1920).

Dedicke, Er (1919-20). Ernest Charles. LXXXIII, 2418

de Funiak, Frederick. LIV, 524 (1905). de la Torre, Alberto. LXXVII, 1913 (1914) Denham, Donald Power. (1919-20). LXXXIII, 2420

Derrick, Henry Clay. LXXX, 2133 (1916). Dickinson, Pomeroy P. XLIII, 611 (1900). Dillon, Sidney. XXXVI, 603 (1896). Alexander Samuel. XXXVII, 571 Diven.

(1897). Doane, Thomas. XXXIX, 690 (1898) Douglas, Benjamin. LXXV, 1151 (

MEMOIRS—(Continued), Drury, Edmund Hazen. LXXXI, 1697 (1917).James Chatham. Duane. XXXIX. 686 1898) Du Bois, Augustus Jay. LXXXI, 1699 (1917). ubols, Gustavo Adolfo. LXXXIII, 2367 Dubols. (1919-20).Dudley, Charles Tarbell, LXIV, 588 (1909). Dun, James, LXI, 560 (1908). Durant, Thomas C. XXXVI, 602 (1896). Dusenberry, Walter Lorton. LXV, 533 Dusenberry, (1909). Earley, John Edwin, LX1, Eaton, Horace LaFayette. LXI, 562 562 (1908) XXXVI, Eber, John William. LXXX, 2135 (1916) Eberly, Clarence Frederick. LXXXIII, 2369 (1919-20).William Roberts, LXXIX, 1347 Eckart. (1915).Ellis, John Waldo. LXXXI, 1702 (1917). Ellis, Theodore G. XXXVII, 557 (1897). Ellsworth, Emory Alexander. LXXX, 2136 Ely, Theodore Newel. LXXXI, 1705 (1917). Emery, Charles Edward. XLH, 558 (1899). Emigh, John Hall. LXVII, 628 (1910). Emmons, Charles Morton. LXXIV, 499 (1911).William Alexis George. XXXVI, Emonts, 504 (1896). The state of the st 594 (1896). (1915).Flad, Henry. XLII, 561 (1899). Follett. William Wallace. LXXX, 2143 (1916).Forbes, Murray. LXXVII, 1915 (1914). Forshey, Caleb Goldsmith. XXXVII, 560 (1897).Fouguet. John Douglas. LXXVII, 1857 (1914).Francis, Charles. LXXX, 2146 (1916). Francis, George Bliun. LXXVI, 2214 (1913). Francis, James. XLV, 627 (1901). Frazee, John Hatfield. LXXXII, 1723 Frazee, (1918). Joseph Heckart. LXXV. Frazer. (1912).Frazier, James Lewis. LXXIX, 1416 (1915). French, Alexis Henry. LXXX, 2148 (1916). French, Edmund. XXXVII, 561 (1897). French, Frederick Reginald. LIV, 526 (1905)Frizell, Joseph Palmer. LXXIII, 501 (1911). Frost, George Henry. LXXXI. 1827 (1917). Fteley, Alphonse. LIV, 509 (1905). Fuller, Frank Louis. LXXXIII, 2189 Fuller, Fr (1919-20).

Gates, Warren Austin. LXXX, 2257 (1916). Gay, Leon Lincoln. LXXIX, 1479 (1915), Gazlay, Webster. LXXVII, 1861 (1914).

Gazlay, Webster. LXXVII, 1881 (1914). Gelette, William Durfee. L, 500 (1903). Gerber, Emil. LXXIX, 1418 (1915). Gibbs, Nathan Jackson. LXXV, 1188 (1912). Gibbs, William Wetmore. LXXXIII, 2371

(1919-20).

Gillham, Robert, XLIII, 613 (1900).
Gilliss, John Roberts, XXXVI, 555 (1896).
Goad, Charles Edward, LXXI, 418 (1911).
Gould, Edward Sherman, LIV, 528 (1905).
Gould, Harry Madera, LXXXII, 1686 (1918). Graham, Joseph Marshall. LXIV. (1909).Grant, Justus Herbert, LXXIX, 1423 (1915). Grant, William Harrison, XXXVI, 557 William Harrison. (1896).Gray, Edward. LXXX. 2150 (1916) Edward. LXXVI, Grav. George 2198 (1913). Green, Bernard Richardson, LXXX, 2151 (1916)Green, Rutger Bleecker. LXIV, 585 (1909). Greene, David Maxson. LVI, 466 (1906). Greene, George Sears. XLIX, 335 (1902). Greene, Howard Arnold. LXXXI, 1800 (1917).Greene, Joseph Norton. LV, 446 (1905) Greene. Robert Maxson. LXXIX, 14 1425 Gregory, Charles Emerson. LXXXIII, 2191 (1919-20). (1915).Greth, John Charles William. LXXIX, 1427 (1915). Gridley, Vernon Hill. XXXVI, 595 (1896). Grimm, Carl Robert. LXXX, 2157 (1916). Grimshaw, James Walter. LXXXI, 1712 (1917).Guİld, Josephus Conn. LIX, 540 (1907) Gzowski, Sir Casimir Stanislaus. XLII, 567 (1899)Hadsall, Joseph Canby. LXXV, 1190 (1912). Hagar, Edward McKim, LXXXII, 1727 (1918).Charles Arthur. LXXVII, 1863 Hague. (1914). Hague, William LXXXII, 1729 (1918). Haicombe, Norman Marshall, LXXXIII, 2373 (1919-20). Hall, Julien Astin LXXV, 1153 (1912) Hallock, Ja (1919-20). James Currie. LXXXIII, 2197 Hambleton, Francis Henry. LXXIX, 1429 (1915). Hanna, Walter Scott. LXXV, 1191 (1912). Hardee, William Joseph, LXXXIII, 2199 (1919-20)Harding, Henry. LXXII, 591 (1911). Harding, Horace. XLIII, 618 (1900). Harlow, James Hayward. LXXXIII, (1910-20). Harris, Heurique. XXXVII, 562 (1897) Harrison, Charles Lewis. LXXVI, 2218 (1913).Harrod, Benjamin Morgan, LXXVI, 2194 (1913). Hartrick, Edward Macaulay. LXXX, 2159 (1916).Hasbrouck, Charles Alfred. (1910).Haswell Charles Haynes, LXI, 553 (1908). Hatfield, Robert G. XXXVI, 558 (1896). Haugh, James Charles, LXXVII, 1864 (1914).Hausman, Frederick Appel. LVII, 533 (1906).Haven, aven, William Appleton, LXXXIII, 2205 (1919-20). Haviland, Arthur. LXXXIII, 2214 (1919-1920). 1920).
Hawes, Louis Edwin, LXXIII, 508 (1911).
Hawkesworth, John, LXXVI, 2255 (1913).
Hawkesworth, John, LXXIV, 523 (1911).
Hayeroft, James Isaac, LXII, 564 (1909).
Hayes, Richard Somers, LV, 448 (1905).
Hays, John Willis, LXXVII, 1805 (1914).
Hazen, John Vose, EXXXIII, 2216 (1919-20).

MEMOIRS—(Continued).

MEMOIRS-(Continued).

Hazlehurst, George Blagden, 2219 (1919-20). LXXXIII,

Hazlehurst, James Nisbet. LXXXIII, 2220 1919-20).

LIX, 543 Hemming, Dunkin Wirgman. (1907).

Henderer, William Oswald. LXXXI, 1713 (1917).

John Gibson. LXXXIII, 2223 Hendrie.

(1919-20). Robert Monteith.

Henley, Robert Dwiggins Monteith LXXXIII, 2376 (1919-20). Henry, Daniel Farrand. LXXI, 420 (1911) Hequembourg, Charles Ezra. LIX, 545 LIX, 545 (1907).

Herbert, Arthur Powis. LXXV, 1154 (1912). Hermany, Charles. LXV, 525 (1909). Herrick, Henry Augustus. LXXXII, 1687 (1918).

Hickey. Louis Thomas Franklin. LXXIX,

1480 (1915).

1480 (1916). Hider, Arthur, LXXXI. LXXXI, 1715 (1917). LXXVII, (1914).

Hildreth, Russell Wadsworth. XXXVI, 596 (1896).

Hill, James Jerome. LXXXI, 1829 (1917). Hillman, Charles Fletcher. XLIX, 345 XLIX, 345 (1902).

Hinckley, John Franklin. LXXIII, 504 (1911).

Franklin Allen. LXXVII. 1870 (1914).

Hite-Smith, Van Dusen. LVI, 479 (1906). Hoag, Sidney Willett, Jr. LXXXI, 1718 (1917).

Hobby, Arthur Stanley. XLIX, 347 (1902) Hodge, Henry Wilson. LXXXIII, 222-(1919-20).

Hogg, James Breading. LXXV, 1155 (1912). Holbrook, Frederick LXXX, 2161 (1916). Frederick William Doane.

Holbrook, Henry Randolph. LXXIII, 506 (1911).

Holloway, Roger Tifft. LXXVII, 1917 (1914).

Holman, Stephen. LXXVI, 2262 (1913). Holmes, Edwin Merritt. LXXII, 598 (1911). Honeyman, Bruce Ritchie. LXXXIII, 2378

(1919-20).Albert Lloyd. LXXIX, 1481 Hopkins,

(1915).

Horan, John Joseph. LXVII, 634 (1910). Horn, Frank Churchill. LXXXIII, 2229 (1919-20).

Horton, Horace Ebenezer. LXXVI, 2221 (1913).Hotchkiss, Charles Wilcox. LXXXI, 1721

(1917). Houston, John.

Houston, John. XXXIX, 694 (1898). Hovenden, Thomas, Jr. LXXX, 2251 (1916). Howard, Joel Manning. LXXXII, 1731

(1918).Howard, Oliver Zell. LXXXII, 1689 (1918). Howe, Horace Joseph. LXXIV, 502 (1911). Howe, Milton Grosvenor. XLIX, 349

(1902). owe, William Bell White. LXXVI, 2234 Howe,

(1913). owell, George Washington. XLIX, 351 Howell,

Hoyt, William Edwin. LXXX, 2164 (1916) Hughes, William Mackenzie. LXXIX, 1431 (1915).

Humphrey, Henry Cyprian. LXVII, 630 (1910).

Humphreys, Charles. LVIII. 534 (1907)Hunicke, William August. LXXVII, 1871

Hunt, Alfred Ephriam. XLVI, 557 (1901).

MEMOIRS—(Continued).

Hunt, Loren Edward. LXXX, 2252 (1916). Hunt. Randell. XLV, 629 (1901). Hunt, Rufus Cameron. LXXXIII, 2232

(1919-20)

Hunter, William. LXXX, 2167 (1916). Hunter, William Henry. LXXXI, 1723 (1917).

Huntington, Linn Murdoch. LXXXIII.

Huntington, Linn Murdoca, LXXXII, 2234 (1919-20). Hurd, Hurd Clarence, LXXIX, 1433 (1915), Hutton, Nathaniel Henry, LX, 581 (1908), Hyde: William Herbert, LXXXI, 1802 (1917)

Irwin, Roger Brooke. LXXI, 448 (1911) Jackson, Thomas Moore, LXXVI, 223 Jackson, Thomas Moore. (1913).

Jackson, William. LXXIV, 504 (1911) Jacobs, Charles Mattathias. LXXX Jacobs, Charles 2236 (1919-20). LXXXIII,

Jacobs. Julius Lilien. LXXXIII. 2244 (1919-20).

Jacomb-Hood, John Wykeham. LXXIX, 1435 (1915).

Janvrin. Ned Herbert. LXXVII, (1914)Jeme, Tien Yow. LXXXIII, 2246 (1919-20). Jenkins, James Edgar. LXXXI, 1725 (1917). Jewel, Lindsey Louin. LXXX, 2169 (1916).

Jewett. William Cornell. LXXX, (1916).

Johnson, Chapman Love. LXXIX, 1436 (1915).

Johnson, John Butler. LI, 454 (1903). Johnson, Luther Elman. LXX, 480 (1910). Johnson, Thomas Humrickhouse. LXXVII, 1876 (1914)

Wallace Clyde. LVIII, 538 Johnson, (1907).

LXXX, 2174 Johnston. John Howard. (1916).

Joy, James Frederic. XXXVII, 575 (1897). Judah, Theodore Dehone. XXXVIII, 448 (1897)

Katigbak, José Petronio. LXXXI, 1803 (1917)

Katté, Walter. LXXXI, 1727 (1917). Keating, (1912). Edward Henry. LXXV, 1159

Kellogg, Albert Victor. LXXIII, 510 (1911)

Kelly. Cassius William. LXXXIII, 2259 (1919-20).

Kenly, Edward Marion. LXXIV, 506 (1911). Kennedy, William Harlin. LXXX, 2176

(1916).

Kernot, William Charles. LXVI, 499 (1910).

Killebrew, Samuel. XLI, 639 (1899).

King, Charles Cyrus. LXXII, 592 (1911).

King, Paul Sourin. LXXXIII, 2261 (1919-

1920) King, William Byrd. LXXXI, 1733 (1917). Kingman, Lewis. LXXV, 1161 (1912). Kingsley, William C. XXXVI, 612 (1896). Kirstein, Paul Robert. LXXXIII, 2379

(1919-20).Knowlton, Charles Andrews. (1905).

Krupp, Alfred. XXXVI, 609 (1896) Kuichling, Emil. LXXIX, 1438 (1 Knnz, Frederic Charles. LXX $\frac{6)}{(1915)}$. 2184LXXX, (1916).

Labelle, Henry Francis. LXXIX, 1440 (1915).

Lake, Orloff. LXXVII, 1925 (1914). Lamont, Clarence Booth. LXXXII, 1691 (1918).

Lant, Frank Parsons. LXXIX. 1442 (1915). Lassig, Moritz, XLIX, 353 (1902). Latcha. Jacob Albert. LIV, 531 (1905). Latham, Norman Smith. LIV, 542 (1905).

MEMOIRS-(Continued). Laub, Hermann. LXXXIII, 2263 (1919-20). Laurie, James. XXXVII, 553 (1897). Law, Arthur Price. LVIII, 547 (1907). Lawson, William Bateman. XLVI, 560 (1901). Leather, Basil Henry. LXXIV, 527 (1911). Leavenworth, George Stevens. LXXXIII, Lederle George Anthony. LXXI, (1911).Lee, Francis Valentine Toldervy. LXXVII, Lee, Francis Valencia, 1880 (1914). Lee, George William. LXXVII, 1919 (1914). Leverich, Gabriel. LVI, 469 (1906). Lewerenz, Alfred Courtney. LXXIV, 508 2266 Lewinson. Maxymilian. LXXXIII, (1919-20).Eugene Castner. LXXXI, 1735 Lewis. (1917). wis, Isaiah William Penn. XXXVIII, Lewis, Isais 453 (1897). Libby, Edmund Dorman, LXXI, 424 (1911). Lincoln, William Shattuck. LI, 457 (1903). Lindenthal, Dominik. XLV, 637 (1901). Linville, Jacob Hays, LIX, 549 (1907). Locke, Charles Abbott. LXXX, 2186 (1916). Locke, Franklin Buchanan. LXXXII, 1694 (1918).Lockwood, William Frederick. LXXVI, 2238 (1913). Lofland, Henry Fiddeman. LXXV, 1164 (1912)Looker, Henry Brigham, LVIII, 548 (1907). Lovett, Thomas Davis, XI., 571 (1898). Lowe, Jesse, LXXXII, 1697 (1918). Lutz, Ulysses Stanislaus, LXXIX, 1444 (1915).Francis Asbury. Lyte. XXXVIII, (1897).MacCallum. Alexander William. LXXXI, 1741 (1917). MacCracken, George Gere. LXXXI, 1806 (1917).Macfarlane, Arthur Keddie, LXXII, 599 (1911).Mackall, Benjamin Franklin. LXXIV, 511 (1911). Mackay, A (1919-20). Angus Robert, LXXXIII, 2380 MacNaughton, James. LVI, 471 (1906). MacRitchie, Charles, LXIV, 587 (1909). McAlpine, Charles Le Grand, XXXVII, 563 (1897). Bee, Vardry Echols, Jr. LXXI, 449 McBee. (1911).
McCalla, Richard Calvin. LV, 453 (1905).
McClure, Hunter. LXXXIII, 2381 (1919-1920). McCool, Daniel. LXXXI, 1744 (1917). McCrickett, Thomas Francis. LXXX, 2188 (1916).McCurdy, John Egbert. LXXI, 426 (1911). McFarland, Walter Ashfield. LXXIX, 1446 (1915). McGee, Van Norman. LIV, 538 (1905). McKean, Reginald. XLIX, 366 (1902). McKenzie, Theodore Hall. LXXXI. McKeown, Thomas. LXXI, 428 (1911). McMath, Robert Emmet. LXXXIII, 2268 (1919-20).McMullen, Stanley Hastings. LXXXI, 1808 MeMilien, Statisty (1917).
McVean, John Jay. LXXI, 430 (1911).
Maey, Arthur. XXXVII, 562 (1897).
Mais, Henry Coathupe. LXXX, 2190 (1916).
Malézieux, Emile. XXXVI, 524 (1896).
Mansfield, Martin William. LXIII, 431 Marburg, Edgar. LXXXIII, 2272 (1919-20).

Marple, William McKelvey. LXXXII, 1699 (1918). Marr, George Anson. LV, 455 (1905). Marr William Walter. LXXXII. Marrian, Ralph 2421 (1919-20). Ralph Richardson. LXXXIII. Matcham, Charles Arthur. LXXIV, 513 (1911).Matson, Jesse Sidwell. LXXIX, 1483 (1915).Mayhew, Alfred Boardman. LXXXII, 1703 (1918).Melcher, Frank Otis. LXXV, 1166 (1912). Melliss, David Ernest. LXXIX, 1447 (1915) Melvin, David Neilson. LXXVII, 188 (1914).

Mendell, George Henry. LI, 459 (1903).

Menke, William. LXXXIII, 2383 (1919-20).

Meriwether, Niles. XLV, 632 (1901).

Merrikek, Horace Guy. LXXVII, 1920 (1914).

Merrill. Ogden. LXXXIII, 2385 (1919-20).

Mez, Frederick W. XXXVI, 615 (1896).

Metcalf, William. LXXIV, 490 (1911).

Michle, William Roberts. XLI, 647 (1899).

Millard, Curtiss. LXXX, 2253 (1916).

Miller, James Blaine. LXXX, 2253 (1916).

Miller, Silvanus, Jr. XXXIX, 696 (1898).

Miller, Stanley Alfred. LXXXI, 1749 (1917).

Mills, Adelbert Philo. LXXXIII, 2387 (1919-20). (1914).Ils. (1919-20). (1919-20). Stephen Mitchell. Arnold. LXII. 552 (1909).Mohun, Edward. LXXVI, 2239 (1913) Moncure. William Augustus. LXXXIII, 2282 (1919-20). Moore. William Edwin, LXXIX. (1915).Mordecai, Augustus. LXXXIII, 2284 (1919-1920). Morison, George Shattuck. LIV, 513 (1905). Morris, Charles John Augustus. LXXXIII, 2286 (1919-20). Morris, Gouverneur. XXXIX, 698 (1898). Morris, Henry Gurney. LXXX, 2193 (1916). Morrison, Henry Prentice. LXXXIII, 2289 (1919-20)Morse, Benjamin Franklin, LXXVII, 1884 (1914). Murray, J (1919-20). James Powell, LXXXIII, 2389 Myers, George Higgins. LXXI, Myers, William Madison. LXXVI, 2256 (1913).Myers-Beswick, William Beswick, LIV, 534 (1905)Neely, William Ridley, LXXXI, 1752 (1917). Neher, Clarence Rufus, LXXXIII, 2291 Neher, Charence (1919-20), (1919-20), Neilson, Robert, XXXVII, 564 (1897) Nelles, George Thomas, LX, 586 (19 Nelson, George Alfred, LXXVII, 586 (1908) 1886 (1914).Newbrough, William, LXXXIII, 2293 (1919-1920). Newton, James Dynan, LXXVII, (1914).Nichols, Allen Eugene, LXXXIII, 2391 (1919-20).Nichols, Lewis Abel. LXXXIII, 2295 (1919-1920). Nichols. Norman James. XXXVI. 559 (1896), Nichols, Othniel Foster, LXI, 564 (1908), Nicholson, George Benson, LIX, 556 (1907), Noble, Alfred, LXXIX, 1352 (1915). 556 (1907). Alexander Joseph. LXXXIII, 2297 Norris. (1919-20)North, (1912). Edward Payson, LXXV, 1167 Northrup, Herbert Franklin, LX, 588 (1908).

MEMOIRS—(Continued).

MEMOIRS-(Continued).

Nourse, Edwin Green, XXXIX, 699 (1898). Noyes, Albert Franklin, XXXVI, 560 560

(1896).

Oberndorf, Paul Ernest. LX, 595 (1908) O'Brien, William Arthur. LXXXIII, 2 O'Brien, W (1919-20). O'Donnell, John Patrick, LXXXIII, 2299

(1919-20). etroich, Henry Lewis. Oestreich, LXXIX, 1451 (1915)

Ogden, Harold Coe. LXXXIII, 2395 (1919-1920).

Olney, La Fayette. LXXV. Olney, Robert Blum. L, 510 Ostrup, John Christian. LX 1177 (1912).10 (1903). LXXXIII,

(1919-20).Owens, Henry Kinder, LXXXIII, (1919-20).

Page, Logan Waller. LXXXIII, 2305 (1919-

1920)

Paine, Charles. LX, 575 (1908).
Palmer, Richard Jeter, Jr. LXXXIII, 2422 (1919-20).

Parker, Harold. LXXXI, 1755 (1917). Parthesius, Philip Henry. LXXXI, (1917).

Patterson, William Rodney. LXXXI, 1757 (1917). Pearson, William Anson, Jr. LXXI 431

(1911)

Peck. Myron Hall. LXXXIII, 2310 (1919-1920). Pennypacker, Levis Passmore. XLVI, 570

(1901).Peterson, Peter Alexander, LXXVII, 1888

(1914). Peyton, John Howe. LXXXIII, 2313 (1919-1920)

Philbrick, Edward Southwick. XXXVIII, 454 (1897).

Phillips, Arthur Louis. LXXIX, 1453 $(19\hat{1}5)$.

Phinney. Henry Ward Beecher. XXXVI, 563 (1896)

Pickett, William Douglas, LXXXI, 1671

(1917).
Pierce, William Thomas, LVII, 525 (1906).
Pihl, Olaf Ridley, LXXX, 2195 (1916).
Pike, Ralph Ashur, LXXIX, 1485 (1915).
Pomeroy, Lewis Roberts, LXXXI, 1811

Pontzen, Ernest, LXXVII, 1829 (1914), Pope, Macy Stanton, LIV, 540 (1905), Pope, Willard Smith, XXXVI, 565 (1896),

Post. George Browne. LXXVII, (1914).

Post, James Clarence, XXXVI, 569 (1896) Potter, Edwin James, LXXXIII, 2396 (1919-20).

Powell, Charles Francis, LXI, 567 (1908), Pratt, Carey Simon, LXXXIII, 2398 (1919-1920) Robert Winthrop, LXXXIII, 2317

Pratt, Rol (1919-20) Prendergast, Francis Ensor. XXXIX, 701

(1898).2199 Preston. Charles Henry. LXXX. (1916).

Pritchard, Philip Morris, LXXIX, 1487

(1915). Prosser, Thomas. XXXVI, 564 (1896). Puffer, William Haselton. LXXVI, (1913).

Radenhurst, William Napier, LXXVII, 1893 (1914)

Rafter, George W. LXII, 554 (1909). Ramsey, Joseph. LXXXI, 1759 (1917). Rasinsky, Charles Ezekiel. LXXIX, (1915).

Raymond, Charles Walker. LXXVII, 1894

(1914).

MEMOIRS—(Continued).

Raymond, Thomas Laidlaw. XLIX, 354 (1902)

Read, Robert Leland, LXXIX, 1455 (1915). Ream, Ward Hall, LXXXIII, 2400 (1919-Ream, 1920).

Reed, William Ward, LII, 558 (1904). Rees, William Marshall, LVI, 473 (1906) Reilly, Charles Gilbert, LXXXIII, 242 Rees, (1919-20), (1919-20), Oake Plummer.

Reiseger, Marc John, XLV, 634 (1901). Reno, James Hart, XXXVII, 566 (1897). Rice, Edward Curtis, XXXIX, 703 (1898). Rich, Isaac, LXXX, 2200 (1916). Rich, Watson Wellman, L, 501 (1903).

XLV, Richards, Joseph Ruggles. (1901).

Richardson, Henry Brown. LXVI, 501

Thomas Franklin. LXXXI, Richardson, 1761 (1917).

Richmond, Henry A. LXXVII, 1926 (1914). Riegner, Wallace Berkley, LXXVII, 1902 (1914)

Riffle, Albert Stanley. LXVI, 504 (1910). Rinecker, Francis. XLII, 569 (1899). Ritter, Homer Peter. LXXXIII, 23

(1919-20)Roberts, Evelyn Pierrepont, LXXII, 593

(1911). Roberts, William. LX, 593 (1908) William Milnor, XX XXXVI, (1896).

Robertson, Marshall Pope. LXXXII, 1705 (1918).

Robinson, Albert Alonzo. LXXXIII, 2322 (1919-20).Robinson, Stillman Williams, LXXI, 433

(1911).Rockwell, James Vincent. LXXX, 2202

Rockwell, James Vincent, LXXX, 2202 (1916).
Rogers, Merritt Harrison, LIX, 562 (1907).
Rohnert, Benno, LVIII, 557 (1907).
Rohrer, Grant. LXXXII, 1706 (1918).
Rohwer, Henry, LXXX, 2205 (1916).
Rood, Henry Martyn, LXXIX, 1457 (1915).
Rowe, Robert Delos, XLII, 571 (1899).
Rowe, Samuel MeMath, LXXII, 594 (1911).
Rowland, Thomas Fitch, LXII, 547 (1909).
Roy Robert Meditland, LXXII, 547 (1909).

LXXXI. Robert Maitland. Roy, Roy, (1917). 1765 Rudloff, Henry Frederick, XXXVI, 570

(1896).Rundlett, Leonard Warren. LXXXI, 1766 (1917).

Nathaniel Edwards. XLIX, 355 Russell. (1902).Sackett, Jo (1919-20). LXXXIII, 2325 John Warren.

John, Isaac Munroe. (1896).

Sample, John Henderson. LXX, 474 (1910). Scarborough, Francis Winthrop. LXXX, 2209 (1916).

Scherzer, Albert John. LXXIV, 515 (1911). Schilling, Alexander Charles. LXXXIII, 2402 (1919-20).

Schneider, Charles Conrad. LXXXI, 1665 (1917).Schofield. Mark William. LXIII, 432

(1909).Frederick Schussler, Hermann

Schussler, Hermann Frederick August.
LXXXIII, 2329 (1919-20).
Schuyler, Howard. XXXVI, 572 (1896).
Schuyler, James Dix. LXXVI, 2243 (1913).
Scott, William Ulysses. XLII, 572 (1899).
Sears, Alfred Francis. LXXV, 1178 (1912).
Sears, Walter Herbert. LXXV, 1180 (1912).
Seaver, John Wright. LXXII, 596 (1911).
Sec. George Corliss. LXXXIII, 2404 (1919-1920).

(1911).
Shedd, Frank Edson. LXXXI, 1768 (1917).
Shedd, Joel Herbert. LXXX, 2211 (1916).
Shima, Takejiro. LXXIV, 525 (1911).
Shinbur, Elver La Zelle. LVII, 531 (1906).
Shipley, Robert Earle. LXXXIII, 2406 Shipley, Robert Earle, LXXXIII, 2406 (1919-20). Shiraishi, Naoji. LXXXIII, 2331 (1919-20). Shreve, Samuel Henry, XXXVI, 576 (1896). Sicard, Mirtiliano, XL, 577 (1898). Sickels, Frederick Ellsworth, XXXVI, 577 Sidenius. Harry Godfred, LXXXIII, 2334 (1919-20).Simpson, George Frederic. LXXIX, 1460 Simpson, George (1915).

(1915).

Simson, David. LXXXI, 1770 (1917).

Sinclair, Frank Oscar. LXXXI, 1772 (1917).

Sites, Wilmon W. C. XXXVI, 582 (1896).

Slataper, Felician. LVIII, 540 (1907).

Sloan, Robert Imlay. XLVI, 562 (1901).

Smead, Raphael Chart. LXXXIII, 2335 Smith, Albert Mather. LXX, 476 (1910). Smith, Benjamin Burgh. LII, 550 (1904). Smith, Edgar Field. LXXXIII, 2408 (1919-1920). Smith. Edwin Foster. LXXXIII, (1919-20), Smith, Frederick Henry. XLI, 643 (Smith, Hamilton, XLVI, 564 (1901). Smith, Isaac Williams. XXXVIII, 643 (1899). (1897)Smith, James. LXXIV, 518 (1911) Smith, Thomas Guilford. LXX LXXV. 1182 iitn, (1912). William Smith, Stuart. LXXXI. 1815 Smith, william Stuart. LXXXI, 1815 (1917).
Snyder, Baird, Jr. LXXVII, 1903 (1914).
Soper, Ralph Carroll. LXXI, 450 (1911).
Soulé, Frank. LXXVI, 2246 (1913).
Speidel, Hugo S. LXXXIII, 2424 (1919-20).
Spence, David Wendel. LXXXI, 1774 (1917).
Sperry, Austin Russell Willard. LXXXIII, 2410 (1919-20).
Sproul Archibald Alexander Ir. LXXI Sproul, Archibald Alexander, Jr. LXXI, 435 (1911). ahlberg, Albert Jacob. XXXVI, Stahlberg, (1896). anton, Fred Caswell. LXXXIII, 2338 Stanton, (1919-20).Stanwood, James Hugh. XXXVI, (1896). Starling, William. XLVI, 566 (1901). Stearns, Frederic Pike. LXXXIII, 2132 Henry Maynadier. Steele. LXVII, (1910)Steere, Edmund Job. LXXX, 2216 (1916). Stephens, Clinton Fitch. LXXIX, 1462 (1915).Stephens, George Hippesley Stanley, LXXXIII, 2412 (1919-20). Stevens, Edwin Augustus, LXXXII, 1708 Stites, Archer Cochran. LVI, 475 Stixrud, Martinius. LI, 463 (1903) Stone, Henry Morton. LXXX LVI, 475 (1906). LXXXIII. 2340 (1919-20).(1819-20).
Stone, Waterinan. XLI, 649 (1899).
Storey, Frank Burns. LXXIX, 1492 (1915).
Stott, Henry Gordon. LXXXI, 1776 (1917).
Stratton. George Draper. LVI, 481 (1906).
Sutermeister, Arnold Henry. LXXXIII, Sutermeister, A 2342 (1919-20).

MEMOIRS-(Continued).

Seely, 7 (1896).

(1897).

(1917)

Thomas Jennings. XXXVI, 574

Seymour, Horatio, Jr. LXVI, 507 (Seymour, Mark Tucker, XXXVII,

Shaler, Ira Alexander, XLIX, 357 (1902) Shaw, William Thomas, LXXXI, 1813

Swan, Charles Herbert, XLVI, 568 (1901). Swanker, John Edward, LXXXII, (1918)leRee. XXXVI, 616 (1896). Ernest Frederick, LXXX. Swift, McRee. Tabor, 2218 (1916).Tainter. William Noyes, XXXIX, 704 (1898).Tappan, Roger. LXXXII, 1735 (1918). Tasker, Stephen Paschall Morris, XLVI, 572 (1901). Tatuall, George. LVIII, 544 (1907). Tatum, Sledge. LXXXI, 1779 (1917). Taylor, Lucian Arnold. LXXIX, Lucian Arnold. 1464 (1915)Taylor, Norman Alfred. LXXI, 451 (1911). Taylor, Selwyn Mellon. LII, 552 (1904). Taylor, William Dana. LXXIV, 520 (1911). Teigen, Thomas William Rostad. LXXV, 1193 (1912). Edward Clinton. LXXXI. (1917).Thomas, Arthur Towne. XLIX, 360 (1902). Thomas, George Edward, LXI, 571 (1908). Thomas, Joseph Russell. XXXVII, 566 (1897).Thompson, Clark Wallace. LXXXII, 1732 (1918).Thompson, John Chambers. XXXVI, 584 (1896).Thomson, George Huntington, LXXI, 438 (1911).Thomson, Samuel Forsythe. LXXXI, 1817 LX, 590 (1908). k. LXXI, 442 Thorndike. John Larkin. Richard Fenwick. Thorp. (1911)Tidd. Marshall Martain. XXXXIII. (1897). Tingley, George Curtis, LIII. 510 (1904). Charles Harry, LXXVI, 2258 (1913).Toms, Jay William. LXXXIII, 2425 (1919-1920). Totten, Joseph G. XXXVI, 525 (1896). Toucey, John Montgomery, XLV, XLV, (1901).(1901).
Tower, Ashley Bemis, XLIX, 361 (1902).
Tower, Morton Loudon, LXXX, 2220 (1916).
Towle, Stevenson, LXXX, 2223 (1916).
Truesdell, Charles, XXXVI, 555 (1896).
Tullock, Alonzo J. LIV, 535 (1905).
Tulner, Nathaniel, LXXVII, 1905 (1914).
Turner, Willis Tubbs, LXXV, 1195 (1912).
Tutton, Charles Harold, LXII, 560 (1900).
Uhlig, Carl, LXXXIII, 2344 (1919-20).
Van Buren, John Dash, LXXXII, 1713 (1918). (1918).Van der Hoek, Jacobus. LXX, 477 (1910). Vansiftart, George Edward, LXXXI, 1821 Vansittart, George Edward. (1917).Vanghu, Clarence George. LXII, 562 (1909). Vaughu, George Washington. LXXX, 2225 (1916). Erle LeRoy, LXXXI. 1784 Veuve. Vliegenthart, Johannes Cornelis. LXXVII, Voorbees, Theodore, LXXXI, 1786 (1917). Voorbees, Theodore, LXXXII, 1715 (1918), Wachtel, Louis. LXXXII, 1734 (1918). Wagner, Bernard Matthew. LXXXII, 1716 (1918).Christopher Champlin, XLIX, 363 Waite. (1902). Walton, Louis Roberts. XXXXII(1896)LXXX, 2228 Ward, Charles Dod. Warner, James Madison, LXXXI, 1823 Washington, William de Hertburne. LXXIX, 1490 (1915).

MEMOIRS—(Continued).

MEMOIRS—(Continued).

Waterhouse, John. LXXXII, 1718 Watson, William Parsons, LXX (1918)LXXV. 1184 (1912)

Webber, Perkins. LXXX, 2232 Charles (1916).Clinton Glencairn. LXIV. 590

(1909).Welton, Nelson James. LXXXII, 1736

(1918).Wentworth, Charles Chancellor, LXXX,

2234 (1916). Weston, Edmund Brownell. LXXXI, 1789

(1917).Weston, George. LXXXIII, 2345 (1919-

1920).LXXVI, 2249 Wheeler, Ebenezer Smith.

Wheeler. Orlando Belina. XXXVI, 587 (1896).

Whipple, Squire. XXXVI, 527 (1896). White, George Howard. LXXV, 1186 (1912).

White, Henry Fisher. LXXVI, 2251 (1913). White, *Sir* William Henry. LXXVII, 1824

(1914). White. William Howard. XLV, 635 (1901). Whitford, Oscar F. XLIX, 364 (1902). Whittemore, Don Juan. LXXXII, 1653

(1918). hittet, Rufus Mason. LXXXIII, 2347 Whittet, (1919-20).

Wilkes, James Knapp. LXXX, 2236 (1916) Wilkins, George Shreve. LXXV, 119

(1912).Willard, James Eager. LXXI, 445 (1911). Williams, David. LXXX, 2238 (1916). Williamson, Frank Robert. LXXX,

(1916)Williamson, William Garnett. XLI, 645

(1899). Ilson, Elliott Hinckley. LXXXIII, 2349

Wilson, John Allston. XXXVI, 588 (1896). Wilson, Joseph Miller. L, 504 (1903). Wise, James Hugh. LXXVI, 2260 (1913). Wood, Charles. XXXVI, 591 (1896). Wood, Charles Widney. LXXIV, 522 (1911). Wood, Irving Sparrow. LXXXIII, 2351

(1919-20).Woollard, George Clifton. LV, 456 (1905). Worthen, William Ezra. XL, 565 (1898). Augustine Washington. LXXXII, Wright, Augu 1721 (1918).

Wright, Edward Thomas. LXXXI, 1791

(1917).Wright, Horatio Gouverneur. XLVI, 551 (1901). right. Willis Benton. LXXXIII, 2352 Wright,

(1919-20) Wrotnowski, Arthur Francis. LXXX, 2242

(1916).Yeatman, Henry Clay. XL, 579 (1898). Young, Eddy Elbert. LVIII, 551 (1907). Zeller, Albert Henry. LVIII, 554 (1907). Zipperlein, Joseph William. LIX, 565 (1907).

Luther Reese. LXXVII, 1907 Zollinger, (1914).

MERCURY.

Specific gravities and weights per cubic foot of — at different temperatures. XL, 531 (1898).

METAL PROTECTION.

See CORROSION AND PROTECTION OF METALS.

METALLURGY.

Ancient -. XXIV, 326 (1891).

METALLURGY—(Continued).

"Mining Engineering in the United States."
E. Gybbon Spilsbury. (Inter. Eng. Cong. 1904). LIV, Part A, 121 (1905).
"Nickel Steel for Bridges." J. A. L. Waddell. (With Discussion.) LXIII, 101

(1909).

"The Possibilities in Bridge Construction by the Use of High-Alloy Steels." J. A. L. Waddell. (With Discussion.) LXXVIII, 1 (1915).

METALS.

"A Note on the Resistance of Materials."
Robert H. Thurston, II, 239 (1873).
"A Peculiar Phase of Metallic Behavior."
O. E. Michaelis. (With Discussiin.) XI, 429 (1882) "Note on t

Note on the Resistance of Materials." Robert H. Thurston. IV, 334 (1875).

"Note on the Resistance of Materials, Affected by Flow and by Rapidity Distortion." Robert H. Thurston. Rapidity of 199 (1876).

"Observations on the Stresses Developed in Metallic Bars by Applied Forces." Theodore Cooper. VII, 174 (1878). "On a New Method of Detecting Overstrain

in Iron and Other —, and on its Application in the Investigation of the Causes of Accidents to Bridges and Other Constructions." Robert H. Thurston. VII, 53 (1878)

"On a Newly Discovered Relation Between the Tenacity of—and Their Resistance to Torsion." Robert H. Thurston, VII, Robert H. Thurston, VII,

169 (1878).

"On the Permanent Effects of Strain in

on Their Self-Registration and Mutual Interactions." Robert H. Thurston.

tual Interactions." Robert II. Thurston. XXIV, 159 (1891). Discussion, XXIV, 104: XXV, 17 (1891). Discussion, XXIV, 104: XXV, 17 (1891).
"On the Strength, Elasticity, Ductility and Resilience of Materials of Machine Construction, and on Various Hitherto Unobserved Phenomena, Noticed during Experimental Researches with a New Testing Machine, Fitted with an Autographic Registry." R. H. Thurston, II, 349 (Section I); (1873): III, 1 (Section II), (1874). Discussion, IV, 265 (1875); V. 102 (1876) V, 102 (1876).
"On the Varie

Variation Strains in the Elastic Limit in —, and on its Practical Value and More Important Applications. Robert H. Thurston. IX, 173 (1880). Discussion, IX, 362. Specifications for special — used in machinery for lift bridges. LXXVI, 398 et seq. (1913). due to Orthogonal

"The Rate of Set of — Subjected to Strain for Considerable Periods of Time." Rob-ert H. Thurston. VI, 28 (1877). "The Treatment of — for Structural Pur-

poses." James Christie. XXX, 155 (1893). Discussion, XXX, 655.

See also ALUMINUM: CAST IRON: IRON: STEEL: STRENGTH OF MATERIALS: WROUGHT IRON.

METEOROLOGY.

"Suggested Changes and Extension of the United States Weather Bureau Service in California." George S. Binckley, and Charles H. Lee. LXXXI, 161 (1917). Discussion: N. C. Grover, William S. Post, Charles T. Leeds, Fred H. Tibbetts, and J. B. Linpingert, LXXVI 174. betts, and J. B. Lippincott. LXXXI, 171.

METERS.

"A Mechanism for Metering and Recording the Flow of Fluids Through Venturi Tubes, Orifices, or Conduits, by Integra-ting the Velocity Head." J. W. Ledoux. LXXVI, 1148 (1913). Memoir on Water." John Thomson. XXV, 40 (1891). Discussion, XXV, 66,

"A Novel Application of the Polar Planimeter. Charles E. Emery, XVIII, 312 (1888).

(1888).

"A Water Meter for Irrigation." A. D. Foote. XVI, 134 (1887).

"Characteristics of Cup and Screw Current—; Performance of These—in Tail-Races and Large Mountain Streams; Statistical Synthesis of Discharge Curves." B. F. Groat. LXXVI. 819 (1913). Discussion: W. G. Price, E. E. Haskell, Charles H. Miller, John C. Hoyt, and C. W. Staniford. LXXVI, 841.

"Current Meter and Weir Discharge Comparisons." Edward C. Murphy. XLVII, 370 (1902). Discussion: Charles H. Miller, Rudolph Hering, Morris R. Sherrerd, L. J. Le Conte, J. B. Lippincott, and E. E. Haskell, XLVII, 379.

Current meter ratings. XLVII, 202 (1902). Current meter used in measuring flow in Sudbury River Conduit. XII, 117 (1883).

Sudbury River Conduit. XII, 117 (1883). Current — XLI, 2 (1899). Current — used in North Metropolitan

Current — used in North Metropolitan sewers, Massachusetts. XLVI. 78 (1901). Deacon waste water meter. XXXIV, 198 (1895).

"Hydrometry as an Aid to the Successful Operation of an Irrigation System."

"J. C. Stevens. (With Discussion.)

"J. C. Stevens. (With Discussion.)
LXXI, 314 (1911).
"On the Current-Meter, Together with a
Reason Why the Maximum Velocity of
Water Flowing in Open Channels is Re-301 (1883).

"Proportional Proportional Water Meter. Specially Adapted to Inferentially Measure the Total Discharge of Nozzles." John Thomson, (With Discussion.) XXIV, Water Meter. 528 (1891).

Simple type of Venturi meter. LXXXIII, 1210 (1919-20).

"Some Facts in Relation to Friction, Waste and Loss of Water in Mains."
Charles B. Brush. (With Discussion.) XIX, 89 (1888)

XIX, 89 (1888).

Steam meter. XVIII, 312 (1888).

Tests for coefficients of Venturi—.

LXXXIII, 162 (1919-20).

Tests of current—. LXXX, 1231 (1916).

"The Accuracy and Durability of Water—." John W. Hill. (With Discussion.)

XII, 326 (1809).

"The Automatic Volumeter." E. G. Hopson. LXXX, 572 (1916). Discussion: George W. Booth, LXXX, 590.

"The Nozzle as an Accurate Water Meter." John R. Freeman. (With Discussion.)

XXIV, 492 (1891).

"The Use and Care of the Current Meter."

"The Use and Care of the Current Meter, as Practiced by the United States

as Practiced by the United States Geological Survey." John C. Hoyt. (With Discussion.) LXVI, 106 (1910). "The Venturi Water Meter: An Instru-ment Making Use of a New Method of Gauging Water; Applicable to the Cases of Very Large Tubes, and of a Small Value Only, of the Liquid to be Gauged." Clemens Herschel. XVII, 228 (1887). Discussion, XVIII, 133 (1888).

METERS—(Continued).

Use of water - to prevent waste. XXXIV,

185 (1895). Venturi — XLVI, 434 (1901). Venturi —, at Ogden, Utah. XXXVIII, 280 (1897).

Venturi —, Loss of head in. XL, 486, 516 (1898); XLIV, 51 (1900). Venturi —, of reinforced concrete, for Washington filtration plant. LVII, 331, 335 (1906).

Venturi—. Use of. XXIV, 515 (1891); XXXIV. 212 (1895), XXXV, 296 (1896). Water meter testing plant, LUV, 13 (1905). Water —. XLVI, 407 (1901).

METRIC SYSTEM.

"On the - of Weights and Measures." A Discussion. Clemens Herschel, Joseph B. Davis, Coleman Sellers, Julius E. Hilgard, Theodore G. Ellis, and Robert Hilgard, Theodore G. Briggs. V, 355 (1876).

MILITARY ENGINEERING.

History of — in the United States. XXXVII, 429 (1897). "The 'Light Railways' of the Battle Front in France." Frank G. Jonah. (With Discussion.) LXXXIII, 1220 (1919-20).

MINING.

Water Power and Compressed Air Transmission Plant for the North Star — Company, Grass Valley, Utah." Arthur De Wint Poote. (With Discussion.) XXXVI, 171 (1896).

XXXVI. 171 (1896).

"An Analysis of the Cost and Description of the Methods of — Employed in the Marquette Iron Region, Lake Superior, Michigan." T. B. Brooks. II, 15 (1873). Application of — methods to subway excavation. LXXXI, 400, 408 (1917).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

"Electric Rock Blasting: The American Method." William L. Saunders. XXVII, 529 (1892). Discussion, XXVIII, 144 (1893).

(1893)."Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Her-bert M. Wilson. LXX, 190 (1910). Dis-cussion: Kenneth Allen, Henry Kreis-inger, Walter O. Snelling, A. Bartoccini, H. G. Stott, and B. W. Dunn, LXX, 300.

"Freezing as an Aid to Excavation in Un-stable Material." James H. Brace. (With Discussion.) LII, 365 (1904). —Engineering. Discussion on Inter. Eng.

Cong. Papers, 1904. J. A. Ede. LIV, Part A, 135 (1905).

"Art A, 139 (1905).
"Engineering in the United States." E. Gybbon Spilsbury. (Inter. Eng. Cong. 1904.) LIV, Part A, 121 (1905).
"Notes upon the Construction of a Water System for Placer—, and Suggestions for a New Method of Dam Building."

for a New Method of Dam Building."
Robert Brewster Stanton. (With Discussion.) XXXV, 70 (1896).

"On the Simultaneous Ignition of Thousands of Mines, and the Most Advantageous Grouping of Fuses." Julius H. Striedinger. VI, 177 (1877).

Sulphur—. LIV, Part A, 125 (1905).

Temperature in mines. XIII, 80 (1884).

"The Conflagration now Existing in the Coal at Kidder Slope." Martin Coryell.

III, 147 (1874). Discussion, III, 153; IV. 317 (1875). III, 147 (1874 IV, 317 (1875).

MINING—(Continued).

"The Control of Hydraulic — in California by the Federal Government." William W. Harts. (With Discussion.) LVII, William

The — of Metals." An Informal Discussion. Edwin N. Hawkins. LXI, 438 (1908). "The - of

"The Operation of Mines in France." E. Gruner. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part A. 113 (1905).

"Water Power with High Pressures and Wrought-Iron Water Pipe." Hamilton Smith. (With Discussion.) XIII, 15

(1884).

MODELS.

Hydraulic and other—. LXXXII, 1140, 1149, 1156, 1165 (1918).

MOMENTS.

"Exponent of the Principle of —." W. S. Auchincloss. X, 135 (1881).
"The Theorem of Three —." J. P. J. Williams. (With Discussion.) LXXVI, 785

MONOPOLIES.

See ECONOMICS.

MORTARS.

"Behavior of Cement — under Various Contingencies of Use. With a Brief Discussion of Certain Tests, etc." F. Collingwood. XIV, 491 (1885).

Cement, mortar and concrete used in the Pennsylvania Avenue Subway. XLVIII,

488, 557 (1902).

"Compressive Strength of Cements and the "Compressive Strength of Cements and the Compression of — and Settlement of Masonry." Report of Progress of the Committee. XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).
"Impurities in Sand for Concrete." An Informal Discussion. Sanford E. Thompson and others. LXV, 250 (1909).
Mortar as a preservative of steel. L, 320

"Note on the Coefficient of Elasticity of Concrete and Mortar Beams during Flex-ure." Myron S. Falk. (With Discus-

Concrete and Mortar Beams during Flexure." Myron S. Falk. (With Discussion.) L, 473 (1903).
"Note on the Consolidation of Mortar." George W. Rafter. XLVIII, 96 (1902).
"Notes on Coments,—and Concretes." William H. Grant. (With Discussion.) XXV, 259 (1891).
"Some Experiments with—and Concretes Mixed with Asphaltic Oils." Arthur Taylor and Thomas Sanborn. (With Discussion.) LXXVI, 1094 (1913).
"Some of the Properties of Oil-Mixed Portland Cement Mortar and Concrete." Logan Waller Page. (With Discussion.)

Logan Waller Page. (With Discussion.) LXXIV, 255 (1911).

"Specifications and Methods of Tests for Portland Cement." LXXXII, 166 (1918). Tensile strength of cement — IX, 286 (1880).

"The Action of Frost on Cement Cement Mortar, Together with Cement Mortar, Together with Other Experiments on These Materials." Ernest R. Matthews and James Watson. (With Discussion.) LXIV, 320 (1909). "The Effect of Freezing on Cement Mor-tar." Alfred Noble. (With Discussion.)

XVI, 79 (1887). See also CEMENT.

MOSQUITOES.

"Prevention of Mosquito Breeding." Spencer Miller. LXXVI, 759 (1943). Discussion: Harold Farnsworth Gray, J. J. Rosenthal, E. P. Feit, Ralph H. Hunt, Robert A. Rutherfurd, Kenneth Allen, W. E. Britton, and Thomas H. Means, LXXVI, 767.

"The Sanitation of Construction Camps."
Harold Farnsworth Gray. (With Discussion.) LXXVI, 493 (1913).

MOTIVE POWER.

"Comparative Tests of an Electric Motor and a Steam Locomotive on the Manhattan (Elevated) Railway, New York."
Lincoln Moss. (With Discussion.)

XXIII, 193 (1890).
"Compressed Air as a Motor for Subterranean Railways." J. Dutton Steele.

1, 244 (1872).

- for Street Railways." Alfred F. Sears.
XXVII, 313 (1892). Discussion, XXVII, 574.

"Test of Power Required to Drive Electric "Test of Power Required to Drive Electric Street Cars, and Total Efficiency of Motor." Louis B. Bonnett. XXVII, 307 (1892). Discussion, XXVII, 675.
"The Substitution of Electricity for Steam as a — for Suburban Traffic." John Findley Wallace. (With Discussion.) XXXVII, 133 (1897).

See also COMPRESSED AIR: ELECTRIC POWER: STEAM: WATER POWER.

MOTOR TRUCKS.

-: sizes, equipment, and cost of operation. LXXVII, 1181 (1914).

"Comparative Tests of an Electric Motor and a Steam Locomotive on the Man-hattan (Elevated) Railway, New York." Lincoln Moss. (With Discussion.)

Mattan (Elevated) Kariway, New York.
Lincoln Moss. (With Discussion.)
XXIII, 193 (1890).
"Specifications for Metal Railroad Bridges
Movable in a Vertical Plane." B. R.
Leffler. (With Discussion.) LXXVI,

Movable in a vertical Plane." B. R. Leffler. (With Discussion.) LXXVI, 370 (1913).
"Street—ou the Government Tramways at Sydney. New South Wales." George Downe. XXVIII, 150 (1893).
"Test of Power Required to Drive Electric Street Cars, and Total Efficiency of Motor." Louis B. Bonnett. XXVII, 307 (1892). Discussion, XXVII, 675.
"Triple Theornic Motor." Description Opera-

307 (1892). Discussion, XXVII, 675.
"Triple Thermic Motor: Description, Operation and Results of a Single Expansion, Non-Condensing Steam Englne, Supplemented by the Evaporation of the Bisulphide of Carbon and Expansion of its Vapor, at Brush Electric Light Company, Cleveland, Ohio." Charles H. Haswell. XVII, 193 (1887). Weights of motor cars and trailers for elevated railroads. XXXVII, 314 (1897).

MOUNTAIN SLIDES. See LAND-SLIDES.

MOVABLE DAMS.

"A Western Type of Movable Weir Dam." W. C. Hammatt. LXXVI, 121 (1913). Discussion: Thomas C. Atwood, LXXVI,

"General Notes on the Great Kanawha Improvement, Tripping Bars and Im-proved Hurters on Chanoine Wicket

MOVABLE DAMS-(Continued).

Dams, etc." Addison M. Scott. (With Discussion.) XXXI, 539 (1894). "Movable Dams." B. F. Thomas. (With Discussion.) XXXIX, 431 (1898).

used on American rivers. LIV, Part F, 274, 287 (1905).
 Natural Waterways. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part D,

Eng. Cong 449 (1905).

"Rolling Dams." K. E. Hilgard. (Inter. Eng. Cong. 1904.) LIV, Part D, 439 (1905).

"The Compensating Works of the Lake Superior Power Company." G. F. Stick-ney. (With Discussion.) LIV. 346 (1905). "The Improvement of the Ohio River." William L. Sihert. (With Discussion.) LXIII, 388 (1909).

MOVABLE SIDEWALKS.

Movable sidewalk at Paris Exposition, 1900. XLI, 317 (1899).

NAVAL ARCHITECTURE. See SHIP-BUILDING.

NAVIGATION.

"Inland — in France." A. Charguéraud. (Translated from the French by Foster Crowell.) (Inter. Eng. Cong. 1904.) LIV, Part F. 235 (1905).
"—Works Executed in France from 1876 to 1891." F. Guillain. (Translated from the French by C. L. Crandall, assisted by C. W. Sherman.) XXIX, 1 (1893). (1893).

"Reservoir System of the Great Lakes of the St. Lawrence Basin; Its Relation to the Problem of Improving the—of These Bodies of Water and of Their Connecting Channels." Hiram M. Chit-tenden. (With Discussion.) XL, 355 (1898).

"Some Important Phases of Canal—, Illustrated by Recent Experiments in Germany." Elnathan Sweet, XLVII, 435 (1902).

(1902).

"The Dangers Threatening the—of the Mississippi River and the Reclamation of its Alluvial Lands." B. M. Harrod, VII, 243 (1878).

"The Low Stage of Lakes Huron and Michigan." C. E. Grunsky. (With Discussion.) LXIII, 31 (1909).

See also CANALS: LAKES: RIVERS.

NEUTRAL AXES.

"A Record of Experiments Showing the Character and Position of —, as Seen by Polarized Light." Louis Nickerson. III, 31 (1874). Discussion, III, 48; IV, 277 (1875).

NIAGARA GORGE.

"A Few Remarks about the —." L. L. Buck. (With Discussion.) XXXII, 205 (1894).

NICKEL-STEEL. See STEEL.

NOMOGRAPHS.

"Nomographic Solutions for Formulas of Various Types." R. C. Strachan. (With Discussion.) LXXVIII, 1359 (1915).

NOZZLES.

Coefficient of discharge of various forms of — XXI, 304 (1889).

Loss of head in — XIII, 376 (1884).

"Proportional Water-Meter, Specially Adapted to Inferentially Measure the Total Discharge of —" John Thomson. (With Discussion.) XXIV, 528 (1891).

"The Nozzle as an Accurate Water-Meter." John R. Freeman. (With Discussion.) XXIV, 492 (1891).

OBELISKS.

"The Disintegration of the Egyptian Obelisk in the Central Park, New York."
Thomas Egleston. XV, 79 (1886).

OCEAN BARS.

See BARS.

OCEAN CURRENTS.

Littoral current on the Pacific Coast. XXXVI, 109 (1896).
"Littoral Movements of the New Jersey Coast, with Remarks on Beach Protection and Jetty Reaction." Lewis M. Haupt. (With Discussion.) XXIII, 123 (1890).

"Origin of the Gulf Stream and Circulation of Waters in the Gulf of Mexico, with Special Reference to the Effect on Jetty Construction." N. B. Sweitzer. (With Discussion.) XL, 86 (1898). "Tidal Phenomena in the Harbor of New York." H. de B. Parsons. (With Discussion.) LXXVI, 1979 (1913).

OCEAN WAVES.

See WAVES.

OCEANS.

"Some General Notes on Ocean Waves and Wave Force." Theodore Cooper. (With Discussion.) XXXVI, 139 (1896). "Temperature of Water at Various Depths in Lakes and —." Hamilton Smith. (With Discussion.) XIII, 73 (1884).

OIL SEPARATORS.

contractors' plant, East River Tunnels, Pennsylvania Railroad, LXIX, 22 (1910).

OIL STORAGE.

"Concrete-Lined - Reservoirs in Califor-Data." E. D. Cole, (With Discussion.) LXXX, 691 (1916).

OIL WELLS. See WELLS.

OPTICS.

"Recent Improvements in Leveling Instru-ments." Dunbar D. Scott. LXXVI, 1172 (1913).

ORDNANCE.

"Ammunition for Cannon." Thales L. Ames. (Inter. Eng. Cong. 1904.) LIV, Part B, 283 (1905).

"An Investigation to Determine the Strains in a Hollow Cast-Iron Disk, Cooled from the Interior." G. Leverich, XVIII, 43 (1888).

"Experiments on the Front or Shield the Experimental Casemate at Fort Monroe." J. G. Barnard. I, 173 (1872).

ORDNANCE—(Continued).

George W. Goethals. Cong. 1904.) LIV, Part "Fortifications." Eng. (Inter.

(Inter. Eng. Cong. 1904.) Liv, Fart A, 57 (1905).

"Gun Construction in the United States."
Odus C. Horney. (Inter. Eng. Cong. 1904.) LIV, Part B, 209 (1905).

Ordnance. Discussion on Inter. Eng. Cong. Papers, 1904. Sir William H. White. H. T. Ashton, and George W. Burr. LIV, Part B, 280 (1905)

Part B, 389 (1905).
"Seacoast Gun-Carriage Design and Construction." Edward P. O'Hern. (Inter. Eng. Cong. 1904.) LIV, Part B, 257

(1905).
"Steel: Its Properties; Its Use in Structures and in Heavy Guns." William Metcalf. (With Discussion.) XVI, 283 (1887).

"The Art of Designing and Constructing Mobile Artillery." George W. Burr. (Inter. Eng. Cong. 1904.) LIV, Part B,

313 (1905).

"The Art of Designing and Constructing Small Arms." John T. Thompson. (Inter. Eng. Cong. 1904.) LIV, Part B, 351 (1905).

"The Heavy Gun Question." O. E. Michaelis. XIII, 215 (1884).

PACKING.

"Tests of Friction of Hydraulic Cupped-Leather --." Theodore Cooper. XVI, 30 (1887).

PAINTING.

"Experiments on the Protection of Steel and Aluminum Exposed to Sea Water."

A. H. Sabin. First Paper. (With Discussion.) XXXVI, 483 (1896); Supplementary Paper. (With Discussion.)

mentary Paper. (With Discussion.)
XLIII, 444 (1900).

Method of —interior of tubes, Illinois and St. Louis Bridge. III, 252 (1874).
Paint used for dry docks. LX, 112 (1908).
"—of Iron Structures Exposed to Weather." E. Gerber. (With Discussion.) XXXIII, 485 (1895).
"—Structural Steel: The Present Situation." A. H. Sabin. LXXVII, 952 (1914).
Discussion: Allerton S. Cushman, Samuel Tobias Wagner, H. A. Gardner, A. W. Carpenter, Maximilian Toch, R. D. Coombs, Lewis D. Rights, and W. E. Belcher, LXXVII, 958.
"—the Louisville and Jeffersonville Bridge."

- the Louisville and Jeffersonville Bridge."

O. E. Selby. (With Discussion.) XXXIX, 19 (1898).

'Rust; As Shown in the Removal of a Seventeen-Story Building." T. Kennard Thomson. (With Discussion.) LXXI. 200 (1911).

200 (1911).
Sand-blast for cleaning metal before—.
XXXIX, 28 (1898).
Sand-blasting and—Niagara Railway Arch
Bridge, LXXXIII, 1990 (1919-20).
Specifications for paint for steel terminal
structures, Pennsylvania Railroad, New
York, LXIX, 213, 218, 224 (1910).

See also CORROSION AND PROTECTION OF METALS.

PATENTS.

"Engineering —." An Informal Discussion.
D. A. Usina, and J. P. A. Maignen.
LVII, 83 (1906).
"Is It Unprofessional for an Engineer to
be a Patentee?" Archibald R. Eldridge.
(With Discussion.) XLVIII, 314 (1902).

PAVEMENT.

"A Rational Formula for Asphalt Street Surfaces." J. Alden Griffin. LXXVII, 64 (1914).

64 (1914).
"A Review of Chicago Paving Practice."
P. E. Green. LXVI, 1 (1910). Discussion: W. W. Crosby, E. H. Thomes. Richard Lamb, William W. Marr, and Nelson P. Lewis, LXVI. 34.
"An Account of Some Observations of Street Traffic." Francis V. Greene. XV, 123 (1886).
"Asphalt and Asphalt Pavements." George

"Asphalt and Asphalt Pavements." George W. Tillson. (With Discussion.) XXXVIII, 215 (1897).

Asphalt pavements. LXXXII, 1391, 1399, 1412 (1918).

"Brick Manufacture and Brick—." F. A. Calkins. (With Discussion.) XXVI, 363 (1892).

"California Practice in Highway Construction." W. C. Hammatt. (With Discussion.) LXXVII, 1760 (1914).

'Car Tracks and Pavements." James Owen.

XXXVII, 63 (1897). Discussion, XXXVII, 78. of various pavements. XXVI, 417 Cost

(1892).

Definitions of highway engineering terms LXXXII, 1420 et seq. (1918).

Durability of various pavements. XXVI, 401 (1892).

Durability of wooden pavements. L, 315 (1903).

"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use."
(With Discussion.) LXXXII, 1384 (1918).
w York City—. Brief description of.

(With Discussion.)

New York City—, Brief description of.

LXXVI, 1737 (1913).

"Pavements." An Informal Discussion.

George W. Tillson, J. H. Haylow, Clif
ford Richardson, Horace Andrews, Gardner S. Williams, Lansing H. Beach, E. M. T. Ryder, William H. Lawton, Philip W. Henry, B. Bienenfeld, Nelson P. Lewis, and Edward P. North. LIX, 336 (1907).

"Reinforced Concrete Foundations over

Excavations on Paved Streets." John McNeal. LX, 217 (1908).

'Road Construction and Maintenance." An Informal Discussion. Logan Waller Page and others. LXXIII, 1 (1911).
"Road Construction and Maintenance: Bituminous Surfaces" An Informal Dis-

cussion. A. W. Dean and others. LXXV,

548 (1912).
"Road Construction and Maintenance: Cement-Concrete Payements," An Informal Discussion, J. A. Johnston and others, LXXVII, 118 (1914).
"Road Construction and Maintenance:

Drainage and Foundations." An In formal Discussion. James Owen and others. LXXV, 504 (1912).
"Road Construction and Maintenance:

Engineering Organizations for Highway Work." An Informal Discussion. Wil-lis Whited, and others. LXXVII, 1074

(1914). "Road toad Construction and Maintenance: Equipment and Methods for Maintaining Bituminous Surfaces and Bituminous Pavements." An Informal Discussion. William R. Farrington. H. B. Pullar, Arthur H. Blanchard, W. H. Fulweller, James H. Sturdevant, Herbert Spencer, T. Hugh Boorman, Philip P. Sharples, and Maintenance:

PAVEMENT—(Continued).

William de H. Washington, and A. F. Masury. LXXVII, 1155 (1914). Coad Construction and Maintenance: Equipment for the Construction of Bituminous Surfaces and Bituminous Pavements." An Informal Discussion Fran-"Road cis P. Smith and others. LXXVII, 171

(1914). coad Construction "Road Construction and Maintenance: Factors Limiting the Selection of Materials and of Methods in Highway Construction." An Informal Discussion. P. E. Green and others. LXXVII, 1123 (1914). and Maintenance:

"Road Construction and Maintenance: Fillers for Brick and Block Pavements."
An Informal Discussion, George W. Tillson, Theodor S. Oxholm, E. A. Kingsley, Samuel Whinery, L. P. Sibley, D. E. McComn, W. A. Howell, W. W. Crosby, Will P. Blair, H. B. Pullar, and Arthur H. Blanchard. LXXV, 527 (1912).

"Road Construction and Maintenance: Use of Bituminaus, Material in Proceedings

of Bituminous Material in Penetration and Mixing Methods." An Informal Discussion. Linn White and others.

and Mixing Methods. All Individual Discussion. Linn White and others. LXXV, 572 (1912).

Stone block pavements. LXXXII, 1391, 1414 (1918).

"Street Grades and Cross-Sections in Asphalt and Cement." Robert P. Woods. (With Discussion.) XLII, 1 (1899).

"Street Paving Crowns, Washington, D. C." T. J. Powell. LXXIII, 225 (1911). Discussion: E. A. Steece, LXXIII, 228.

"Street Traffic in New York City, 1885 and 1904." Clifford Richardson. (With Dis-cussion.) LVII, 181 (1906).

"The Construction and Maintenance of Roads," Edward P. North. VIII, 95 (1879). Discussion, VIII, 333.

(1879). Discussion, VIII, 333.

"The Influence of Rails on Street Pavements." Edward P. North. (With Discussion.) XXXVII, 70 (1897).

"The Maintenance of Asphalt Streets."
James N. Hazlehurst. XLIX, 182 (1902).
Discussion: S. Whinery, Nelson P. Lewis S. C. Thompson, J. M. Evans, and W. Boardman Reed, XLIX, 192.

"The Manufacture and Use of Paving Brick." Daniel W. Mead. XXIX, 653 (1893). Discussion, XXX, 585 (1893).
Use of wood blocks on roadway of Twelfth Street Viaduct, Kansas City, Mo. LXXX, 566 (1916).

566 (1916).

Wood block pavements. LXXXII, 1391, 1416 (1918).

PENSTOCKS.

"Air Tanks on Pipe Lines." Minton M. Warren. (With Discussion.) LXXXII, 250 (1918).

Economic construction of — for hydro-electric plants. LXXIX, 1014, 1044 (1915). "—and Surge-Tank Problems." Minton M.

(With Discussion.) Warren. LXXIX.

238 (1915).

238 (1915).

"Pressures in — Caused by the Gradual Closing of Turbine Gates." Norman R. Gibson. LXXXIII, 707 (1919-20). Discussion: Otto V. Kruse, Eugene E. Halmos, R. D. Johnson, Minton M. Warren, T. Noble Anderson, Ford Kurtz, and William P. Creager, LXXXIII, 741.

"Pulsations in Pipe Lines, as Shown by Some Recent Tests." H. C. Vensano. (With Discussion.) LXXXII, 185 (1918).

PERCOLATION. See SEEPAGE.

PERMANENT WAY. See TRACK.

PHILOSOPHY

"The - of Engineering." Maurice G. Parsons. (With Discussion.) LXXVII, 38 (1914).

PIERS.

See WHARVES.

For material relating to Bridge Piers, see BRIDGE PIERS: CONCRETE: FOUN-DATIONS: MASONRY.

PIEZOMETERS.

See GAUGES.

PILE-DRIVERS.

"An Account of the Operation of the Gun-powder Pile-Driver." Samuel R. Pro-basco. (With Discussion.) II, 403 (1873). "On the Nasmyth Pile-Driver." D. J. Whittemore. XII, 441 (1883).

PILE-DRIVING.

Clamps or grips for pulling sheet piling. LXXXI, 569 (1917).

Experiments in sinking hollow wrought-

ron piles in sand. XL, 250 (1898).

Formulas: Their Construction and Factors of Safety." Charles H. Haswell. (With Discussion.) XLH, 267 (1899).

sheet-pile pockets. New York City pier. LXXVI 517 573 (1917).

— sheet-pile pockets, New York City pier.
LXXXI, 517, 573 (1917).

Pile tests and—at Pearl Harbor Dry
Dock. LXXX, 260, 299, 327 (1916).

"Principles of Tidal Harbor Improvement
as Applied at Wilmington, Cal." Clinton B. Sears. V, 388 (1876). Discussion, VI, 189 (1877).

"The Ocean Pier at Concy Island."
Charles Macdonald. VIII, 227 (1879).

"The Structural Design of Buildings."
Charles C. Schneider. (With Discussion.) LIV, 371 (1905).

"The Supporting Power of Piles." Ernest
P. Goodrich. (With Discussion.) XLVIII,
180 (1902).

180 (1902). "Uniform Practice in —." J. Foster Cro-well. XXVII, 99 (1892). Discussion, XXVII, 129, 589.

"A Concrete Sewer on --." Eugène Lentilhon. (With Discussion.) XXXI, 569 (1894).

"An Account of the Removal of some Broken—from the Bed of the Connec-ticut River." J. Albert Monroe. I, 275

of concrete = LXXVIII, 1062 Bending (1915).

(1915).

Cast-iron — used in pier at Fortress Monroe, Va. XXVII, 116 (1892).

"Clamp for Pulling Sheet Piling." Charles E. Emery. XX, 118 (1889).

Comparison of pneumatic caissons with concrete —. LXI, 218 (1908).

"Concrete —." Howard J. Cole. LXV, 467 (1909). Discussion: Morton L. Tower, L. J. Mensch, Charles H. Higgins, Maxwell M. Upson, Thomas C. Desmond, R. D. Coombs, Homer A. Reid, and Hunley Abbott, LXV, 488.

PILES—(Continued).

Concrete - and method of sinking them. LXXX, 834 (1916).

Concrete — used in the construction of a pler. LXXVIII, 1128 (1915). "Construction Problems, Dumbarton Bridge, Central California Railway." E. J. Schneider. (With Discussion.) LXXVI,

"Dams on Sand Foundations: Some Principles Involved in Their Design, and the Law Governing the Depth of Penetration Required for Sheet-Piling." Arnold C. Koenig. (With Discussion.) LXXIII, 175 (1911).

Decay of en 469 (1896). entirely submerged -. XXXV,

"Method Pursued in Replacing a Stone Pier on a Pile Foundation." J. Albert Monroe. III, 58 (1874). Discussion, IV, 205 (1875).

"Notes upon Docks and Harbors." Wagoner. (With Discussion.) LXII, 135

(1909).

"Observations on Dock Work in New York Harbor." J. A. Bensel. (With Discussion.) (Inter. Eng. Cong. 1904.) LIV, Part F, 3 (1905).
Pile tests and pile-driving at Pearl Harbor Dry Dock. LXXX, 260, 299, 327

(1916).

"Protecting—against the Teredo Navalis on the Louisville and Nashville Rail-road Company's Lines." R. Montfort. (With Discussion.) XXXI, 221 (1894). "Renewal of the Foundation, and Transfer

of a Light-House in Pascagoula Har-bor." J. W. Putnam. (With Discusbor." J. W. Putnam. sion.) X, 14 (1881). (With Discus-

sion.) X, 14 (1881).

Screw-piles proposed for North River Tunnels. LXVIII, 26, 42, 46, 216 (1910).

Sheet-piling in comparison with pneumatic caisson work. LXI. 229 (1998).

Specifications for—used in bridges and subways. LXXV, 330 (1912).

Steel—used in north wall of Fremantle Graving Dock. LXXVI, 1950 (1913).

Steel sheet-piling. LXII, 129 (1909).

Steel sheet-piling used in coffer-dam for 1000-ft. pier, New York City. LXXXI, 498 (1917).

1000-ft. pier, New 101K City.
498 (1917).
"Steel Sheeting and Sheet-Piling." L. R.
Gifford. LXIV, 441 (1909). Discussion:
Charles W. Sherman, C. C. Conkling,
Charles H. Higgins, Charles Evan Fowler, J. C. Meem, E. P. Goodrich, Frank
W. Skinner, and R. B. Woodworth,
LXIV. 452 LXIV, 452.

"Sub-Aqueous Underpinning." A. G. Meno-cal. XI, 181 (1882).

Tests of concrete underpinning — for sub-way on Fulton Street, New York City. LXXXI, 87, et seq., 103 et seq. (1917). "The Bracing of Trenches and Tunnels,

with Practical Formulas for Earth Pressures." J. C. Meem. (With Discussion.)

with Fractical Formulas for Earth Flessures." J. C. Meem. (With Discussion.) LX, I (1908).

"The Railway Pile and Pontoon Bridge across the Mississippi River at Prairie du Chien, Wis." John Lawler. (With Discussion.) XIII, 67 (1884).

"The Reinforced Concrete Wharf of the United Fruit Company at Bocas del Toro, Panama." T. Howard Barnes. (With Discussion.) LXVI, 289 (1910). "The Supporting Power of "Enest P.

"The Supporting Power of —." Ernest P. Goodrich. XLVIII, 180 (1902). Discussion: E. Sherman Gould, Horace J. Howe, and Joseph P. Carlin, XLVIII, 213.

PILES—(Continued).

"The Ultimate Load on Pile Foundations: A Static Theory." John H. Griffith. (With Discussion.) LXX, 412 (1910). Use of concrete—on Twelfth Street Viaduct, Kansas City, Mo. LXXX, 502, 540, 547, 569 (1916). Use of sheet-piling in dams. LXXXI, 1

(1917).

Wrought iron -, Coney Island Pier. VIII,

230 (1879).
Wrought-iron—driven by water-jet.
XXVII, 127 (1892).

PILLARS.

See COLUMNS.

"A Peculiar Case of Failure in a Water Main." D. McN. Stauffer. (With Discussion.) VII, 14 (1878).
"A Solution of the Problem of Determining the Economic Size of—for High-Pressure Water-Power Installation."
Arthur L. Adams. (With Discussion.)

LIX, 173 (1907).
"Additional Information on the Durability of Wooden Stave—" Arthur L. Adams, LVIII, 65 (1907). Discussion: Shirley Baker, Clemens Herschel, D. C. Henny, G. P. Hawley, Andrew Swickard, A. M. Hunt, L. J. Le Conte, T. Chalkley Hatton, J. C. Ralston, C. D. Marx, D. Farrand Henry, and Edwin Duryea, Jr., LVIII. 7 LVIII, 71.

"An Accident to Steam Pipes Arising from the Use of Blast Furnace Wool." T. Egleston. (With Discussion.) XII, 253

(1883).

"An Experimental Study of the Resistances to the Flow of Water in Pipes.

to the Flow of Water in Pipes." Augustus V. Saph and Ernest W. Schoder. (With Discussion.) LI, 253 (1903). Cast-iron—of large dimension in Astoria Gas Tunnel. LXXX, 662 (1916). "Cement Joints for Cast-Iron Water Mains." Clark H. Shaw. LXXXIII, 277 (1919-20). Discussion: Harry Y. Carson, F. M. Randlett, Walter Pearl, H. G. Moulton, H. B. Lynch, Edward R. Bowen, and George W. Pracy, LXXXIII, 288.

Construction of steel-XXXVIII, 258 (1897). of steel - at Ogden, Utah.

protection of steel -.

Corrosion and prote LXXVIII, 857 (1915) of -- laying around curves. XLVII,

Cost of — laying around curves. ALVII, 361 et seq. (1902).

"Description of a Line of Large Water-Mains, Laid by the Croton Aqueduct Department of the City of New York; and an Inquiry into the Causes of Failure of a Few of Them." A. W. Craven. I, 3 (1872). Discussion, I, 26.

"Description of Some Experiments Made on the Providence R. I. Water-Works to

the Providence. R. I., Water-Works to Ascertain the Force of Water Ram in Pipes." Edmund B. Weston. XIV, 238

(1885).

Design of steel—for hydro-electric plants. LXXIX, 1014 (1915). Details of cost and manufacture of con-crete—at Monterrey, Mexico. LXXII, 500, 573 (1911)

"Expansion of Pipes." Ralph C. Taggart. LXX, 1 (1910). Discussion: William D. Ennis, and William Kent, LXX, 31. "Experimental Determination of Loss of

Head Due to Sudden Enlargement in

PIPE—(Continued).

Circular Pipes." W. H. Archer. LXXVI,

999 (1913).

999 (1913).

"Experiments on the Flow of Water in Wood Stave Pipes." E. A. Moritz. (With Discussion.) LXXIV, 411 (1911).

"External Corrosion of Cast-Iron—." Marshall R. Pugh. LXXVIII, 806 (1915). Discussion: C. P. Bowie, Kenneth Allen, William W. Brush, Samuel Tobias Wagner, R. C. Kellogg, A. D. Flinn, William J. Boucher, George M. Purver, W. J. E. Binnie, and Leonard S. Doten, LXXVIII, 857. LXXVIII, S57.

54-in. flexible-joint steel intake -- XXXIV,

29 (1895).

29 (1895).

Flexible joint — XXXIII, 257 (1895).

"Flow of Water in Wrought and Castfron Pipes from 28 to 42 Ins. in Diameter." Isaac W. Smith. (With Discussion.) XXXVI, 197 (1896).

"Friction Coefficient for Riveted Steel —."

An Informal Discussion. Hawks. XLII, 155 (1899). 1.

Infiltration of water into sewer -. LXXVI,

1909 (1913). Life of water — systems. XXIV, 251 (1891). "Memorandum and Tables, Exhibiting the Results of Some of Darry's Experiments on the Flow of Water through Pipes." James B. Francis. 11, 45 (1873).

"Modern Practice in Wood Stave - Design and Suggestions for Standard Specifica-

and Suggestions for Standard Specifica-tions." J. F. Partridge. (With Discus-sion.) LXXXII, 433 (1918).
"Moving Two 36-In. Water Mains without Shutting off the Water." E. C. Moore. (With Discussion.) XXXIV, 532 (1895).
"Note on Kutter's Diagram." Charles H. Swan. IX, 326 (1880).
Old wood—In New York City, XLI, 62

(1899).

"On the Removal of Incrustation in Water Mains. A Description of the Operations

Mains. A Description of the Operations
Performed in Halifax, N. S. Canada."
E. H. Keating. XI, 127 (1882).
"Penstock and Surge-Tank Problems."
Minton M. Warren. (With Discussion.)
LXXIX, 238 (1915).
"Pressures in Penstocks Caused by the
Gradual Closing of Turbine Gates."
Norman R. Gibson. (With Discussion.)
LXXXIII, 707 (1919-20).
"Pressures Resulting from Changes of
Velocity of Water in Pipes." J. P.
Frizell. (With Discussion.) XXXIX, 1
(1898).

(1898).

"Reinforced Concrete — for Carrying Water under Pressure." Chester Wason Smith. LX, 124 (1908). Discussion: F. Teichman, J. R. Worcester, Ernst F. Jonson, R. W. Lesley, William Gavin Taylor, and Thomas H. Wiggin, LX, 142. 6-ft. wood-stave penstock. VI, 69 (1877). Some dimensions of cast-iron water — LXXXIII, 297 (1919-20). "Some Facts in Relation to Priction Waste

"Some Facts in Relation to Friction, Waste and Loss of Water in Mains." Charles B. Brush. (With Discussion.) XIX, 89 (1888).

"Stave—: Its Economic Design and the Economy of its Use." Arthur L. Adams. (With Discussion.) XLI, 27 (1899).
Steel—at Astoria, Oregon, Water-Works. XXXVI, 21 (1896).

"Stoppage of Flow in a Water Main by Anchor Ice." James B. Francis. (With Discussion.) XVI, 171 (1887).

PIPE—(Continued).

"Submerged - Work at Portland, Oregon."

"Submerged — Work at Portland, Oregon."
D. D. Clarke. (With Discussion.)
LXXVIII, 1305 (1915).
"The Distortion of Riveted—by Back-Filling." D. D. Clarke. (With Discussion.) XXXVIII, 93 (1897).
"The Effect of Tuberculation on the Delivery of a 48-In. Water Main." James Duane. XXVIII, 26 (1893). Discussion, XXVIII, 257, 352.
"The Flow of Water in Pipes under Pressure." Charles G. Darrach. VII. 114

sure." Charles G. Darrach. VII, 114 (1878). Discussion, VII, 122.
"The Flow of Water in Small Channels, after Ganguillet and Kutter, with Kutter's Diagram Modified, and Graphical Tables with Special Reference to Sewer Calculations." R. Hering. VIII, 1 (1879).

(1879).

"The Flow of Water in Wood Pipes."
Theron A. Noble. (With Discussion.)
XLIX, 112 (1902).

"The Flow of Water through Pipes."
Hamilton Smith. XII, 119 (1883).

"The Results of Investigations Relative to
Formulas for the Flow of Water in
Pipes." Edmund B. Weston. (With
Discussion.) XXII, 1 (1890).

"The Spongilla in Main Pipes." Desmond
Fitz(rerand. (With Discussion.) XV.

FitzGeraid. (With Discussion.)

337 (1886).
"The Venturi Water Meter: An Instrument
Making Use of a New Method of Gaug-Ing Water; Applicable to the Cases of Very Large Tubes, and of a Small Value very Large Tubes, and of a Small Value Only, of the Liquid to be Gauged." Clemens Herschel. XVII, 228 (1887). Discussion, XVIII, 133 (1888). "The Water Supply of the El Paso and Southwestern Railway from Carrizozo to Santa Rosa, N. Mex." J. L. Campbell. (With Discussion.) LXX, 164 (1910).

(1910).

Variation in diameter of -. XLVII, 94 et

**Yaraton ... seq. (1902).

"Water Power with High Pressures and Wrought-Iron Water—," Hamilton VIII. 15 Wrought-Iron Water --." Hamilton Smith. (With Discussion.) XIII, 15 Smith. (1884).

Wood - at Astoria, Oregon, Water-Works.

\(\text{XXXVI, 15 (1896).} \)
\(\text{Wood} - \text{at Denver, Colo. XXXI, 125 (1894).} \)
\(\text{Wood} - \text{at Ogden, Utah. XXXVIII, 267} \) (1897).

Wood — of Bear Valley Irrigation Company, California. XXXIII, 112 (1895). See also AQUEDUCTS: CONDUITS: PIPE LINES.

PIPE LINES.

"A Study of Economic Conduit Location."

"A Study of Economic Conduit Location."
C. E. Hickok. (With Discussion.)
LXXVII, 778 (1914).
"A Water Conduit under Pressure." John
T. Fanning. VI, 69 (1877).
"Air Tanks on—" Minton M. Warren.
(With Discussion.) LXXXII, 250 (1918).
Croton Aqueduct. VI, 54 (1877).
Data concerning some existing stave—
VII 43 (1899)

XLI, 43 (1899). Effect of San Francisco earthquake on —. LIX, 251 (1907).

LIX, 251 (1907).
"Experiments on the Flow of Water in a 48-inch Pipe." F. P. Stearns. (With Discussion.) XIV, 1 (1885).
"Experiments on the Flow of Water in the Six-Foot Steel and Wood Pipe Line of the Pioneer Electric Power Company,

PIPE LINES-(Continued).

at Ogden, Utah." Charles D. Marx, Charles B. Wing, and Leander M. Hoskins. First Paper (With Discussion), XL, 471 (1898); Supplementary Paper (With Discussion), XLIV, 34 (1900). "Experiments on the Flow of Water in Wood Stave Pipes." E. A. Moritz. (With Discussion.) LXXIV, 411 (1911).

Discussion.) LXXIV, 411 (1911).

Flow of water in Sudbury Aqueduct.

XXXV, 241 (1896).

"Flow of Water in Wrought and CastIron Pipes from 28 to 42 Ins. in Diameter." Isaac W. Smith. (With Discussion.) XXXVI, 197 (1896).

"Friction Coefficient for Riveted Steel
Pipe." An Informal Discussion. A.

McL. Hawks. XLII, 155 (1899).

Gaugings of Rochester, N. Y. pipe line.

XLIV, 56 (1900).

Hydraulics of Sudbury River Conduit.

Hydraulics of Sudbury River Conduit. XII, 114 (1883).

"Line of 28-In. Cast-Iron Submerged Pipes across the Williamette River, at Port-land, Ore." Franklin Riffle and Albert S. Riffle. (With Discussion.) XXXIII, 257 (1895).

"Notes and Suggestions on the Croton Water-Works and Supply, for the Future." Benjamin S. Church. V, 107 (1876). Discussion, V, 254; VI, 68 (1877). "Notes upon the Construction of a Water

System for Placer Mining, and Suggestions for a New Method of Dam Building." Robert Brewster Stanton. (With Discussion.) XXXV, 70 (1896),
"On the Hydraulies of the Hemlock Lake Conduit of the Peoblect N. V. Weter

Conduit of the Rochester, N. Y., Water-Works," George W. Rafter, XXVI, 13 (1892). Discussion, XXVI, 28.
pe line at Grass Valley, Cal. XXXVI,

pe line at 173 (1896).

Pipe line for water supply, Seattle, Wash. XLIX, 112 (1902).

Pipe line from Huacal Dam, Sonora, Mexico, and test of its capacity. LXXVIII, 596 (1915).

Dipe line of Astoria, Oregon, Water-Works. XXXVI, 10 (1896).

Pipe line of Bear Valley Irrigation Company, California. XXXIII, 112 (1895).

- for Morenci Water Company. LXXIX, 1289 (1915).

-for railroad water supply, LXX, 164 (1910).

"Pulsations in —, as Shown by Some Recent Tests." H. C. Vensano. (With Discussion.) LXXXII, 185 (1918).

Discussion.) LXXXII, 185 (1918).
6-ft. wood-stave penstock. VI. 69 (1877).
"Submerged Pipe Work at Portland, Oregon." D. D. Clarke. LXXVIII, 1305 (1915). Discussion: F. M. Randlett, Ben S. Morrow, Clemens Herschel, Kenneth Allen, R. C. Kellogg, Thomas H. Wiggin, W. E. Spear, J. P. Hogan, W. W. Brush, L. J. Le Conte, C. D. Ward, and W. R. Phillips, LXXVIII, 1324.
Texas Creek, Cal., — XIII, 28 (1884).
"The Construction of the Klondike Pipe Line." W. W. Edwards. LXXVIII, 547 (1915). Discussion: G. B. Pillsbury, and Walter S. Wheeler, LXXVIII, 560.
"The Distortion of Riveted Pipe by Back-Filling." D. D. Clarke. (With Discussion.) XXXVIII, 93 (1897).
"The Effect of Tuberculation on the De-

"The Effect of Tuberculation on the Delivery of a 48-In. Water Main." James Duane. XXVIII, 26 (1893). Discussion, XXVIII, 257, 352.

"The Power Plant, Pipe Line and Dam of

PIPE LINES-(Continued).

the Pioneer Electric Power Company at Ogden, Utah." Henry Goldmark. (With Discussion.) XXXVIII, 246 (1897). 30-in. pipe line of Denver Water-Works. XXXI, 143 (1894).
"Tufa Cement, as Manufactured and Used on the Los Angeles Aqueduct." J. B. Lippincott. (With Discussion.) LXXVI, 520 (1013) 520 (1913).

Vunnel Surveying on Division No. 6, New Croton Aqueduct." F. W. Wat-kins. (With Discussion.) XXIII, 17 "Tunnel

(1890).

"Water Power with High Pressures and Wrought-Iron Water Pipe." Hamilton Smith. (With Discussion.) XIII, 15 (1884).

See also PIPE.

PISTOLS.

See SMALL ARMS.

PITOT TUBES.

"Characteristics of Cup and Screw Current Meters; Performance of These Meters in Tail-Races and Large Mountain Streams; Statistical Synthesis of Discharge Curves." B. F. Groat. (With Discussion.) LXXVI, 819 (1913).

Description of—and their use. XLVII, 6 et sea. (1902).

et seq. (1902).

Meters for recording flow as indicated by —. LXXVI, 1148 (1913).

PLANE TABLES.

"Some Devices for Increasing the Accuracy or Rapidity of Surveying Operations." Walter Loring Webb. (With Discussion.) XLVIII, 98 (1902).

PLANIMETERS.

"A Novel Application of the Polar Plani-meter." Charles E. Emery. XVIII, 312 (1888).

POLARIZED LIGHT.

Record of Experiments Showing the Character and Position of Neutral Axes, as Seen by—" Louis Nickerson. III, 31 (1874). Discussion, III, 48; IV, 277 (1875).

POLLUTION OF STREAMS.

See STREAM CONTAMINATION.

PONTOON BRIDGES.

"The Railway Pile and Pontoon Bridge across the Mississippi River at Prairie du Chien, Wis." John Lawler. (With Discussion.) XIII, 67 (1884).

POPULATION.

Probable future—in San Francisco Metro-politan District, and comparison with other cities and districts. LXXX, 7, 118 (1916).

PORTAGE.

"Early Surveys and Reports in Reference to the Transmission of Trade across the Allegheny Mountains in the State of Pennsylvania, known as the Allegheny —." Moncure Robinon. XV, 181 (1886).

PORTS.

See HARBORS.

POWER.

See COMPRESSED AIR: ELECTRIC POWER: STEAM: STEAM POWER: WATER POWER.

POWER BRAKES.

"- for Freight Trains." William P. Shinn. XIV, 405 (1885).

POWER HOUSES.

See POWER PLANTS.

POWER PLANTS.

High-Voltage Power Transmission."
M. H. Gerry, Jr. (With Discussion.)
L, 212 (1903).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

ities." LXXVI, 2133 (1913).

"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX, 951 (1916).

"Construction of the Power-House of the Rochester Power Company, adjacent to Genesee Falls, Rochester, N. Y." Robert Cartwright. XXVIII, 19 (1893).

"Electrical Power: Generating Stations and Transmission." L. B. Stillwell. (With Discussion.) (Inter. Eng. Cong. 1904.)

LIV, Part D, 357 (1905).

"Ice Diversion, Hydraulic Models, and Hydraulic Similarity." Benjamin F. Groat. (With Discussion.) LXXXII, 1138 (1918).

Groat. (With Discussion.) LXXXII, 1138 (1918).

Power house, Astoria, Oregon, Water-Works. XXXVI, 35 (1896).

Power house equipment at South Boston Terminal. XLIII, 150 (1900).

— at Ontario, California. LV, 173 (1905).

—, Pennsylvania Railroad Terminal, New York. LXIX, 284, 333 (1910).

Power stations of the New York Central & Hudson River R. R. LXI, 78 (1908).

"The Design of Hydro-Electric—." J. D. Galloway. LXXIX, 1000 (1915). Discussion: William P. Creager, E. Newman, H. Homberger, and Arnold Pfau, LXXIX, 1036. LXXIX, 1036.

"The Electric Station of the Citizens' Light

and Power Company of Rochester, N. Y." Robert Cartwright. (With Discussion.) XXXI, 335 (1894).
"The Guadalajara Electric-Light Installation, Utilizing the Famous Juanacatlán Water-Falls 28 Km. Distant from Guadalajara." Rafael M. de Arozarena. XXIX, 689 (1893).
"The Hydraylic Plant of the Puret Sound

XAIA, 689 (1893).

"The Hydraulic Plant of the Puget Sound Power Company," Edwin H. Warner. (With Discussion.) LV, 228 (1905).

"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company," A. H. Van Cleve. (With Discussion.) LXII, 199 (1900)

(1909).

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." E. L. Sayers and A. C. Polk. (With Discussion.) LXXVIII, 1409 (1915).

"The Necaxa Plant of the Mexican Light and Power Company." F. S. Pearson and F. O. Blackwell. (With Discussion.) LVIII, 37 (1907).

"The Ninety-Sixth Street Power Station of the Metropolitan Street Railway Company, of New York City." L. G. Montony. (With Discussion.) XLIV, 119 (1900). (1900).

POWER PLANTS—(Continued).

"The Power Plant, Pipe Line and Dam of the Pioneer Electric Power Company at Ogden, Utah." Henry Goldmark. (With Discussion.) XXXVIII, 246 (1897). "The Pumping Plant of the Morenci Water Company." W. L. Du Moulin. (With Discussion.) LXXIX, 1268 (1915). "The Twenty-Eighth Street Central Station of the United Electric Light and Power Company." H. W. York. (With Discussion.) XXXV, 429 (1896).

POWER STATIONS.

See POWER PLANTS.

POWER TRANSMISSION.

POWER TRANSMISSION,

"A High-Voltage—." M. H. Gerry, Jr.,
I., 212 (1903). Discussion: F. O.
Blackwell, P. H. Thomas, W. B. Potter,
and J. R. McKee, L, 245.

"A Problem in Continuous Rope Driving."
Spencer Miller. (With Discussion.)
XXXIX, 165 (1898).

"A Simple Method of Computing Deflections of a Cable Span Carrying Multiple Loads Evenly Spaced." F. C.
Carstarphen. (With Discussion.)
LXXXIII, 1383 (1919-20).

"A Water Power and Compressed Air
Transmission Plant for the North Star
Mining Company, Grass Valley, Cal."
Arthur De Wint Foote. (With Discussion.)
XXXVI, 171 (1896).

Comparison of electric and compressed air
transmission of power. XXXVI, 192
(1896).

(1896)

(1896).

"Electrical Power: Generating Stations and Transmission." L. B. Stillwell. (With Discussion.) (Inter. Eng. Cong. 1904.) LIV, Part D, 357 (1905).

"Electrical Transmission from Niagara." Benjamin Rhodes. XIV, 205 (1885).

"Overhead Construction for High-Tension Electric Traction or Transmission." R. D. Coombs. LX, 505 (1908). Discussion: Joseph Mayer, W. K. Archbold, Charles Rufus Harte, Farley Osgood, and W. S. Murray, LX, 539.

"Reinforced Concrete Towers." D. W. Krellwitz. (With Discussion.) LX, 160 (1908).

(1908).

"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company." A. H. Van Cleve. (With Discussion.) LXII, 199 (1909).

"The Lock 12 Development of the Alabama

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." E. L. Sayers and A. C. Polk. (With Discussion.) LXXVIII, 1409 (1915). "The Necaxa Plant of the Mexican Light and Power Company." F. S. Pearson and F. O. Blackwell. LVIII, 37 (1907.) Discussion: Edwin H. Warner, H. F. Labelle, F. G. Baum, and J. D. Galloway, LVIII, 51.

"Transmission of Power in Operating Cable Railways." Robert Gillham. XXIX, 543 (1893). Discussion, XXX, 548 (1893).

PRECIPITATION.

See RAINFALL.

PRESERVATION OF TIMBER.

"A Proposed Method for the —." F. A. Kummer. (With Discussion.) XLIV, 181 (1900).Data for vulcanizing. XXXVII, 320 (1897). PRESERVATION OF TIMBER—(Cont.)

Effect of preservative methods on strength of timber. LI, 83 (1903).
"Preservation of Timber." Report of the Committee. Preliminary Report, XI, 325 (1882). Discussion, XI, 355; Final Report, XIV, 247 (1885). Discussion, XIV,

372. - at Wilmington Harbor, Cal. V, 417 (1876). Discussion, VI, 189 (1877). - from marine wood-borers. XL, 203

Preservatives for wood blocks. LXXXII, 1417, 1462 (1918).

Preservatives for wood stave pipe.

Preservatives for wood stave pipe. LXXXII, 441 et seq. (1918).

"Protecting Piles Against the Teredo Navalis on the Louisville and Nashville Railroad Company's Lines." R. Montaville Discussion.) XXXI, 221 (1894)

"Tests of Creosoted Timber." W. B. Greg-ory, LXX, 37 (1910).
"Tests of Creosoted Timber." W. B. Greg-ory, LXXVI, 1192 (1913).
"The Artificial Preservation of Railroad This by the Live of Time Chlorida!" Well

Ties by the Use of Zinc Chloride." Walter W. Curtis. (With Discussion.) XLII, ter W. Cu 288 (1899).

"The Inspection of Treatment for the Protection of Timber by the Injection of Creosote Oil." H. R. Stanford. LVI, 1 (1906). Discussion: James C. Haugh, J. L. Campbell, Cliff S. Walker, E. H. Bowser, L. J. Le Conte, John B. Lindsey, Jr., and W. K. Hatt, LVI, 10.
"The Kyan Process for— Its Use and Effect at Fort Ontario, New York, 1839 to 1882." William P. Judson. XI, 345 (1882). "The Inspection of Treatment for the Pro-

(1882).

"The Permanent Way of Railways in Great The Permanent Way of Railways in Great Britain and Ireland, with Especial Reference to the Use of Timber Preserved and Unpreserved." John Bogart. VIII, 17, (1879).

"The Preservation of Materials of Construction." An Informal Discussion. William Barclay Parsons and others. L, 293 (1993)

William Day 233 (1993).
"The Preservation of Railway Ties in The Preservation of Chanute. (With Discus-

Europe." O. Chanute. (With Discussion.) XLV, 498 (1901).
"The —." J. W. Putnam. IX, 206 (1880).
"The Teredo Navalis, or Ship-Worm." G.
W. R. Bayley. (With Discussion.) III, 155 (1874).

"Timber Preservation: Its Development and Timber Preservation: its Development and Present Scope." Walter Buehler, LXXI, 364 (1911). Discussion: Richard Lamb, J. Martin Schreiber, George W. Tillson, Ernest F. Hartmann, A. L. Dean, and Clifford Richardson, LXXI, 374.

Treatment of paving blocks. LXVI, 20

(1910).

PRESSES.

"Platen - for Letter-Press Printing, Embossing, Cutting and Scoring. Thomson. XXXII, 493 (1894). John

PRESSURES.

See EARTH PRESSURES: WATER PRESSURES.

PRINTING.

"Platen Presses for Letter-Press—, Em-bossing, Cutting and Scoring." John Thomson. XXXII, 493 (1894).

PROBABILITIES, THEORY OF

Probability paper for plotting diagrams. LXXVII, 684, 1549 (1914). "Short and Easy Methods for Computing Probable Errors." E. A. Fuertes. XLVI,

"Storage to be Provided in Impounding Reservoirs for Municipal Water Supply." Allen Hazen. (With Discussion.) LXXVII, 1539 (1914).

PUBLIC UTILITIES.

See ELECTRIC RAILWAYS: GAS AND GAS-WORKS: POWER PLANTS: RAILROADS: RATE-MAKING. STREET RAILWAYS: TELEGRAPH: TELEPHONES: VALUATION: WA-TER POWER: WATER WORKS.

PUDDLE.

Use of clay and other materials in —. XXVI, 658 (1892).

PULP MILLS.

"The Pulp Mill of the Cliff Paper Company of Niagara Falls, N. Y." Wallace C. Johnson. (With Discussion.) XXXII, 214 (1894).

PULSOMETERS.

"Efficiency of Steam Vacuum Pumps." J. Foster Flagg. V, 381 (1876).

PUMPING ENGINES.

See ENGINES.

PUMPS.

Canal pumping works in Chicago. XXVI, 683 (1892).

Centrifugal sand — used in dredging. LIV, Part C, 303, 391, 479 (1905). Cost of — and pumping stations. LXXIV, 15 (1911).

Drainage — of Holland. XXVI, 622 (1892).
"Efficiency of Steam Vacuum —." J. Foster Flags. V, 381 (1876).
Hydraulic rams for water-works of Nar-

ragansett Bay coaling station. LVII, 224

"Induced Currents of Fluids." F. zur Nedden. (With Discussion.) LXXX, 844 (1916).

"Municipal Water-Works Pumping Engines." Irving H. Reynolds. (Inter. Eng. Cong. 1904.) LIV, Part D, 513 Eng. (1905).

Pumping Machinery. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part D, 533 (1905).

hydraulic pressure, contractors'

plant, Pennsylvania Railroad Tunnels, New York. LXIX, 32 (1910). "Rebuilding Three Large Pumping En-gines." Charles B. Buerger. LXXV, 649

(1912).
Sand—used in dredging. XL, 290 (1898).
"Test of a Three-Stage, Direct-Connected, Centrifugal Pumping Unit." Philip E. Harroun. LVI. 144 (1906). Discussion:
J. Richards, C. D. Marx, Arthur L. Adams, Joseph N. Le Coute, Elmo G. Harris, W. B. Gregory, H. F. Dunham, Clyde Potts, and Edwin Duryea, Jr., LVI. LVI. 184 XL, 290 (1898). LVI, 150.

"The Installation of a Pneumatic Pumping Plant," Arthur H. Diamant. LIV, 1 (1905). Discussion: Elmo G. Harris, and Edward Wegmann, LIV, 19.

PUMPS-(Continued).

"The Principles of Design of Velocity —."
"The Principles of Design of Velocity —."
William Mayo Venable. (Inter. Eng. Cong. 1904.) LIV, Part D., 473 (1905).
"Theory of Centrifugal — and Fans: Analysis of Their Action, with Suggestions for Designs." Elmo G. Harris. I.I. 166 (1903). Discussion: William Mayo Venable, E. T. Adams, Allen Hazen, Joseph Mayer, and Theodore Horton, LI, 224.
Wind mill — of Holland. XXVI, 622 (1892).

QUARRYING.

operations, Lock 12 Development, Alabama Power Company LXXVIII, 1506 (1915).

See also BLASTING.

QUAY WALLS.

See RETAINING WALLS.

QUICKSAND.

Definition and discussion of -. XLIII, 582 590 (1900).

in Excavation." Charles L. McAlpine. (With Discussion.) X, 275 (1881).

RACK RAILROADS. See INCLINED RAILWAYS.

RADIATORS.

"Tests of Condensation in Cast-Iron —." William J. Baldwin. XXXII, 34 (1894).

RAILROAD PLATFORMS.

at Harrison Transfer Yard, Pennsylvania Railroad Terminal, LXVIII, 76 (1910).

- Pennsylvania Terminal St York, LXIX, 201, 259 (1910). Terminal Station, New

RAILROAD STATIONS.

Description of Diagonal Station, Lexington Avenue Subway, New York City. LXXXII, 280, 320 (1918).

Location and design of terminal —. LXIX, 401, 417, 423, 428, 435 (1910).

New York Central and Pennsylvania — in New York City, Brief description of. LXXVI, 1680 (1913).

of Illinois Central R. R. at Chicago. XXXVIII, 315 (1897).
on Manhattan Elevated Railways. Elevated on Manhattan Elevated Railways. LXXXII, 559, 572, 722 (1918). -, Philadelphia Germantown and Norris-

town Railroad, in Philadelphia. LXXVI, 1865 (1913). Removal of New York Central & Hudson River R. R. train-shed. LNI, 131 (1908), "The Detroit Union Depot Viaduct." J. W. XXVIII. (With Discussion.) Schaub.

309 (1893).
"The New Railway Stations at Dresden."
C. Köpcke and O. Klette. XXX, 450

(1893).

(1893).

"The New York Tunnel Extension of the Pennsylvania Railroad. Certain Engineering Structures of the New York Terminal Area." George B. Francis and Joseph H. O'Brien. LXIX, 153 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs. LXIX, 226, 434 (1910).

"The Philadelphia and Reading Terminal Railroad and Station in Philadelphia."

Railroad and Station in Philadelphia.

RAILROAD STATIONS—(Continued).

Joseph M. Wilson. (With Discussion.) XXXIV, 115 (1895).
"The Rearrangement of Rallroad Tracks and Stations in Cologne, Prussia." F.

and Stations in Cologne, Prussia." F.
Lohse. (Translated from the German by
Mansfield Merriman.) XXIX, 277 (1893).
"The Rearrangement of the Railway Terminal System at Altona, with Special
Reference to the Avoidance of Grade
Crossings." R. Caesar. (Translated from
the German by Wm. H. Searles.)
XXIX, 295 (1893). Discussion XXX 512 XXIX, 295 (1893). Discussion, XXX, 512 (1893).

"The Reconstruction of the Passenger Ter-

minals at Washington, D. C." W. F. Strouse. LXXI, 11 (1911).
"The South Terminal Station, Boston, Mass." George B. Francis. (With Discussion.) XLIII, 107 (1900).

See also RAILROAD TERMINALS.

RAILROAD TERMINALS.

"British --." William Theodore Foxlee. (Inter. Eng. Cong. 1904). LIV, Part F, 441 (1905).

"French -.. rench —." Ernest Pontzen. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part F,

493 (1905).

Michigan Central Railroad Terminal at De-troit. LXXIV, 352 (1911). New York Central and Pennsylvania — in

New York City, Brief description of. LXXVI, 1680 (1913). diroad Terminals. Discussion on Inter.

LAAVI, 1000 (1915).
Railroad Terminals. Discussion on Inter.
Eng. Cong. Papers, 1904. Albert P.
Greensfelder, Wilkie Woodard, George
W. Parsons, E. E. R. Tratman, S. G.
Homfray, W. M. Camp, Robert Moore,
Charles L. Morgan, and Elmer L. Corthell. LIV, Part F, 527 (1905).

"—: Review of General Practice." Elmer L.
Corthell (Inter Eng. Cong. 1904). LIV.

Corthell. (Inter. Eng. Cong. 1904). LIV, Part F. 499 (1905).

Part F. 499 (1905).
"Rapid Transit and Terminal Freight Facilities." Report of the Committee. Facilities." Report of the Committee. IV, 1 (1875). Discussion, IV, 240, 251, 252.
"The New York Tunnel Extension of the Pennsylvania Railroad." Charles W. Raymond. LXVIII, 1 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. Certain Engineering Structures of the New York Terrories of the York Terrories of the New York Terrories of the New York Terrories of the New York Terrories of the York Terrories o

neering Structures of the New York Terminal Area." George B. Francis and Joseph H. O'Brien. LXIX, 152 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. Contractors'

Pennsylvania Railroad. Contractors'

Pennsylvania Railroad. Contractors' Plant for East River Tunnels." Henry Japp. LXIX, 1, 393 (1910).

The New York Tunnel Extension of the Pennsylvania Railroad. Discussion on the Sixteen Papers Descriptive of This Work. Edward Wegmaun, Charles E. Fraser, Henry Japp. A. Bartoccini, C. L. Harrison, J. V. Davies, William J. Wilgus, Charles S. Churchill, G. R. Henderson, Edwin B. Katte, George A. Harwood, N. W. Storer, J. H. Gandolfo, E. R. Hill, and George Gibbs. LXIX, 388 (1910). (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad, Meadows Divi-

remsylvania Mairoad. Meadows Division and Harrison Transfer Yard." E. B. Temple. LXVIII, 75 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment,

RAILROAD TERMINALS-(Continued).

Electric Traction, and Locomotives. George Gibbs. LXIX, 226, 434 (1910). "The New York Tunnel Extension of the Pennsylvania Railroad The Bergen Hill Tunnels." F. Lavis. LXVIII, 84 (1910). "The New York Tunnel Extension of the

"The New York Tunner Lace Pennsylvania Railroad. The Cross-Town Tunnels." James H. Brace and Francis Mason. LXVIII, 391 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The East River Pinision." Alfred Noble. LXVIII, 62

(1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The East River Tunnels." James H. Brace, Francis Ma-son, and S. H. Woodard. LXVIII, 419

"The New York Tunnel Extension of the Pennsylvania Railroad. The Lining of the Four Permanent Shafts of the East River Division." F. M. Green. LXIX,

TR (1910).
The New York Tunnel Extension of the Pennsylvania Railroad. The Long Island Approaches to the East River Tunnels." George C. Clarke. LXIX, 91 (1910)

"The New York Tunnel Extension of the Pennsylvania Railroad. The North River Division." Charles M. Jacobs. LXVIII,

32 (1910).

32 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The North River Tunnels." B. H. M. Hewett and W. L. Brown. LXVIII, 152 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The Site of the Terminal Station." George C. Clarke.

LXVIII, 340 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The Sunnyside Yard." Louis H. Barker, LXIX, 132 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The Terminal Station-West." B. F. Cresson, Jr.

Station-West." B. F. Cresson, Jr. LXVIII, 303 (1910).
"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912).
"The Rearrangement of the Railway Terminal Control of the Ra

minal System at Altona, with Special Reference to the Avoidance of Grade Crossings." R. Caesar. (Translated from the German by Wm. H. Searles.) XXIX, 295 (1893). Discussion, XXX, 512 (1893).

"The Reconstruction of the Passenger Terminals at Washington, D. C." W. F. minals at Washington, D. C." Strouse. LXXI, 11 (1911).

See also RAILROAD STATIONS.

RAILROAD YARDS.

 Philadelphia Germantown and Norris-town Railroad, in Philadelphia. LXXVI, 1874 (1913).

1874 (1913).
"The New York Tunnel Extension of the Pennsylvania Railroad. Meadows Division and Harrison Transfer Yard." E. B. Temple. LXVIII, 75 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs. LXIX, 226, 434 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The Sunnyside

RAILROAD YARDS-(Continued).

Yard." Louis H. Barker. LXIX, 132 (1910).

"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912). Windsor Yard, Michigan Central Railroad. LXXIV, 354 (1911).

See also RAILROAD TERMINALS.

RAILROADS.

RAILROADS.

"A Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. (With Discussion.) LXXXI, 413 (1917).

"A Review of the Report of Captain Andrew Talcott, Chief Engineer, Mexico and Pacific Railroad, Eastern Division, from Vera Cruz to Mexico: Explorations, Surveys, Estimates, 1858." Emile Low. LXXX, 1543 (1916). Discussion: T. K. Mathewson, H. T. Douglas, W. T. Ingram, L. Perez Castro, T. M. R. Talcott, and H. M. Taylor, LXXX, 1609.

"Accidents to Railway Structures." Thos. C. Clarke. I, 323 (1872).

Account of Callao, Lima & Oroya Railway, Peru. V, 240 (1876).

"Availability of the Cafions of the Colorado River of the West for Railway Purposes." Robert Brewster Stanton. (With Discussion.) XXVI, 283 (1892).

Baltimore and Ohio Railroad, Early history of. XXVI, 235 (1892).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

"Bridging Cafions Lengthwise." Howard V. Hinckley. XXVI, 521 (1892).

"Bridging Cafions Lengthwise." Howard V. Hinckley. XXVI, 521 (1892). Brief description of — terminating in New York City. LXXVI, 1680 (1913). "Cheap Transportation vs. Rapid Transit and Delivery." Martin Coryell. IX, 401

(1880). "Common Roads, Railways and River Communications in Portugal." Frederico Augusto Pimental. XXIX, 299 (1893).
"Construction Methods for Rogers Pass

Augusto Pimental. XXIX, 299 (1893).

"Construction Methods for Rogers Pass Tunnel." A. C. Dennis. (With Discussion.) LXXXI, 448 (1917).

Delaware & Hudson Canal and Railway, Early history of. VI. 44 (1877).

"Early History of Railways and Origin of Gauge." J. Dutton Steele. (With Discussion.) II, 53 (1873).

"Early Surveys and Reports in Reference to the Transmission of Trade across the Allegheny Mountains in the State of Pennsylvania, known as the Allegheny Portage." Moncure Robinson. XV, 181 (1886).

"Electricity versus Steam for Branch Railroad Lines." An Informal Discussion. H. S. Haines and others. XLII, 375 (1899).

(1899).

"(1899).
"Emergencies on —." Channing M. Bolton.
(With Discussion.) XXVII, 39 (1892).
"English and American — Compared." Edward Bates Dorsey. First Paper, XV, 1 (Jan., 1886): Supplementary Paper, XV, 733 (Nov., 1886). Discussion, XV, 745.
"English and American — Compared in Operating Expenses." Edward Bates Dorsey. XX, 131 (1889).
"European Railways, as They Appear to an American Engineer." W. Howard White. III, 61 (1874). Discussion, IV, 263 (1875).

263 (1875).
"Final Report of the Special Committee to Formulate Principles and Methods

RAILROADS—(Continued).

for the Valuation of Railroad Property

for the Valuation of Raiiroad Property and Other Public Utilities." (With Discussion.) LXXXI, 1311 (1917).

"Free Railway Construction vs. Government Controlled and Owned Railways." E. Bates Dorsey. (With Discussion.) XXV, 628 (1891).

"Harper's Ferry Improvement." William Lee Sisson. XXXII, 351 (1894).

"Heavy Railway Construction in Wyoming." J. I. Boggs. XLVI, 1 (1901). Discussion: Emile Low, XLVI, 17.

"History of the Pennsylvania Avenue Subway, Philadelphia, and Sewer Construction Connected Therewith." George S. Webster and Samuel Tobias Wagner. (With Discussion.) XLIV, 1 (1900).

"How can Railways be Made More Efficient in the Transportation of Freight?" (Discussion on Paper No. 248, Vol. XI, p. 365.) William P. Shinn. XII, 189 (1883). Discussion, XII, 339.

Hudson River Railway, Early history of. VI, 61 (1877).

"Inland Transportation." F. A. Mahan. XXIX, 97 (1893). Discussion, XXX, 457 (1893).

(1893).

XXIX, 97 (1893). Discussion, XXX, 457 (1893).

"Inspection and Maintenance of Railway Structures." A Discussion. John A. Wilson, Willard S. Pope, George H. Pegram, G. Bouscaren, W. S. Lincoln, Joseph M. Wilson, James G. Dagron, J. A. L. Waddell, Edward S. Philbrick, A. Bryson, Robert A. Shailer, W. A. Haven, John M. Goodwin, Albert Lucius, E. P. Dawley, C. A. Marshall, D. J. Whittemore, Theodore Cooper, H. Stanley Goodwin, A. M. Wellington, Percival Roberts. Jr. C. C. Schneider, C. Frank Allen, John Bogart, Frederic Graff, Robert I. Sloan, J. Foster Flagg, J. J. R. Croes, William Kent, Robert Moore, and William J. McAlpine. XVII, 259 (1887).

Lumber—in Northwestern Pennsylvania. XXV, 119 (1891).

"Method Used by the Railroad Commission, of Texas, under the Stock and Bond Law, in Valuing Railroad Properties." R. A. Thompson. LII, 328 (1904). Discussion: E. L. Corthell, F. Lavis, W. H. Coverdale, and W. D. Taylor, LII, 346.

"Methods of Reducing the Cost of Railroad Construction." Alfred F. Sears. II, 1 (1873).

Mohawk & Hudson Railway, Early history of. VI, 49 (1877).

"Mountain Railroad Construction." William Barclay Parsons. XXV, 119 (1891).

"On Form of Railway Excavations and Embarchy and Embarkment with the search of Embarch went in the search of the search of Railroad Construction." XXIV, 556 (1891).

(1891).

(1891).

"On Form of Railway Excavations and Embankments." D. J. Whittemore. (With Discussion.) XXXII, 255 (1894).

"On the Increased Efficiency of Railways for the Transportation of Freight." Wm. P. Shinn. XI, 365 (1882). Discussion, XII, 126, 180, 189, 339 (1883).

"Physical Valuation of —" William J. Wilgus. LXXVII, 203 (1914). Discussion: Maurice G. Parsons, J. Frank Aldrich, J. Shirley Eaton, C. P. Howard, M. H. Brinkley, Albin G. Nicolaysen, F. A. Molitor, Halbert P. Gillette, J. E. Willoughby, S. Whinery, F. Lavis, William W. Crehore, Alexander C. Humphreys, J. H. Gandolfo, T. Kennard Thomson, Charles S. Churchill, R. D. Coombs, Colin M. Ingersoll, Arthur M. Waitt, Stevenson Taylor, F. C. Hand,

RAILROADS—(Continued).

RAILROADS—(Continued).

P. H. Norcross, Charles Rufus Harte, F. W. Green, R. S. McCormick, and Charles Corner, LXXVII, 225.

"Pioneer Railway Development in the United States." W. D. Taylor, LXXIV, 94 (1911). Discussion: Marshall R. Pugh, R. L. Morrison, William J. Boucher, George T. Hammond, and Fred J. Wood, LXXIV, 135.

"Railroad Discrimination against New York and the Remedy." Abel E. Blackmar. XLVI, 182 (1901). Discussion: H. S. Haines, Walter G. Berg, Edward P. North. Andrew H. Green, George Y. Wisner, William G. Raymond, Herman Conrow, and George W. Rafter, XLVI, 195.

"Railroad Location." Michael L. Lynch. (With Discussion.) XXXI, 81 (1894).

— at Paris Exposition of 1900. XLI, 323 (1899).

— in the Republic of Marion in 1902."

(1899).
"—in the Republic of Mexico in 1893."
E. Prieto Basave. (Translated from the Spanish by Foster Crowell.) XXIX, 357

(1893).

"Railways of Mexico." William Barclay Parsons. XXII, 233 (1890). Discussion, XXIII, 285 (1890).

"Rapid Transit and Terminal Freight Facilities." Report of the Committee. IV, 1 (1875). Discussion, IV, 240, 251, 252.

"Remedies for Landslides and Slips on the Kanawha and Michigan Railway." R. P. Black. LXXI, 1 (1911). Discussion: Charles H. Miller, LXXI, 8.

"Reminiscences and Experiences of Early Engineering Operations on —, with Especial Reference to Steep Inclines." W. Milnor Roberts. VII, 197 (1878). Discussion, VII, 216.

Milnor Roberts. VII, 197 (1878). Discussion, VII, 216.
Results of State operation of—in France.
LXXIII, 943. et seq. (1919-20).
"Right of Way for—." Julien A. Hall.
(With Discussion.) XXV. 313 (1891).
"Rivers and—in the United States." William W. Harts. (With Discussion.)
LXYIV 919 (1915)

liam W. Harts. LXXIX, 919 (1915).

"Some Railway Construction in Okla-homa." A. G. Allan. Ll, 424 (1903). Discussion: Samuel H. Lea, Emile Low, H. F. Dunham, and J. P. Snow, Ll, 436

"Steam team Locomotive and Electric Operation for Trunk-Line Traffic: A Comparison of Costs and Earnings." Joseph Mayer,

of Costs and Earnings." Joseph Mayer, LVII, 455 (1906). Discussion: Frank J. Sprague, LVII, 496.
"Study upon—to Connect Guadalajara with the Pacific Ocean." S. V. Pascal. (Translated from the Spanish by Foster Crowell.) XXIX, 373 (1893).
"The Abt System of Railway for Steep Inclines." Walton W. Evans. XV, 147

(1886).

"The American Line from Vera Cruz to the City of Mexico, via Jalapa, with Notes on the Best Methods of Surmounting High Elevations by Rafl." A. M. Wellington. (With Discussion.) XV, 791

"The Canadian Pacific Railway." Presidential Address at the Annual Convention at Milwaukee, Wisconsin, June 28th, 1888. Thomas C. Keefer. XIX, 55

he Cheapest Railroad in the World." Arthur Pew. (With Discussion.) XXIII,

111 (1890).
"The Concurrent Development of Traffic on Improved Waterways and on—." Edward P. North. (With Discussion.)

RAILROADS—(Continued).

(Inter. Eng. Cong. 1904). LIV, Part B, 475 (1905).

"The Construction of a Light Mountain Railroad in the Republic of Colombia." E. J. Chibas. (With Discussion.) XXXVI, 65 (1896).

"The Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains, and the Performance of Locomotives on its Steep Grades." James D Burr. (With Discussion.) VIII, 295 Burr. (With Discussion.) (1879).

(1879).

"The Electrification of the Suburban Zone of the New York Central and Hudson River Railroad in the Vicinity of New York City." William J. Wilgus. (With Discussion.) LXI, 73 (1908).

"The Elements of Cost of Railroad Freight Traffic." O. Chanute. II. 381 (1873).

"The Elevation of the Tracks of the Philadelphia Germantown and Norristown Railroad. Philadelphia, Pa." Samuel Tobias Wagner. LXXVI, 1819 (1913). Discussion: J. P. Snow, E. W. Lewis, Charles Rufus Harte, and George S. Webster. LXXVI, 1900.

"The Hell Gate Arch Bridge and Approaches

"The Hell Gate Arch Bridge and Approaches of the New York Connecting Railroad over the East River in New York City."
O. H. Ammann. (With Discussion.)
LXXXII. 852 (1918).

"The Incline Plane Railroad at Madison. Ind. Its History and Operation." M. J. Becker. VII, 68 (1878). Discussion,

"The Lake Front Improvements of the Illinois Central Railroad in Chicago." John Findlev Wallace. (With Discussion.) XXXVIII, 315 (1897).

ston.) XXXVIII, 315 (1897).

"The 'Light Railways' of the Battle Front in France." Frank G. Jonah. LXXXIII. 1220 (1919-20). Discussion: William Wren Hav. F. W. Green. William M. Black, William J. Wilgus. H. F. Dunham. Morris E. Pumphrey. Hazen L. Hovt. Jr. W. B. Poland. Marshall R. Pugh. Francis W. Perry, and Gavin Hadden. LXXXIII. 1238

"The Location of the Knoxville. La Fol-

Hadden, I.XXXIII. 1238
"The Location of the Knoxville. La Follette and Jellico Railroad, of the Louisville and Nashville System." W. D. Taylor. LII. 467 (1904) Discussion: Emile Low, William P. Watson, E. J. Beard, Walter Watson, William G. Raymond, F. Lavis, W. H. Coverdale, Harvey Linton, and W. T. Forsythe, LII, 400

490.

"The National Railroad Question of To-Day." Francis Lee Stuart. LXXXIII, 927 (1919-20). Discussion: T. Kennard Thomson, A. J. County, George W. Kittredge, Calvin Tomkins, Augustus Smith. John H. Bernhard, G. J. Ray, Herbert C. Keith, Clement C. Williams, C. A. Morse, and S. Whinery, LXXXIII, 935.

Morse, and S. Whinery, LXXXIII, 935.

"The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa." George S. Webster and Samuel Tobias Wagner. XLVIII, 470 (1902). Discussion: Joseph M. Wilson, Charles G. Darrach, William Barclay Parsons, George A. Soper, and Richard L. Humphrey. XLVIII, 591.

"The Production of Traffic and the Transportation of Freight and Passengers." Martin Correll (With Discussion). II

Coryell. (With Discussion.) II, Martin

240 (1873).

"The Prospective Competitor Method of Valuation of Property." M. L. Byers.

RAILROADS—(Continued).

(With Discussion.) LXXXIII, 1313 (1919-20)

"The Railway System of New South Wales." Thomas Fletcher Birrell. Wales," Thoma XXIX, 326 (1893).

XXIX. 326 (1893).

"The Substitution of Electricity for Steam as a Motive Power for Suburban Traffic." John Findley Wallace. (With Discussion.) XXXVII, 133 (1897).

"The Valuation of Public Service Corporation Property." Henry Earle Riggs. (With Discussion.) LXXII, 1 (1911).

"Uniformity of Requirement and Clearness of Specification in Agreements for the Graduation of —." W. F. Dennis. (With Discussion.) LVIII, 321 (1907). Valuation of railroad land. LXXXI, 614

(1917).

See also ACCOUNTS: BRAKES: CABLE RAILWAYS: CURVES: ELECTRIC RAILWAYS: ELEVATED RAILROADS: FERRIES: FREIGHT: FROG POINTS: CROSSINGS: GAUGE: GRADE GRADES: GUARD RAILS: RAILROAD STATIONS: RAILROAD TERMINALS: RAILS: ROLLING STOCK: ROUND-HOUSES: SHIP RAILWAYS: SIGNAL-ING; SURVEYING: TIES: TRACK: TRAIN LOADS: TRAIN RESISTANCE: TUNNELS: TRANSFER TABLES: TURN-TABLES: UNDER-GROUND RAILWAYS: VALUATION: WHEELS.

RAILS.

"A Brief Description of a Modern Street Railway Track Construction." A. C. (With Discussion.) LXXVI, 455 (1913).

"A Memoir on —." Ashbel Welch. III, 106 (1874). Discussion, III, 109; IV, 233 (1875).

(1875).

"Comparative Economy of Steel—with Light and Heavy Heads." Ashbei Welch. X. 251 (1881).

"Cylindrical Wheels and Flat-Topped—for Railways." D. J. Whittemore. XXI, 133 (1889). Discussion, XXI, 153.
"Destruction of—by Excessive Weights." Joseph T. Dodge. (With Discussion.) XX. 121 (1889).

"Development of the American Rail and Track." J. Elfreth Watkins. XXII, 209 (1890).

(1890).

"Final Report of Special Committee on Rail Sections." LXX, 456 (1910). Form of — for electric railways. LXIII,

Form 96 (1909)

"History of the Iron—upon the Michigan Southern and Northern Indiana Rail-way." Charles Paine. (With Discus-

way." Charles Paine. (With Discussion.) I, 249 (1872).

Lift-rail for Dumbarton Point Draw-Bridge. LXXVI, 1618 (1913).

"Notes on the Weight of — and the Breaking of Iron—." O. Chanute, III, 111 (1874). Discussion, IV, 233 (1875).

"On the Form, Weight, Manufacture and Life of—." Report of the Committee. First Report, III, 87 (1874); Discussion, III, 109; Second Report, IV, 136 (1875); Discussion, IV, 233; Final Report, V, 237 (1876). 327 (1876).

"Pioneer Railway Development in the United States." W. D. Taylor. (With Discussion.) LXXIV, 94 (1911).

"Progress Report of the Special Commit-tee to Report on Stresses in Railroad Track." LXXXII, 1191 (1918). "Proper Relation to Each Other of the

"Proper Relation to Each Other of the Sections of Railway Wheels and —."
Report of the Committee. Preliminary Report, XIX. 1 (1888); Final Report, XXI, 223 (1889).
"Recent Practice in —." An Informal Discussion. Robert W. Hunt, Albert Ladd Colby, William R. Webster, John F. Wallace, Sir Lowthian Bell, and J. D. Smelt. XLIV, 475 (1900).
"Second Progress Report of the Special

Wallace, Sir Lowthian Bell, and J. D. Smelt. XLIV, 475 (1900).

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." (With Discussion.) LXXXIII, 1409 (1919-20).

"Some Notes on the Creeping of —." Samuel Tobias Wagner. LIII. 466 (1904). Discussion: G. Lindenthal. W. M. Camp. F. S. Stevens, Hunter McDonald. P. H. Dudlev. George Tatnall. Joseph S. Ward, and Charles Rufus Harte. LIII, 479.

"Standard Rail Sections." Report of the Committee. Progress Report. XXIV. 1 (1891): Final Report, XXVIII, 425 (1893). The Influence of — on Street Pavements." Edward P. North. (With Discussion.) XXXVII, 70 (1897).

See also TRACK.

See also TRACK.

RAINFALL.

RAINFALL.

"A Method of Determining Storm-Water Run-Off." Charles R. Buerger. (With Discussion.) LXXVIII, 1139 (1915).

"Analysis of the—at Lake Cochituate, Mass., 1852-1883." Desmond FitzGerald. (With Discussion.) XIII, 359 (1884).

California precipitation and run-off. LXXX, 57, 113, et seq. (1916).

"Comparison between—and Run-Off in the Northeastern United States." John C. Hoyt. LIX, 431 (1907). Discussion: E. C. Murphy, Charles A. Holden, H. C. Frankenfield and Alfred J. Henry, Thaddeus Merriman, Raphael Zon, C. C. Vermeule, H. K. Barrows, J. C. Stevens, M. O. Leighton, F. H. Newell, A. P. Davis, N. C. Grover, and F. W. Hanna, LIX, 484.
"Computing Run-Off from—and Other

"Computing Run-Off from — and Data." Adolph F. Other Physical Data." Adolph F. Meyer.
LXXIX, 1056 (1915). Discussion: Joel
D. Justin, A. M. Strong, E. F. Chandler.
C. E. Grunsky, Robert E. Horton, and
W. G. Hoyt, LXXIX, 1156.
"Derivation of Run-Off from — Data." Joel
D. Justin, (With Discussion, LXXVIII.

Justin. (With Discussion.) LXXVII, 346 (1914).

"Distribution of — during the Great Storm of October 3 and 4, 1869." James B. Francis. VII, 224 (1878). Effect of — on water storage in San Bernardino Basin, California. LXXXII, 802.

et seq. (1918).

et seq. (1918).

"Excessive Rainfalls Considered with Especial Reference to Their Occurrence in Populous Districts," R. L. Hoxie. (With Discussion.) XXV, 70 (1891).

"Forests and Reservoirs in Their Relation to Stream Flow, with Particular Reference to Navigable Rivers," H. M. Chittenden. (With Discussion.) LXII, 245 (1909). 245 (1909).

"Hydrology of the Panama Canal." Mills Saville. (With Discussion.) LXXVI, 871 (1913).

"Maximum Rates of -." Desmond Fitz-Gerald, XXI, 93 (1889).

RAINFALL—(Continued).

"Maximum Rates of — at Boston." Charles W. Sherman. LIV, 173 (1905). Discussion: Kenneth Allen, C. E. Gregory, Asa E. Phillips, E. Kuichling, L. J. Le Conte, William Mayo Venable, C. S. Burns, S. Whinery, and George S. Webster, LIV, 181.

Maximum rates of—in New York City. LXXXI, 1062 (1917). Maximum rates of—in the United States. LXXVII, 622 (1914).

"Notes on - at Savannah, Georgia." J. de

Bruyn-Kops. LX, 248 (1908).
"Notes on the Flow of the West Branch of the Croton River." J. James R. Croes. III, 76 (1874). Discussion, IV,

Croes. III, 76 (1874). Discussion, 1V, 297 (1875).

"Rain and Run-Off near San Francisco. California." C. E. Grunsky. LXI, 496 (1908). Discussion: E. C. Murphy. Edwin Duryea, Jr., H. L. Haehl and Asahel C. Toll. and A. G. McAdie, LXI, 516.

"—and River-Flow." Cyrus C. Babb. (With Discussion.) XXVIII, 323 (1893).

"—and Run-Off in Storm-Water Sewers." Charles Emerson Gregory. (With Discussion.) LVIII, 458 (1907).

—and run-off near San Diego, Cal. LXXV, 29, 54 (1912).

29, 54 (1912). at Calgary and LXXXI, 225 (1917). Gleichen, Alberta. Nacozari, Mexico. LXXVIII. 571

(1915).

—at Tuscaloosa, Ala. XLIX, 310 (1902).

"—. Flow of Streams, and Storage." Desimond FitzGerald. (With Discussion.) XXVII, 253 (1892).

—in Great Lakes Basin, XL, 436 (1898).

—in Java, LIV, Part C, 35 (1905).

in Monterpey, Moying, LXXII, 480

Monterrey, Mexico. LXXII. (1911).

— in Owens Valley, California. LXXVIII, 164 (1915).

in parts of Mexico and Southwestern United States. LXXX, 1996, 2000, et seq. (1916).

in Potomac Basin, XXVII, 29 (1892).
in San Francisco, LXV, 310 (1909).
in Southern California, LXXVII, (1914).

in the Philippine Islands. LXV, 388 (1909)

vicinity of Puget Sound, XLI, 1 (1899).

of the South Platte River Basin. LIII, 90, 153 (1904).

Run-off of Cedar River, Washington, XLI, 10 (1899).

Run-off of Hudson River, 1888 to 1899. XLIII, 325 (1900).

"South African Irrigation." Francis Rob-ert Johnson. (With Discussion.) LII,

1 (1904). "Storage and Pondage of Water." Joseph P. Frizell. XXXI, 29 (1891). Discussion, XXXI, 552.

"NAAI, 552.
"Suggested Changes and Extension of the United States Weather Bureau Service in California." George S. Binckley, and Charles H. Lee. (With Discussion.) LXXXI, 161 (1917).
"The Cause of Rain and the Structure of the Atmosphere." Franz A. Velschow.

the Atmosphere." XXIII, 303 (1890).

"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." W. B. Clapp, E. C. Murphy, and W. F. Martin. (With Discussion.) LXI, 281 (1908). RAINFALL—(Continued).

"The Flow of the Sudbury River, Massa-chusetts, for the Years 1875 to 1879." Alphonse Fteley. (With Discussion.) X, 225 (1881).

"The Relation between the - and the Discharge of Sewers in Populous Districts." Knichling. (With Discussion.) XX, 1 (1889).

"Twenty Years' Run-Off, at Holyoke, Mass., of the Connecticut River." Clemens Her-schel. (With Discussion.) LVIII, 29 (1907)

"Water Supply for the Lock Canal at Panama." Julio F. Sorzano. (With Discussion.) LXVII, 61 (1910).
"Yield of the Sudbury River Watershed in the Freshet of Feb. 10th-13th, 1886."
Desmond FitzGerald. XXV, 253 (1891).

RAPID TRANSIT.

"- and Terminal Freight Facilities." Report of the Committee. IV, 1 (1875). Discussion, IV, 240, 251, 252.

RATE-MAKING.

RATE-MAKING.

"A Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. LXXXI, 413 (1917). Discussion: Frank S. M. Harris, T. Kennard Thomson, W. B. Yereance, Leonard C. Jordan, H. F. Clark, Allen Hazen, W. G. Irving, and H. A. Whitney. LXXXI, 423.
"Depreciation as an Element for Consideration in the Appraisal of Public Service Properties." C. E. Grunsky. (With Discussion.) LXXIX, 727 (1915).

"The Valuation of Public Utility Property." J. H. Gandolfo. (With Discussion.) LXXIX, 842 (1915).

See also VALUATION.

REFRIGERATOR SYSTEMS.

REFRIGERATOR SYSTEMS.
Refrigerating plant at the Washington Terminal Station. LXXI, 100 (1911).
Refrigerating plant, Pennsylvania Railroad Terminal, New York. LXIX. 290 (1910).
"The Colorado Automatic Refrigerator System at Denver, Colo." A. McL. Hawks. XXIV, 389 (1891).
Use of balsa wood in—. LXXXI, 149 (1917).

REFUSE DESTRUCTORS.

"Municipal Refuse Disposal: An Investi-gation." J. T. Fetherston. (With Dis-cussion.) LX, 345 (1998). The Delancy Slip rubbish incinerator and

electric lighting station, New York City. LVII, 69 (1906). Various — described. L, 100 et seq. (1903).

REFUSE DISPOSAL.

"Disposal of Municipal Refuse, and Rubbish Incineration," H. de B. Parsons.

bish Incineration." H. de B. Parsons. LVII, 45 (1906).

Disposal of Municipal Refuse. Discussion on Inter. Eng. Cong. Papers, 1904. W. Francis Goodrich, M. N. Baker, Shirley C. Hulse, Andrew Rosewater, Robert Spurr Weston, George W. Fuller, Gardner S. Williams, L. J. Le Conte, J. C. H. Stut. Ed. Vermehren. Bohm and Grohn, G. Watson, Rudolph Hering, and P. Tur. LIV. Part E. 319 (1905).

"Disposal of Municipal Refuse: Review of General Practice." Rudolph Hering.

REFUSE DISPOSAL—(Continued).

(Inter. Eng. Cong. 1904.) LIV, Part E,

(Inter. Eng. Cong. 1904.) LIV, Part E., 265 (1905).
"European Sewage and Garbage Removal."
W. Howard White. XV, 849 (1886).
"Municipal—: An Investigation." J. T.
Fetherston. LX, 345 (1908). Discussion:
W. M. Venable. Albert A. Cary, E. H.
Foster, R. F. Welton. C. Herschel Koyl,
Louis L. Tribus, H. Norman Leask, Rutger B. Green. George N. Cole. Edwin A. ger B. Green, George N. Cole, Edwin A. Fisher, Frederick L. Stearns, William F. Morse, E. B. Newton, and Rudolph Hering. LX, 390.

Hering. LX, 390.
"Note on the Removal and Utilization of Municipal Refuse in French Cities." P. Tur. (Translated from the French.) (Inter. Eng. Cong. 1904.) LIV, Part E, 309

(1905).

ewage and Wastes Disposal for the United States Army." Leonard S. Doten. (With Discussion.) LXXXIII, 337 (1919-"Sewage

1920).

1920),
"The Sanitary Disposal of Municipal Refuse." An Informal Discussion. Rudolph Hering, John McGaw Woodbury, H. de B. Parsons, W. F. Morse, George A. Soper, Theodore Horton, W. J. Baldwin, Charles B. Ball, M. N. Baker, Elmer W. Firth. Myron S. Falk, Charles H. Haswell, W. H. Booth, and H. A. Young. L. 95 (1903).
"The Sanitation of Construction Camps." Harold Farnsworth Gray. (With Dis-

Harold Farnsworth Gray. (Vension.) LXXVI, 493 (1913). (With Dis-

See also SEWAGE DISPOSAL. REINFORCED CONCRETE.

"A Few Points in the Design of - Arches." B. R. Leffler. (With Discussion.) 183 (1905).

183 (1905).
"A—Stand-Pipe." W. W. Clifford. (With Discussion.) LXXIV, 375 (1911).
"Bond-Friction-Resistance in—." William Fry Scott. LXXIII. 230 (1911). Discussion: Edward Godfrev. Joseph T. Maguire. A. N. Talbot. Hector Robins Burroughs, Albert I. Frye, and F. E. Turneaure, LXXIII. 267.
"Cinder Concepts, Floor Construction Bernard F. Edward F.

"Cinder Concrete Floor Construction Be-tween Steel Beams." Harold Perrine and George E. Strehan. (With Discussion.) LXXIX, 523 (1915).

"Cinder Concrete Floors." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914). Concrete and Concrete-Steel. Discussion (With Discussion.) LXXVII, 1773 (1914). Concrete and Concrete-Steel. Discussion on Inter. Eng. Cong. Papers, 1904. W. W. Christie, Albert W. Buel. R. J. Gifford Read, F. Schüle, Richard L. Humphrey, J. L. Van Ornum, Oswald Erlinghagen, Robert W. Lesley, Charles G. Darrach. A. N. Talbot, Gardner S. Williams, William B. Fuller, Rudolph P. Miller, Oscar Lowinson, G. N. Knapp, H. F. Dunham, E. P. Goodrich, J. B. Marsh, Augustus Smith, Frank Beckwith, W. K. Hatt, A. L. Johnson, Sanford E. Thompson, W. D. Pence, C. A. Wentworth, E. M. Scofield, Sidney B. Williamson, Edwin Thacher, John S. Sewell, and Fritz von Emperger. LIV, Part E, 545 (1905). "Concrete and Concrete-Steel in France." A. Considère. (Translated from the French by Paul A. Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part E, 495 (1905). "Concrete and Concrete-Steel in Holland." J. J. L. Bourdrer. (Inter. Eng. Cong. 1904.) LIV, Part E, 507 (1905).

REINFORCED CONCRETE-(Continued).

"Concrete and Concrete-Steel in the United States." Edwin Thacher. (Inter. Eng. Cong. 1904.) LIV, Part E. 425 (1905). "Concrete and Concrete-Steel in the United States." John S. Sawal.

"Concrete and Concrete-Steel in the United States." John S. Sewell. (Inter. Eng. Cong. 1904.) LIV, Part E, 459 (1905). "Concrete Bridges: Some Important Features in Their Design." Walter M. Smith, Sr., and Walter M. Smith, Jr. (With Discussion.) LXXVII, 695 (1914). "Concrete-Steel Bridges." Fritz von Emperger. (Inter. Eng. Cong. 1904.) LIV, Part E, 523 (1905). Deflection of — beams under repeated loadings. LXXVII, 449 (1914). Failure of the — Ambursen dam across Stony River, West Virginia. LXXVII, 1069 (1914). "Final Report of the Special Committee on

"Final Report of the Special Committee on Concrete and —." (With Discussion.) LXXXI, 1101 (1917).
Final Report of the Special Committee on Concrete and —. Discussion by L. J. Mench and others. LXXXII, 1541 (1918).
Historical sketch of use of concrete and —. LXXVII, 393 (1914).
"Method of Designing a Rectangular — Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. LXXX, 1689 (1916). Discussion: Edward Godfrey, E. P. Goodrich, Ernst F. Jon-LXXX, 1689 (1916). Discussion: Edward Godfrey, E. P. Goodrich, Ernist F. Jonson, Charles M. Montgomery, C. A. P. Turner, Henry T. Eddy, L. J. Mensch, Charles F. Marsh, and Franklin R. Mc-Millan, LXXX, 1697.

"Note on the Coefficient of Elasticity of Concrete and Mortar Beams during Flexion". Myron S. Falk. (With Discussions)

ure." Myron S. Falk. (With Discussion.) L, 473 (1903).
"Progress Report of Special Committee on Concrete and " (With Discussion.) (With Discussion.) Concrete and -.' LXVI, 431 (1910).

"Progress Report of the Special Commit-tee on Concrete and -." LXXVII, 385

(1914).

"Proof of an Assumption in the Theory of Concrete Beams." Ralph E. Goodwin. (With Discussion.) LXXVIII, 1263 (1915).

- Bridge Across the Almendares River, Havana, Cuba." Eugene Klapp and W. J. Douglas. (With Discussion.) LXXIV,

216 (1911).

- construction bridges

- construction in bridges and floors. XXXI, 438 (1894).

"- Docks: Foreign and American Structures. Failures, Costs, and General Considerations." Harrison S. Taft. LXXVIII, 1058 (1915). Discussion: J. H. H. Muirhead, W. J. Barney, Eugene W. Stern, R. D. Coombs, Joel J. Pemoff, William Goldsmith, DeWitt C. Webb, Joshua F. Ramsbotham, Chandler Davis, E. G. Walker, and W. J. Douglas. LXXVIII, 1112. LXXVIII, 1112.

filter-bed covering. -- for XLIII, 307

(1900).

- for reservoirs and bridges at Monterrey, Mexico. LXXII, 475 (1911).

— for retaining walls, etc., Yale Bowl. LXXXI, 259 (1917).

"- Foundations over Excavations on Paved "— Foundations over Excavations on Paved Streets." John McNeal. LX, 217 (1908).

"— Pipe for Carrying Water under Pressure." Chester Wason Smith. (With Discussion.) LX, 124 (1908).

"— Reservoir and Congulation Plant at St. Louis, Mo." Edward Flad. (With Discussion.) LXXVII, 1052 (1914).

REINFORCED CONCRETE—(Continued).

"— Towers." D. W. Krellwitz. LX, 160 (1908). Discussion: R. D. Coombs, LX, 169.

169.

— used for sidewalks at Paris Exposition of 1900. XLI, 312 (1899).

Reinforcement used in Huacal Concrete Arch Dam. LXXVIII, 595 (1915).

"Report on a Series of Tests on Concrete Columns Reinforced with a Spiral of Steel." C. G. Wrentmore, Hugh Brodie, and C. O. Carey. LXXVIII, 97 (1915). Discussion: Edward Godfrey, and A. W. Buel, LXXVIII, 140.

Sections of pipe line for Tieton Canal. LXXI, 158 (1911).

"Shearing Strength of Construction Joints"

LXXI, 158 (1911).
"Shearing Strength of Construction Joints in Stems of — T-Beams, as Shown by Tests." Lewis J. Johnson and John R. Nichols. LXXVII, 1499 (1914). Discussion: L. J. Mensch, J. P. Snow, D. Gutman, Elwyn E. Seely, Alfred B. Heiser, Henry G. Raff, G. E. Doyen, Thomas H. Wiggin and Alexis Saurhrey, LXXVII. Wiggin, and Alexis Saurbrey, LXXVII.

1523.
"Some Mooted Questions in — Design." Edome Mooted Questions in — Design." Edward Godfrey. LXX, 54 (1910). Discussion: Joseph Wright, S. Bent Russell, J. R. Worcester, L. J. Mensch, Walter W. Clifford, J. C. Meem, George H. Myers, Edwin Thacher, C. A. P. Turner, Paul Chapman, E. P. Goodrich, Albin H. Beyer, John C. Ostrup, Harry F. Porter, John Stephen Sewell, and Sanford E. Thompson, LXX, 72. becifications for metal reinforcement:

John Stephen Sewell, and Sanford E. Thompson, LXX, 72.

Specifications for metal reinforcement: Progress report of Special Committee on Concrete and — LXXVII, 430 (1914). Specifications for — in bridges and subways. LXXV, 328, 335 (1912).

Specifications for — in bridges and subways. LXXV, 328, 335 (1912).

Specifications for — in bridges and subways. LXXV, 1017 (1917).

"Statical Limitations Upon the Steel Requirement in — Flat Slab Floors." John R. Nichols. LXXVII, 1670 (1914). Discussion: L. J. Mensch, C. A. P. Turner, Edward Godfrey, H. T. Eddy, A. W. Buel, E. G. Walker, William W. Crehore, and A. E. Greene, LXXVII, 1682.

"Steel Centering Used in the Construction of the Rocky River Bridge, Cleveland, Ohio." Wilbur J. Watson. (With Discussion.) LXXIV, 1 (1911).

"Steel Concrete Construction." George Hill. (With Discussion.) XXXIX, 617 (1898). "Steel-Concrete Construction." An Informal Discussion. R. S. Buck, L. S. Moisseiff, J. R. Worcester, H. S. Jacoby, Leonard C. Wason, A. L. Johnson, William Parker, and William B. Fuller. XLVI, 93 (1901). "Steel Stresses in Flat Slabs." H. T.

XLVI, 93 (1901).

"Steel Stresses Eddy. LXXV in Flat Slabs." H. Steel Stresses in Flat Slabs." H. T. Eddy. LXXVII, 1338 (1914). Discussion: Edward Godfrey, H. E. Eckles, Sanford E. Thompson, L. J. Mensch, W. K. Hatt, George S. Binckley, and C. A. P. Turner, LXXVII. 1389.

"Stresses in Wedge-Shaped — Beams." William Cain. (With Discussion.) LXXVII, 745 (1914).

LXXVII, 745 (1914).

Strosses in wedge-shaped — beams. Discussion. A. C. Janni, and William Cain.

LXXVIII, 734 (1915).

"Temperature Stresses in a Series of Spans." Tresham D. Gregg. (With Discussion.) LXXX, 1626 (1916).

Tests of—slabs made with tufa cement for Los Angeles Aqueduct. LXXVI, 535 (1913).

(1913)

"The Cherry Street Bridge, Toledo, Ohio." Clement E. Chase. (With Discussion.) LXXX, 744 (1916).

REINFORCED CONCRETE—(Continued).

"The Design and Construction of Four—Viaducts at Fort Worth, Texas." S. W. Bowen. (With Discussion.) LXXVIII, 1206 (1915).

"The Development and Recent Improvement of Concrete-Iron Highway Bridges." Fr. von Emperger. (With Discussion.)

von Emperger. XXXI, 438 (1894).

von Emperger. (With Discussion.)

XXXI, 438 (1894).

"The Economical Design of —Floor Systems for Fire-Resisting Structures:"
John S. Sewell. LVI, 252 (1906). Discussion: Wilbur J. Watson, Clarence W. Noble, I. Kreuger, Richard T. Dana, C. A. P. Turner, Ernst F. Jonson, Leonard C. Wason, E. P. Goodrich, Edwin Thacher, H. T. Forchhammer, Arthur W. French, Irving P. Church, B. R. Leffler, George Hill, F. P. Shearwood, Mansfield Merriman, A. H. Perkins, Langdon Pearse, C. B. Wing, and William Cain, LVI, 289.

"The Fatigue of Concrete." J. L. Van Ornum, LVIII, 294 (1907).

"The Picaza Bridge." A. A. Agramonte. LXXX, 200 (1916).

"The—Bridge Aeross the Hudson River at Sandy Hill, New York." William H. Burr. (With Discussion.) LIX, 195 (1907).

Sandy Hill, New York." William H. Burr. (With Discussion.) LIX, 195 (1907).

"The — Wharf of the United Fruit Company at Bocas del Toro, Panama." T. Howard Barnes. (With Discussion.) LXVI, 289 (1910).

"The — Work of the McGraw Building." William H. Burr. LX, 443 (1908). Discussion: H. F. Tucker, W. J. Douglas, Carl Gayler, J. A. Jamieson, Walter M. Smith, Clarence W. Noble, Guy B. Waite, E. P. Goodrich, T. L. Condron and F. F. Sinks, E. W. Stern. L. J. Mensch, and P. E. Stevens, LX, 458.

"The Twelfth Street Trafficway Viaduct, Kansas City, Missouri." E. E. Howard. (With Discussion.) LXXX, 484 (1916).

"The Use of — in Engineering Structures." An Informal Discussion. E. P. Goodrich, Edwin Thacher, Sanford E. Thompson, William H. Burr, T. Kennard Thomson, D. W. Krellwitz, Guy B. Waite, C. L. Slocum, Myron S. Falk, Rudolph P. Miller, Engene W. Stern, and H. C. Turner. LXI, 25 (1908).
"Theory of — joists." John L. Hall. (With Discussion.) LXXVI, 145 (1913).
"Theory of the Spherical or Conical Dome of — or Metal." William Cain. LV, 201 (1905).
"Two—Coal Pockets." Myron S. Falk.

(1905).

"Two—Coal Pockets." Myron S. Falk.
LXXI, 192 (1911).
Use of concrete and—in caissons. LIV,
Part E, 136 (1905).
Use of high-carbon steel in—. LXXX,

540, 588 (1916). Use of — for paving earth dams. LXXXIII, 314 (1919-20). Use of — for wharves. LXXVII, 503 (1914).

REPORTS OF COMMITTEES.

"American Engineering at the Paris Exposition of 1878." (Report of the Committee on the Exhibition made by this Society.) George S. Morison, Edward P. North, and John Bogart. VII, 317 (1878). "Cause of the Failure of the South Fork Dam." Report of the Committee. James B. Francis, W. E. Worthen, M. J. Becker, and A. Fteley. (With Discussion). XXIV, 431 (1891).
"Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry." Report of Progress of the

REPORTS OF COMMITTEES—(Continued)

Committee, F. Collingwood, D. J. Whittemore, W. W. Maclay, T. C. McCollom. Thomas L. Casey, George F. Swain, and Arthur V. Abbott. XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888). "Cost and Work of Pumping Engines." Re-

Jr., W. Milnor Roberts, and John Bogart. IV, 142 (1875). Discussion, IV,

233.

"Final Report of Special Committee on Rail Sections." Joseph T. Richards, C. W. Buchholz, E. C. Carter, S. M. Felton, Robert W. Hunt, John D. Isaacs, Richard Montfort, H. G. Prout, Percival Roberts. Jr., George E. Thackray. Edmund K. Turner, and William R. Webster. LXX, 456 (1910).

"Final Report of the Special Committee on Concrete and Reinforced Concrete." Joseph R. Worcester, Richard L. Humphrey, J. E. Greiner, W. K. Hatt, Olaf Hoff, Robert W. Lesley, Emil Swensson, ad Arthur N. Talbot, LXXXI, 1101 (1917). Discussion: A. H. Rhett, William Fry Scott, Carl Gayler, H. V. Hinckley, Henry T. Eddy, C. A. P. Turner, F. E. Turneaure, and A. N. Talbot, LXXXI, 1153. 1153.

1155.

Final report of the Special Committee on Concrete and Reinforced Concrete. Discussion: L. J. Mensch, G. S. Bergendahl, E. S. Martin, W. K. Hatt, Charles F. Marsh, Clinton S. Bissell, J. R. Worcester, and F. E. Turneaure. LXXXII, 1541 (1918).

dani, E. S. Martin, W. K. Hatt, Charles F. Marsh, Clinton S. Bissell, J. R. Worcester, and F. E. Turneaure. LXXXII, 1541 (1918).

"Final Report of the Special Committee on Floods and Flood Prevention." C. McD. Townsend, John A. Bensel, T. G. Dabney, J. B. Lippincott, Daniel W. Mead. J. A. Ockerson, Arthur T. Safford, Charles Saville, F. L. Sellew, and C. E. Grunsky. LXXXI, 1218 (1917); Minority Report. Morris Knowles. LXXXI, 1230 Discussion: H. M. Eakin, John Hill, M. O. Leighton, Cyrus S. Babb, Kenneth C. Grant, B. F. Groat, H. M. Chittenden, Myron L. Fuller, Gerard H. Matthes, H. K. Barrows, N. C. Grover, E. C. La Rue, Farley Gannett, C. E. Grunsky, C. McD. Townsend, and Morris Knowles, LXXXI, 1235.

"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use." W. W. Crosby, H. K. Bishop, A. H. Blanchard, A. W. Dean, N. P. Lewis, C. J. Tilden, and G. W. Tillson, LXXXII, 1384 (1918). Discussion: E. Dow Giman and J. O. Preston, LXXXII, 1466.
"Final Report of the Special Committee on Steel Columns and Struts." Lewis D. Rights, James H. Edwards, C. W. Hudson, Charles F. Loweth, Ralph Modjeski, George F. Swain, Emil Swensson, and J. R. Worcester, LXXXIII, 1583 (1919-1920). Discussion: Langle Syndension: Langle Gustav Lindenthal, Charles Evan Fowler, J. A. L. Waddell, Edward Godfrey, William H. Burr, R. von Fabrice, L. J. Mensch, LXXXIII, 1634.

"Final Report of the Special Committee on Uniform Tests of Cement." George

Mensch, LXXXIII, 1634.

"Final Report of the Special Committee on Uniform Tests of Cement." George S. Webster, Richard L. Humphrey, W. B. W. Howe, F. H. Lewis, S. B. Newberry, Alfred Noble, Clifford Richardson, L. C. Sabin, and George F. Swain. LXXV, 665 (1912).

"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Property and Other Public Utilities." Frederic P.

REPORTS OF COMMITTEES-(Continued) Stearns, Charles S. Churchill, William G. Raymond, Henry E. Riggs, J. Parker Snow, William J. Wilgus, and Leonard Metcalf. LXXXI, 1311 (1917). Discussion: J. E. Wiloughby, C. E. Grunsky, Joseph Mayer, and W. R. McCann, LXXXI, 1584.

"Final Report of the Special Committee to Investigate the Conditions of Employment of and Compensation of Civil

"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." Nelson P. Lewis, John A. Bensel, S. L. F. Deyo, Dugald C. Jackson, William V. Judson, C. F. Loweth, and George W. Tillson, LXXXI, 1207 (1917). Discussion: H. S. Schick, Lewis A. Jones, and R. S. Wise, LXXXI, 1216. "Nomenclature of Building Stones and of Stone Masonry." Report of the Committee. J. James R. Croes, William E. Merrill, and Edgar B. Van Winkle. VI, 297 (1877). Discussion, VII, 284 (1878). "On the Fallure of the Worcester Dam." Report of the Committee. Theodore G. Ellis, David M. Greene, and William W. Wilson. (With Discussion.) V. 244 (1876). "On the Form, Weight, Manufacture and Life of Rails." Report of the Committee. Ashbel Welch, M. N. Forney, O. Chanute, and I. M. St. John. First Report, III, 87 (1874): Discussion, III, 109; Second Report, IV, 136 (1875): Discussion, IV, 233; Final Report, V, 327 (1876). "On the Means of Averting Bridge Accidents." Report of the Committee. James B. Eads, C. Shaler Smith, Thomas C. Ciarke, Julius W. Adams, Alfred P. Boller, Charles Macdonald, and Theodore G. Ellis. IV, 122 (1875). Discussion, IV, 208. "Preservation of Timber." Report of the Committee. O. Chanute, B. M. Harrod,

"Preservation of Timber." Report of the Committee. O. Chanute, B. M. Harrod, G. Bouscaren, E. R. Andrews, E. W. Bowditch, G. H. Mendell, C. Shaler Smith, J. W. Putnam, and Frederic Graff. Prellminary Report, XI, 325 (1882); Discussion, XI, 355; Final Report, XIV, 247 (1885); Discussion, XIV, 372.

"Progress Report of Special Committee on Bituminous Materials for Road Construc-tion." W. W. Crosby, A. H. Blanchard, H. K. Bishop, and A. W. Dean. LXVI, 429 (1910).

429 (1910).

"Progress Report of Special Committee on Concrete and Reinforced Concrete." C. C. Schneider, Emil Swensson, Richard L. Humphrey, J. E. Greiner, W. K. Hatt, Olaf Hoff, Robert W. Lesley, A. N. Talbot, and J. R. Worcester. LXVI, 431 (1910). Discussion: Wilbur J. Watson, John Stephen Sewell, Clarence W. Noble, S. Bent Russell, J. R. Worcester, W. J. Douglas, and C. A. P. Turner, LXVI, 467.

"Progress Report of Special Committee on

"Progress Report of Special Committee on Steel Columns and Struts." Austin Lord Bowman, Lewis D. Rights, Alfred P. Boller, Emll Gerber, Charles F. Loweth, Ralph Modjeski, Frank C. Osborn, George H. Pegram, George F. Swain, Emil Swensson, and Joseph R. Worcester. LXVI, 401 (1910). Discussion: Thomas H. Johnson, LXVI, 427.
"Progress Report of the Special Committee on Concrete and Reinforced Concrete." J. R. Worcester, Richard L. Humphrey, W. K. Hatt, Olaf Hoff, J. E. Greiner, R. W. Lesley, A. N. Talbot, and Emil Swensson. LXXVII, 385 (1914).
"Progress Report of the Special Committee "Progress Report of Special Committee on

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." Arthur N. Talbot, A. S. Bald-

REPORTS OF COMMITTEES—(Continued)

win, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing, Robert W. Hunt, George W. Kittredge, Paul M. LaBach, C. G. E. Larsson, G. J. Ray, Albert F. Reichmann, H. R. Safford, F. E. Turneaure, and J. E. Willoughby. LXXXII, 1191 (1918)

(1918).

and J. E. Willoughby. LXXXII, 1191 (1918).

"Proper Relation to Each Other of the Sections of Railway Wheels and Ralls." Report of the Committee. H. Stanley Goodwin, A. M. Wellington, Samuel Rea, George S. Morlson, Thomas Rodd, James Archbald, and S. M. Felton. Preliminary Report, XIX, 1 (1888); Final Report, XXI, 223 (1889).

"Rallway Signals." Report of the Committee. J. Dutton Steele, Octave Chanute, and Charles H. Fisher. IV, 147 (1875). Discussion, IV, 237.

"Rapid Transit and Terminal Freight Facilities." Report of the Committee. O. Chanute, M. N. Forney, Ashbel Welch, Charles K. Graham, and Francis Collingwood. IV, 1 (1875). Discussion, IV, 240, 251, 252.

"Second Progress Report of the Special

wood. 19, 1 (1843). Discussion, 19, 240, 251, 252.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." Arthur N. Talbot, A. S. Baldwin, G. H. Bremner, John Brunner, W. J. Burton, Charles S. Churchill, W. C. Cushing. W. M. Dawley, Robert W. Hunt, J. B. Jenkins, George W. Kittredge, Paul M. LaBach, C. G. E. Larsson, G. J. Ray, Albert F. Relchmann, H. R. Safford, F. E. Turneaure, and J. E. Willoughby. LXXXIII, 1409 (1919-20). Discussion: A. W. Buel, and E. P. Goodrich, LXXXIII, 1581.

"Specificatious and Methods of Tests for Portland Cement." Alfred Noble, George S. Webster, Richard L. Humphrey, George F. Swain, Olaf Hoff, Clifford Richardson, Arthur P. Davis, Asa E. Phillips, and Rudolph Wig. LXXXII, 166 (1918).

"Standard Rail Sections." Report of the

"Standard Rail Sections." Report of the Committee. G. Bouscaren, Foster Crowell, S. M. Felton, H. Stanley Goodwin, Samuel Rea, J. D. Hawks, Robert W. Hunt, George S. Morison, E. T. D. Myers, Thomas Rodd, A. M. Wellington, Virgil G. Bogue, and F. M. Wilder, Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).
"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of Members of the American Society of Civil Engineers. (With Discussion.) LIX, 208 (1907). "Standard Rail Sections." Report of the Committee. G. Bouscaren, Foster Cro-

of Members of the American Society of Civil Engineers. (With Discussion.) LIX. 208 (1997).

"The Failure of the Dam on Mill River." Report of the Committee. James B. Francis, Theodore G. Ellis, and William E. Worthen. III, 118 (1874). Discussion, III, 122; IV, 310 (1875).

"Uniform System for Tests of Cement." Report of the Committee. Q. A. Gillmore, D. J. Whittemore, J. Herbert Shedd, Eliot C. Clarke, Alfred Noble, F. O. Norton, W. W. Maclay, Leonard F. Beckwith, and Thos. C. McCollom. Preliminary Report, XIII. 53 (1884); Final Report, XIV, 475 (1885).

RESERVOIRS.

A Cheap Covered Reservoir." Arthur D. Foote. (With Discussion.) XXV, 228 (1891).

RESERVOIRS—(Continued).

RESERVOIRS—(Continued).

"A Mathematical Analysis of the Influence of — upon Stream-Flow." James A. Seddon. XL, 401 (1898).

A Phenomenal Land Slide." (at Portland, Ore.) D. D. Clarke. (With Discussion.) LIII, 322 (1904).

"A Study of the Depth of Annual Evaporation from Lake Conchos, Mexico." Edwin Duryea, Jr., and H. L. Haehl. (With Discussion.) LXXX, 1829 (1916).

"An Account of the Method Adopted to Repair a Breach in the Earthen Dam of the Storing Reservoir of the New Bedford Water-Works." William J. McAlpine. I, 57 (1872).

Asphalt for reservoir lining, XXXV, 70

Asphalt for reservoir lining, XXXV, 70

(1896).

"Concrete-Lined Oil-Storage - in Califor-"Concrete-Lined Oil-Storage—in California: Construction Methods and Cost Data." E. D. Cole. LXXX, 691 (1916). Discussion: C. P. Bowie, Emile Low, and Ralph J. Reed, LXXX, 715.
"Construction Methods Used in Building the Lower Reservoir Dam of the Balmorhea Project." Vernon L. Sullivan. (With Discussion). LXXXIII, 305 (1919-1990)

1920).

"Construction of a High-Service Reservoir at Baltimore, Md." P. A. Beatty. LXXVI, 92 (1913).

92 (1913).
Description of — LXX, 174 (1910).
"Detention — with Spillway Outlets as an Agency in Flood Control." H. M. Chittenden. LXXXII, 1473 (1918). Discussion: Arthur E. Morgan, Alex. Rice Mc-Kim, T. Kennard Thomson, Adolph F. Meyer, William M. Hall, Fred. H. Tibbetts, H. A. Petterson, Ivan E. Houk, Kenneth C. Grant, and Morris Knowles, LXXXII, 1493.
Effect of — on stream flow. XXXI, 36 (1894).

(1894).

(1894).

"Forests and — in Their Relation to Stream Flow, with Particular Reference to Navigable Rivers." H. M. Chittenden. (With Discussion). LXII, 245 (1909).

"Lake Cheesman Dam and Reservoir." Charles L. Harrison and Silas H. Woodard. (With Discussion). LIII, 89 (1904). Lists of — for flood prevention or river control in the United States and foreign countries. LXXVI, 1463 et seq. (1913). New York City water supply, Brief description of — for. LXXVI, 1787 (1913).
"Notes upon the Construction of a Water System for Placer Mining, and Suggestions for a New Method of Dam Building." Robert Brewster Stanton. (With Discussion.) XXXV, 70 (1896).

Prevention of floods by means of storage — LXXVI, 302 (1913).

"Reinforced Concrete Reservoir and Coagnitation." Plant at St. Louis. Ma." Ed.

LXXVI, 302 (1913).

"Reinforced Concrete Reservoir and Coagulation Plant at St. Louis, Mo." Edward Flad. LXXVII, 1052 (1914). Discussion: J. K. Finch, Alexander Potter, Charles B. Buerger, A. W. Buel, and Edward Wegmann, LXXVII, 1061.

Repair of—at Portland, Ore. LXXXII, 776 (1918).

- 776 (1918).
 Reservoir at Astoria, Oregon, Water-Works.
 XXXVI, 27 (1896).
 "Reservoir System of the Great Lakes of
 the St. Lawrence Basin; Its Relation
 to the Problem of Improving the Navigation of these Bodies of Water and
 of their Connecting Channels." Hiram
 M. Chittenden. (With Discussion.) XL,
 355 (1898) 355 (1898)
- a method of flood control. LXXXI.
- 1224 (1917).

 for control of floods in rivers. LXXVI, 1455 et seq. (1913).

RESERVOIRS—(Continued).

-for locomotive water supply. LI, 431 (1903).

-- for water-works, Monterrey,

LXXII, 506 (1911).
"Storage and Pondage of Water." Joseph P. Frizell. XXXI, 29 (1894). Discussion, XXXI, 552.
Storage in underground —. LXXVII, 67

(1914).

Storage — XVI, 92 (1887).
Storage — for irrigation. XLIX, 24 (1902).
"Storage of be Provided in Impounding —
for Municipal Water Supply." Allen
Hazen. (With Discussion.) LXXVII,
1539 (1914).

"Temperature of Water at Various Depths in Lakes and Occans." Hamilton Smith. (With Discussion.) XIII, 73 (1884).
"The Construction of the Sweetwater Dam." James D. Schnyler. (With Discussion.) XIX, 201 (1888).
"The Determination of Safe Yield of Underground—of the Closed-Basin Type." Charles H. Lee. (With Discussion.) LXXVIII. 148 (1915).
"The Dunning's Dam, near Scranton, Pa." E. Sherman Gould. (With Discussion.) XXXII, 389 (1894).
"The East Canyon Creek Dam." A. F. Parker. (With Discussion.) LXXXIII, 574 (1919-20).

Parker. (With Discussion.) LXXXIII, 574 (1919-20).

"The Economic Aspect of Seepage and Other Losses in Irrigation Systems." E. G. Hopson. (With Discussion.) LXXVI, 336 (1913).

"The Groined Arch as a Covering for—and Sand Filters: Its Strength and Volume." Leonard Metcalf. (With Discussion.) XLIII, 37 (1900).

The North Dike of the Wachusett Reservoir. XLVIII, 254, 259 (1902).

"The Outlet Control of Little Bear Valley Reservoir." F. E. Trask. LXVI, 280 (1910).

(1910).

"The Prewitt Reservoir Proposition." J. C. Ulrich. LXXVII, 96 (1914).
"The Silt Problem of the Zuni Reservoir." H. F. Robinson. LXXXIII, 868 (1919-20). Discussion: Elwood Mead, Clarence Jarvis, and George M. Post, LXXXIII,

879.
"The Temperature of Lakes." Desmond
FitzGerald. (With Discussion.) XXXIV,

FitzGerald. (With Discussion.) XXXIV, 67 (1895).

"The Use of Asphaltum for Reservoir Linings." James D. Schuyler. XXVII, 629 (1892). Discussion, XXVIII, 130 (1893).

"The Vicksburg Settling Basins." Clarence Delafield. XXI. 88 (1889).

"The Water-Works of Syracuse, N. Y." William R. Hill. (With Discussion.) XXXIV, 23 (1895).

"Two Earth Dams of the United States Reclamation Service." D. C. Henny. (With Discussion.) LXXIV, 38 (1911).

"Water Supply for the Lock Canal at Panama." Julio F. Sorzano. (With Discussion.) LXVII, 61 (1910).

See also DAMS.

RETAINING WALLS.

"Cylindrical Foundations for a Quay Wall in the Harbour of Delfzyl." W. F. Druyvesteyn. (With Discussion.) (Inter-Eng. Cong. 1904.) LIV, Part E, 125

"Earth Pressures: A Practical Comparison of Theories and Experiments." L. D. Cornish. (With Discussion.) LXXXI, 191 (1917).

"Experiments on - and Pressures on Tun-

RETAINING WALLS-(Continued).

nels." William Cain. (With Discussion.)

LXXII, 403 (1911).
"Fremantle Graving Dock: Steel Dam Construction for North Wall." Joshua Fielden Ramsbotham (With Discussion.)

den Ramsbotham. (With Discussion, LXXVI, 1942 (1913).

"Lateral Earth Pressures and Related Phenomena." E. P. Goodrich. (With Discussion.) LIII, 272 (1904).

"Method Used to Secure the Stability of a Quay Wall at the Port of Altona, on the Elbe, in Germany, which had Shifted its Position after Completion." Berthold Stahl. XXX, 284 (1893). Discussion, XXX, 687.

"Quay and Other—," John D. Van

"Quay and Other—" John D. Van Buren. II, 193 (1873).
"—: An Attempt to Reconcile Theory with Practice." Casimir Constable. III, 67 (1874). Discussion, 111, 74; IV, 310 (1875).

- and abutments, track elevation, Phila-delphia. LXXVI, 1833 (1913).

delphia. LXXVI, 1833 (1913).

-at Terminal Station. New York Tunnel Extension of the Pennsylvania Railroad. LXVIII, 328, 347, 369 (1910).

-for Yale Bowl. LXXXI, 259 (1917).

-on New York Connecting Railroad. LXXXII, 969, 981 (1918).

Sea wall at Boston Harbor. VII, 21 (1878). Sea walls, Chicago Lake Front. XXXVIII, 324 (1897)

324 (1897).

324 (1897).

Specifications for — XLVIII, 486 (1902).

"Stresses in Wedge-Shaped Reinforced Concrete Beams." William Cain. (With Discussion.) LXXVII, 745 (1914).

"Sub-Aqueous Underpinning." A. G. Menocal. XI, 181 (1882).

"The Improvement of the Water Front of the City of New York." John D. Van Buren. (With Discussion.) III, 172 (1874). (1874).

"The Proper Profile for Resisting Wave Action." (Abstract.) Robert Fletcher.

Action." (Abstract.) Robert Fletcher. XXXVI, 514 (1896).
"The Use of Asphaltum in Building Sea Walls." W. C. Ambrose. (With Discussion.) XXIV, 223 (1891).

REVETMENT.

See DIKES: LEVEES: RETAINING WALLS.

RIFLES.

See SMALL ARMS.

RIGHT OF WAY.

"- for Railroads." Julien A. Hall. (With Discussion.) XXV, 313 (1891).

RIVERS.

"A Desirable Method of Dredging Channels through River Bars." S. P. Maximoff. (With Discussion.) L11, 215 (1904).
"A Few Remarks about the Niagara
Gorge." L. L. Buck. (With Discussion.)
XXXII, 205 (1894).
"A Mathematical Analysis of the Influence
of Reservoirs Unon Stream-Flow."

of Reservoirs Upon Stream-Flow."

James A. Seddon. XL, 401 (1898).

Application of the theory of flow through contractions to the design of the flood-prevention works of the Mlami Conservancy District. LXXXIII, 1205 (1919-20).

"Artificial Waterways in the United States."

William L. Sibert. (Inter Eng Cong

William L. Sibert. (Inter. Eng. Cong. 1904). LIV, Part F, 255 (1905). "Availability of the Cañons of the Colorado

RIVERS—(Continued).

River of the West for Railway Pur-poses." Robert Brewster Stanton.

River of the West for Railway Purposes." Robert Brewster Stanton. (With Discussion.) XXVI. 283 (1892). "Back-Water in Streams as Produced by Dams." De Volson Wood. (With Discussion.) II, 255 (1873).
"Bank Revetment on the Lower Mississippi." H. St. L. Coppée. (With Discussion.) XXXV, 141 (1896).
"Calculations of the Mean Horse-Power of a Variable Stream and the Cost of Replacing the Power Lost by a Partial Diversion of the Flow." William II. Grant. (With Discussion.) XXII, 389 Grant. (With Discussion.) XXII, 389 (1890).

(1890).

"Characteristics of the Ravine du Sud in the Island of Hayti, and Plan for Averting its Overflow." J. Foster Crowell. XXIV, 470 (1891). Discussion, XXIV, 478; XXV, 343 (1891).

"Common Roads, Railways and River Communications in Portugal." Frederico Augusto Pimental. XXIX, 299 (1893).

"Comparison Between Rainfall and Runoff in the Northeastern United States." John C. Hoyt. (With Discussion.) LIX, 431 (1907).

John C. Hoye. 431 (1907). "Computing Run-Off from Rainfall and Other Physical Data." Adolph F. Meyer. (With Discussion.) LXXIX, 1056 (1915).

"Control of the Colorado River as Related to the Protection of Imperial Valley." to the Protection of Imperial Valley."
J. C. Allison. LXXXI, 297 (1917). Discussion: A. I., Sonderegger, and J. A. Ockerson. LXXXI, 326.

Current deflectors for deepening river channels. XL, 231 (1898).
"Cut-Offs on the Mississippi River. Their Effect on the Channel Above and Below." Caleb G. Forshey. V, 317 (1876)

(1876).

"Description of the Lower Weser and its Improvement." L. Franzius. (Trans-lated from the German by T. H. Me-Cann, assisted by Albert Beyer.) XXIX, 173 (1893). Discussion, XXX, 483 (1893).

"Detention Reservoirs with Spillway Outlets as an Agency in Flood Control."
H. M. Chittenden, (With Discussion.)
LXXXII, 1473 (1918).

"Dredges and Dredging on the Mississippi River." J. A. Ockerson. (With Dis-cussion.) XL. 215 (1898). "Erosion of River Banks on the Missis-sippi and Missouri—." J. A. Ockerson. XXVIII, 396 (1893). Discussion, XXXI, 1 (1894).

"Final Report of the Special Committee on Floods and Flood Prevention." (With Discussion.) LXXXI, 1218 (1917).

(With Discussion.) LXXXI, 1218 (1917).

"Flood Flows," Weston E. Fuller. (With Discussion.) LXXVII, 564 (1914).

"Forests and Reservoirs in Their Relation to Stream Flow, with Particular Reference to Navigable—" H. M. Chittenden. LXII, 245 (1909). Discussion: F. Collingwood, Thomas P. Roberts, Stephen Child, L. J. Le Conte, F. B. Maltby, J. Francis Le Baron, Edward P. North, A. Miller Todd, William W. Harts, George Otis Smith, George F. Swain, W. H. Leffingwell and A. M. Strong, Bailey Willis, M. O. Leighton, W. D. Piekett, Robert E. McMath, H. F. Labelle, Emil Kuichling, Robert Fletcher, J. P. Snow, Clarence T. Johnson, and Gifford Pinchot. LXII, 319.

"Gauging of Cedar River, Washington."

RIVERS—(Continued).

Theron A. Noble. XLI, 1 (1899). (With Discussion.)

Gauging of Potomac River. XXVIII, 211

(1893).

"Gauging of Streams." A Discussion.
David M. Greene. V, 251 (1876).
Gaugings of Missouri River at Great Falls,
Mont. XXVII, 65 (1892).
"History of the Conversion of the River

Clyde into a Navigable Water-Way, and of the Progress of Glasgow Harbour

of the Progress of Glasgow Harbour from its Commencement to the Present Day." James Deas. XXIX, 128 (1893). Discussion, XXX, 478 (1893). Lee diversion in—. LXXXII. 1138 (1918). "Improvement of the Black Warrior, Warrior and Tombigbee—, in Alabama." R. C. McCalla. XLIX, 212 (1902) Discussion: William L. Sibert. D. A. Watt. George Y. Wisner. John M. G. Watt, George T. Nelles, Edward P. North, S. Whinery, George W. Rafter. Theodore Belzner, William M. Hall, B. F. Thomas. D. M. Andrews, and Nat. A. Yuille, XLIX, 266. "Inland Navigation in France." A. Charguéraud. (Translated from the French by Foster Crowell.) (Inter Eng. Cong. 1904.) LIV, Part F, 235 (1905). "Inland Transportation." F. A. Mahan. XXIX, 97 (1893). Discussion, XXX, 457 (1893).

(1893)

(1893).

"Irrigation and River Control in the Colorado River Delta." H. T. Cory. LXXVI, 1204 (1913). Discussion: L. J. Le Conte, Morris Knowles, Francis L. Sellew, Elwood Mead. W. W. Follett. R. H. Forbes, R. S. Buck, F. T. Robson, Andrew M. Chaffey, C. E. Grunsky, Clarence K. Clarke, and U. S. Marshall, LXXVI, 1454.

"Levee Theory Tested by Facts." Robert E. McMath. XIII. 331 (1884). Discussion, XIV, 219 (1885).

"Levees, as a System for Reclaiming Lowlands." George W. R. Bayley. V, 115 (1876). Discussion, V, 299; VI, 305 (1877).

(1877).

"Measurement of the Flow of Streams by Approved Forms of Weirs with New Formulas and Diagrams: Details and Summaries of the Results of Experiments by Francis, Bazin, Fteley and Stearns, and at the Hydraulic Laboratories of Cornell University and the University of Utah." Richard R. Lyman. (With Discussion.) LXXVII, 1189 (1914).
"Natural Waterways: A Review of their Development in the Netherlands." A. B. Marinkelle. (Inter. Eng. Cong. 1904.) LIV, Part D, 401 (1905).
Natural Waterways: Discussion on Inter.

Natural Waterways: Discussion on Inter. Eng. Cong. Papers. 1994. William M. Hall, E. L. Corthell, Lewis M. Haupt, A. Miller Todd, C. H. West, Arthur Hider, and K. E. Hilgard. LIV, Part D, 449 (1905).

Ravigation Works Executed in France from 1876 to 1891." F. Guillain. (Translated from the French by C. L. Crandall, assisted by C. W. Sherman.) XXIX, 1 "Navigation

(1893).

"Note on the Improvement of the Mississippi River." W. G. Price. LX, 339 (1908). Discussion: L. E. Lion, LX. 342.

"Notes on the Flow of the West Branch of the Croton River." J. James R. Croes. III, 76 (1874). Discussion, IV, 297 (1875). "Notes on the Improvement of River and

RIVERS—(Continued).

Harbor Outlets in the United States." D. A. Watt. LV, 288 (1905). Discussion: L. J. LeConte and William W. Harts, LV, 306.

"Notes on the Improvement of the Mouth of the Mississippi." W. Milnor Roberts. IV. 321 (1875). Discussion, IV, 332; V, 275 (1876).

275 (1876).

"Notes on the South Pass Jetties." Max E. Schmidt. IX, 290 (1880).

"On Flood Heights in the Mississippi River, with Especial Reference to the Reach between Helena and Vicksburg." William Starling. XX, 195 (1889).

"On the Determination of the Flood Discharge of—and of the Backwater Caused by Contractions." William R. Hutton. (With Discussion.) XI, 211 (1882) (1882).

"On the Effect of a Rapidly Increasing Supply of Water to a Stream, on the Flow below the Point of Supply. James B. Francis. (With Discussion.) 558 (1889).

"On the Flow of Water in —." De Volson Wood. VIII, 173 (1879). "Physiography of Water-Sheds and Chan-"Physiography of Water-Sheds and Chan-nels, and Analysis of Stream Action of Southern California—, with Reference to the Problems of Flood Control." A. L. Sonderegger. LXXXIII, 1111 (1919-1920). Discussion: Charles A. Pohl. Francis H. Wright, H. F. Dunham, and Fred D. Bowlus, LXXVIII, 1135. Pollution of —, XXV, 125 (1891). "Practical Consequences of Variation of the Wet Section of — under General and

Wet Section of — under General and Special Conditions." Robert E. McMath. IX. 377 (1880).

"Rainfall and River Flow" ainfall and River Flow" Cyrus C. Babb. (With Discussion.) XXVIII, 323 (1893). "Rainfall, Flow of Streams, and Storage." Desmond FitzGerald. (With Discussion.)

Desmond FitzGerald. (With Discussion.) XXVII, 253 (1892).

"Reclamation of the Potomac Flats at Washington. D. C." Peter C. Hains. XXXI. 55 (1894). Discussion, XXXI. 489 "Removal of Rock 40 Ft, below Surface of Water, North River. N. Y." John A. Bensel. (With Discussion.) XXXII, 231 (1894)

231 (1894)

"Reservoir System of the Great Lakes of the St. Lawrence Basin: Its Relation to the Problem of Improving the Navigation of These Bodies of Water and of Their Connecting Channels." Hiram M. Chittenden. (With Discussion.) XL, 355 (1898).
"River Hydraulics." James A. Seddon. (With Discussion.) XLULI 179 (1900).

"River Hydraulics." James A. Seddon.
(With Discussion) XLIII, 179 (1900).
"River Protection Work on the Kansas
City Southern Railway, near Braden,
Okla." J. A. Lahmer, LXVI, 387 (1910).
Discussion: Charles H. Miller, LXVI, 395.

"—and Railroads in the United States."
William W. Harts. LXXIX. 919 (1915).
Discussion: F. Lavis, H. Burgess, H. T.
Pease, J. H. Bernhard, and Emile Low,
LXXIX. 933.
"Rolling Dams." K. E. Hilgard, (Inter, Eng.
Cong. 1904.) LIV. Part D. 439 (1905).
"Some Notes on the Holland Dikes." William Starting, (With Discussion) XVVII

iam Starling. (With Discussion.) XXVI, 559, (1892).

"Some Observations on the Subject of the Improvement of Several of the — of the Atlantic Coast" W. P. Craighill. (With Discussion.) XIX, 233 (1888). RIVERS—(Continued).

"Some Principles Relating to the Administration of Streams." Clarence T. Johnston. LXXVIII, 630 (1915). Discussion: Herbert E. Bellamy, John II. Lewis, Robert E. Horton, and George P. Decker, LXXVIII, 649.

"Standard Levee Sections." H. St. L. Coppée. (With Discussion.) XXXIX,

191 (1898).

"Stream Contamination and Sewage Puritream Contamination and Sewage Purification." An Informal Discussion. R. E. McMath. W. C. Parmley, Gardner S. Williams, Peter Milne. Kenneth Allen. James Owen, Charles G. Darrach. E. W. Harrison, P. A. Maignen, L. L. Tribus, Palmer C. Ricketts, James S. Haring, and James H. Fuertes. XLII, 160 (1890).

"Technical Methods of River Improvement as Developed on the Lower Improvement as Developed on the Lower Missouri River, by the General Government, from 1876 to 1903," S. Waters Fox. LIV, 280 (1905). Discussion: Samuel H. Yonge, H. M. Chittenden, and L. J. Le Conte, LIV, 327.

"The Atchafalaya River: Some of its Peen-liar Physical Characteristics." J. A. Ockerson. LVIII. 1 (1907). Discussion: Henry B. Richardson, T. G. Dabney, Frank M. Kerr, and L. J. Le Conte, LVIII. 12.

"The Brazos River Harbor Improvement."

Coopen Y. Wisner YVV 510 (1801).

Discussion, XXV, 537: XXVI, 518 (1892).

"The Causes of the Formation of Bars at the Mouths of—, as Shown in an Examination of the Connecticut River."

Theodore G. Ellis, II, 313 (1873).

"The Control of Hydraulic Mining in California by the Federal Government."
William W. Harts, LVII, 1 (1906). Disfornia by the Federal Government." William W. Harts, LVII, 1 (1906). Dis-cussion: H. H. Wadsworth. Franklin Riffle, J. D. Galloway, H. De C. Richards,

Riffle, J. D., Galloway, H., De C. Richards, and Stephen E. Kieffer, LVII, 31.

"The Control of Non-Navigable Streams by the National Government" An Informal Discussion. Rudolph Hering, Charles C. Dorrach, and Francis Collingwood, XLIX, 14 (1902).

"The Dangers Threatening the Navigation

of the Mississippi River and the Re-clamation of its Alluvial Lands." B. M. Harrod. VII, 243 (1878). "The Davis (Crevasse) Levee." Sidney F.

Lewis, XVII, 199 (1887).
"The Dolta of the Mississippi, Considered

The Delta of the Mississinni, Considered in Relation to an 'Oren River Mouth' 'John G. Barnard. IV, 104 (1875). Discussion, IV, 290, 297. The Design of a Drift Barrier across White River, near Anhurn Washington, 'H. H. Wolff. LXXX, 2061 (1916). Discussion: H. M. Chittenden, and W. J. Roberts. LXXX. 2077. The Discharge of the Mississipni River 'William Starling. XXXIV, 347 (1895). Discussion, XXXV, 305 (1896). "The

William Starling, XXXIV, Discussion, XXXV, 305 (1896).

Discussion. XXXV, 305 (1896).
"The Economic Improvement of the Coosa and Alabama"—, in Georgia and Mabama." D. M. Andrews, L. 363 (1903). Discussion: R. R. Raymond, L. 380.
"The Failure of the Yuba River Débris Barrier, and the Efforts Made for Its Maintenance." H. H. Wadsworth. (With Discussion.) LXXI, 217 (1911).
"The First Trip through Big Horn Cañon." E. Gillette, XXV, 8 (1891).
"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins,

RIVERS-(Continued).

RIVERS—(Continued).

California." W. B. Claop. E. C. Murnhy, and W. F. Martin. LXI, 281 (1908). Discussion: C. E. Grunsky, H. M. Chittenden, H. F. Labelle, Luther Wagoner, H. H. Wadsworth, George L. Dillman, and Edwin Duryea, Jr., LXI, 331.

"The Flood of March 22d. 1912, at Pittsburgh, Pa." Kenneth C. Grant. (With Discussion.) LXXVI, 302 (1913).

"The Floods of the Mississippi Delta: Their Causes, and Suggestions as to Their Causes, and Suggestions as to Their Control." William D. Pickett. LXIII, 53 (1909).

"The Flow of the Sudbury River, Massachusetts, for the Years 1875 to 1879" Alphonse Fteley. (With Discussion.) X, 225 (1881).

225 (1881).

"The Gauging of Streams." Clemens Herschel. VII, 236 (1878).
"The Hydrography of the Potomac Basin."

Cyrus C. Babb. XXVII, 21 (1892). (With Discussion.)

XXVII, 21 (1892).

"The Improvement of Channels in Sedimentary—." George H. Henshaw. XX, 109 (1889). Discussion, XX, 116, 229.

"The Improvement of James River, Virginia." H. D. Whitcomb. XXVIII, 209 (1893). Discussion, XXVIII, 445.

"The Improvement of the Mississippi River." William Starling, XX, 85 (1889). Discussion, XX, 229.

"The Improvement of the Ohio River."

"The Improvement of the Ohio River."
William L. Sihert. LXIII, 388 (1909).
Discussion: Theron M. Ripley, LXIII, 426.

"The Levee Theory on the Mississippi

"The Levee Theory on the Mississippi River." An Informal Discussion. B. M. Harrod and others. LI, 331 (1903).

"The Levees of the Missippi River." Caleb. G. Forshev, III. 267, 289 (1874). Discussion, IV. 85 (1875).

"The Limits Attainable in Improving the Navigability of—by Means of Regulation." H. Engels. (Translated from the Covern by Konnoth Allen). VXIV. 202

tion." H. Engels. (Translated from the German by Kenneth Allen.) XXIX, 202 (1893). Discussion, XXX, 492 (1893).
"The Lower Colorado River and the Salton Basin." C. E. Grunsky. LIX. 1 (1907). Discussion: W. G. Price, Rutger B. Green, T. G. Dabney. W. De H. Washington, and J. A. Ockerson, LIX. 52.
"The Mean Velocity of Streams Flowing in Natural Channels." Robert E. McMath XI 186 (1882)

Math. XI, 186 (1882).
"The Overflow of the Mississippi River."
Lyman Bridges. (With Discussion.) XI, 251 (1882).

"The Preservation of the Falls of St. Anthony." F. U. Farauhar, (With Dis-

"The Preservation of the Falls of St. Anthony." F U. Farauhar. (With Discussion.) XII, 393 (1883).
"The Redemption of the Great Valley of California." A D. Foote. (With Discussion.) LXVI, 229 (1910).
"The South Pass Jetties. Descriptive and Incidental Notes and Memoranda." E. L. Corthell. VII, 131 (1878). Discussion, VII, 150

VII, 159. "The South Pass Jetties. Notes on the Consolidation and Durability of the Works, with a Description of the Con-crete Blocks and Other Constructions of the Last Year. Max E. Schmidt. VIII, 189 (1879).

"The South I'ass Jetties. Practical Teachings in River and Har-bor Hydraulies," E. L. Corthell. XIII, 313 (1884). Discussion, XV, 223 (1886). "The Storage of Flood-Waters for IrrigaRIVERS—(Continued).

from Southern California Streams." M. Strong. (With Discussion.) LXXVII, 67 (1914).

67 (1914).
"The Suspension of Solids in Flowing Water." Elon Huntington Hooker. (With Discussion.) XXXVI, 239 (1896).
"The Water Power of the Falls of St. Anthony." Joseph P. Frizell. (With Discussion.) XII, 412 (1883).
"Twenty Years Run-Off, at Holyoke, Mass., of the Connecticut River." Clemens Herschel. LVIII, 29 (1907). Discussion: H. V. Hinckley, and John C. Hoyt, LVIII, 34.
"Wing Dams in the Mississippi above the

"Wing Dams in the Mississippi above the Falls of St. Anthony." Edward P. North. VI. 268 (1877). "Yield of the Sudbury River Water-Shed in the Freshet of Feb. 10th-13th, 1886." Desmond FitzGerald. XXV. 253 (1891).

RIVET SPACING.

60(m)

"A Direct Method of Spacing Rivets and Finding the Position, etc., of Stiffeners in Plate Girders." E. Schmitt. (With Discussion.) XLV, 550 (1901).

RIVETED JOINTS.

"Experiments on Iron and Steel Joints, Riveted on an Angle." Bertram B. Flint. XXVII, 406 (1892).

RIVETING MACHINES.

Riveting machine for field riveting on steel pipe. XXXVIII, 264 (1897).

ROADS.

ROADS.

"A Brief History of Road Conditions and Legislation in California." Marsden Manson. XLVIII, 327 (1902). Discussion: James Owen, and George W. Tillson, XLVIII, 354.

"A New Method of Calculating Cross-Sections of — and Railroads." Francisco Da Silva Ribeiro. (Translated from the French by Foster Crowell.) XXIX, 447 (1893). Discussion, XXX, 533 (1893).

"A Suggested Improvement in Building Water-Bound Macadam —." J. L. Meem. LXXVI, 988 (1913). Discussion: F. G. Frink, C. H. Sweetser, W. W. Crosby, J. C. Meem, and Arthur H. Blanchard, LXXVI, 991. LXXVI, 991.

"An Investigation of Sand-Clay Mixtures for Road Surfacing." John C. Koch. LXXVII, 1454 (1914). Discussion: E. W. James, Arthur H. Blanchard, Spencer J. Stewart and James Owen, LXXVII,

1482.

Ancient — XXIV, 325 (1891).

"California Practice in Highway Construction." W. C. Hammatt. LXXVII, 1760 (1914). Discussion: Allen Hoar, LXXVII, 1769.

Classification of rock for -. LXXV, 583

(1912)

(1912).

"Common—, Railways and River Communications in Portugal." Frederico Augusto Pimental. XXIX, 299 (1893).

Construction of earth and sand clay—. LXXXII, 1400 (1918).

Definitions of highway engineering terms. LXXXII, 1420 et seq. (1918).

Description of the French road system. LXXVII, 152 (1914).

"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use." (With Discussion.) LXXXII, 1384 (1918).

ROADS—(Continued).

Foundations of oil-mixed Portland cement concrete for -. LXXIV, 268 et seq. (1911).

Gravel —. LXXXII, 1388, 1411 (1918).

Gravel—. LXXXII, 1388, 1411 (1918).

"Has Experience Demonstrated That the Oiling—is the Most Satisfactory or Economical Method of Preventing Dust and Preserving the Road Surface?" An Informal Discussion. S. Whinery, and G. S. Davison, LXV, 462 (1909).

Highway Construction. Discussion on Inter. Eng. Cong Papers, 1904. R. J. Thomas, Halbert P. Gillette, W. R. Hillyer, Henry Manley, Oberlin Smith, B. C. Donham, James Collier, B. Cole, H. K. Barrows, E. Purnell Hooley, and James Owen. LIV, Part F, 163 (1905).

"Highway Construction in France." G. Forestier. (Translated from the French by Paul A, Seurot.) (Inter. Eng. Cong. 1904.) LIV, Part F, 129 (1905).

"Highway Construction in the United

"Highway Construction in the United States." James Owen. (Inter. Eng. Cong. 1904.) LIV, Part F, 101 (1905).

"Highway Construction: Methods and Genrighway construction; Methods and General Description of Massachusetts Work."
William E. McClintock, (Inter. Eng. Cong. 1904.) LIV. Part F, 143 (1905).
"Progress Report of Special Committee on Bituminous Metarials for Page Committee on Page 1908.

"Progress Report of Special Committee on Bituminous Materials for Road Construction." LXVI, 429 (1910).

"Road Building." An Informal Discussion. James Owen, W. E. McClintock, Henry I. Budd, N. P. Lewis, Calvin Tomkins, G. A. Roullier, E. W. Harrison, J. J. McLaughlin, G. W. Tillson, Charles H. Graham, Howard J. Cole, Henry B. Seaman, George Hill, S. C. Thompson, Edward P. North, T. McC. Leutzé, Warren B. Travell, F. G. Cudworth, T. H. McCann, M. D. Burke, H. Conrow, L. J. Le Conte, and W. C. Foster, XLI, 85 (1899). (1899)

(1899).

"Road Construction and Maintenance." An Informal Discussion. Logan Waller Page, W. W. Crosby, Arthur H. Blanchard, Clifford Richardson, C. F. Knowlton, A. F. Armstrong, Watson G. Clark, Harold Parker, Henry B. Drowne, Joseph W. Hunter, Paul D. Sargent, Fred. E. Ellis, Samuel Whinery, H. B. Pullar, Nelson P. Lewis, Hubert K. Bishop, George C. Diehl, R. A. Meeker, James H. MacDonald, J. L. Wickes, H. C. Poore, Charles W. Ross, L. R. Grabill, Prevost Hubbard, Frank J. Eppele, John R. Rablin, R. K. Compton, William H. Connell, Arthur W. Dean, Michael Driscoll, Philip P. Sharples, James Owen, Malcolm H. Smith, E. H. Rogers, H. G. Shirley, James C. Wonders, F. C. Pillsbury, F. P. Smith, and J. W. Howard, LXXIII, 1 (1911).

"Road Construction and Maintenance: Bi-

LXXIII, I (1911).

"Road Construction and Maintenance: Bituminous Surfaces." An Informal Discussion. A. W. Dean, W. D. Uhler, Arthur H. Blanchard, William H. Connell, Fred E. Ellis, P. P. Sharples, Clifford Richardson, Harold Parker, W. W. Crosby, J. A. Johnston, James Owen, C. J. Bennett, A. S. Brainard, G. Immediato, W. H. Fulweiler, and Amos Schaeffer. LXXV, 548 (1912).

"Road Construction and Maintenance: Cement-Concrete Pavements." An Informal Discussion. J. A. Johnston, A. H. Blanchard, Sanford E. Thompson, E. H. Thomes, Philip P. Sharples, L. P. Sibley,

ROADS—(Continued).

Samuel Whinery, Harold Parker, William M. Kinney, and James Owen. iam M. Kinney, a LXXVII, 118 (1914).

"Road Construction and Maintenance: Cost Records and Reports." An Informal Dis-cussion. Nelson P. Lewis, L. L. Tribus, W. W. Crosby, George W. Tillson, Will-iam H. Connell, A. H. Blanchard, H. W. Durham, and Frederick Wilcock. Durham, and E LXXVII, 129 (1914).

"Road Construction and Maintenance: Design of Highway Systems." An Informal Discussion. Jean de Pulligny, Bertram Brewer, Nelson P. Lewis, James Owen, Amos Schaeffer, J. W. Howard, C. E. Carter, F. O. Whitney, and A. H. Blanchard. LXXVII, 152 (1914).

chard. LXXVII, 152 (1914). "Road Construction and Maintenance: Goad Construction and Maintenance; Drainage and Foundations." An Informal Discussion, James Owen, Paul D. Sargent, Theodore S. Oxholm, F. C. Pillsbury, J. A. Johnston, Chifford Richardson, W. W. Crosby, Arthur H. Blanchard, Samuel Whinery, H. P. Willis, and Will P. Blair. LXXV, 504 (1912).

"Road Construction and Maintenance: En-Goad Construction and Maintenance: Engineering Organizations for Highway Work." An Informal Discussion. Willis Whited, William H. Connell, E. W. James, Charles J. Bennett, A. W. Dean, Henry W. Durham, Robert A. Meeker, Paul D. Sargent, W. W. Crosby, Nelson P. Lewis, John C. Trautwine, Jr., William Goldsmith, George A. Ricker, and William de H. Washington. LXXVII, 1074, 10144 1074 (1914).

"Road toad Construction and Maintenance: Equipment and Methods for Maintaining Bituminous Surfaces and Bituminous Pavements." An Informal Discussion. William R. Farrington, and others. LXXVII, 1155 (1914). load Construction and Maintenance:

Equipment for the Construction of Bituminous Surfaces and Bituminous Pave-ments." An Informal Discussion. Franments." An Informal Discussion. Francis P. Smith, H. B. Drowne, James L. Gaynor, H. C. Poore, W. S. Godwin, W. H. Kershaw, W. H. Fulweiler, J. A. Johnston, Arthur H. Blanchard, J. W. Howard, Philip P. Sharples, and Prevost Hubbard. LXXVII, 171 (1914).

"Road Construction and Maintenance: Fac-Road Construction and Maintenance: Factors Limiting the Selection of Materials and of Methods in Highway Construction." An Informal Discussion. P. E. Green, E. H. Thomes, S. Whinery, W. W. Crosby, Mark Brooke, George W. Tillson, Robert A. Meeker, R. E. Beaty, William M. Kinney, William Goldsmith, George A. Ricker, D. B. Goodsell, Henry W. Durham, and William de H. Washington. LXXVII, 1123 (1914).

"Road Construction and Maintenance: Fillers for Brick and Block Pavements."
An Informal Discussion. George W. Tillson and others. LXXV, 527 (1912).
"Road Construction and Maintenance: Use

coad Construction and Maintenance: Use of Bituminous Material in Penetration and Mixing Methods." An Informal Discussion. Linn White, Clifford Richardson, A. F. Armstrong, E. H. Thomes, F. C. Pillsbury, Arthur H. Blanchard, W. W. Crosby, G. W. Tillson, R. B. Gage, Frederick Dunham, H. C. Poore, Theodor S. Oxholm, J. W. Howard, Michael Driscoll, Herbert Spencer, P. P. Sharples, H. L. Collier, William H. Con-

ROADS—(Continued).

nell, T. Hugh Boorman, and A. W. Dow.
LXXV, 572 (1912).
"Sampittic Surfacing." Walter Wilson
Crosby. LXIV, 352 (1909). Discussion:
L. W. Page, Prevost Hubbard, Arthur
H. Blanchard, Philip P. Sharples, H. W.
Clark, C. E. Grunsky, Henry B. Drowne,
Francis P. Smith, J. W. Howard, and
Clifford Richardson, LXIV, 359.
Screens used for classifying road material.

Screens used for classifying road material. LXXV, 580 (1912).

LXXY, 580 (1912).
"The Construction and Maintenance of —,"
Edward P. North. VIII, 95 (1879). Discussion, VIII, 333.
"The Controverted Questions in Road Construction." James Owen. XXVII, 603 (1892). Discussion, XXVII, 622; XXVII, 76 (1893).

76 (1893).
"The Maintenance of Macadam and Other
—" An Informal Discussion. Arthur
H. Blanchard, John R. Rablin, Louis L.
Tribus, James Owen, Nelson P. Lewis,
G. N. Houston, D. C. Wedgeworth, and
Ira O. Baker. LXI, 445 (1908).
"The Production of Traffic and the Transnortation of Excipite and Passengers."

portation of Preight and Passengers. Martin Coryell. (With Discussion.) I

240 (1873).

Use of water, calcium chloride, light oils, as dust palliatives. LXXIII, 33 (1911).

See also PAVEMENT.

ROLLING STOCK.

"Experiments on the Resistances of —."
A. M. Wellington. VIII, 21 (1879).
"Experiments with New Apparatus on
Journal Friction at Low Velocities." A. M. Wellington. XIII, 409 (1884). (With Discussion.)

"Loadings for Railroad Bridges." An Informal Discussion. Henry W. Hodge and others. LI, 105 (1903).

Locomotives and other — Discussion on

Inter. Eng. Cong. Papers, 1904. W. F.
M. Goss, G. R. Henderson, A. Mallet, O.
Busse, Karl P. Dahlström, and Henry
S. Haines. LIV, Part D, 347 (1905).
"On the Theoretical Resistance of Rallroad Curves." S. Whinery. VII, 79
(1878). Discussion, VII, 97; VIII, 179
(1878).

(1879).

"Resistances of Railway Trains," (Report of Dynagraph Experiments of P. II. Dudley,) William P. Shinn, V, 341 Dudley.) (1876).

"-in France." Educard Sauvage. (Inter. Eng. Cong. 1904). LIV, Part D, 319 (1905).

in its relation to broad and narrow gauge. LXXVIII, 330 (1915). - on light railways in France. LXXXIII, 1220 (1919-20).

Standard gauge freight cars. XXXI, 201 (1894)

"Street Motors on the Government Tram-ways at Sydney, New South Wales." George Downe. XXVIII, 150 (1893). Tests to determine the effect of speed and

counterbalance on str LXXXIII, 1414 (1919-20). stresses

"The Electrifiction of the Suburban Zone of the New York Central and Hudson River Railroad in the Vicinity of New York City." William J. Wilgus. (With Discussion. LXI, 73 (1908).
"Uniformity in Railway—." O. Chanute. XI, 291 (1882).

ROLLING STOCK-(Continued).

Weight of —. LIV, Part A, 79 (1905). Weight of street cars. XXXVII, 92 (1897). Weights of motor cars and trailers for elevated railroads. XXXVII, 314 (1897).

See also LOCOMOTIVES.

ROOFS.

of oil-storage reservoirs in California. LXXX, 703 (1916).

ROPE DRIVING.

Problem in Continuous —." Spencer Miller. (With Discussion.) XXXIX, 165 (1898).

ROUND-HOUSES.

"Round-House Framing." R. D. Coombs. LV, 157 (1905).

RUN-OFF.

"A Method of Determining Storm-Water

—" Charles B. Buerger. (With Discussion.) LXXVIII, 1139 (1915).
Calculation of—for sewers. LV, 401

(1905)

California precipitation and -. LXXX, 57,

California precipitation and 113, et seq. (1916).
"Comparison Between Rainfall and — in the Northeastern United States." John C. (1907)

"Computing—from Rainfall and other Physical Data." Adolph F. Meyer. (With Discussion.) LXXIX, 1056 (1915). "Derivation of—from Rainfall Data." Joel D. Justin. LXXVII, 346 (1914). Discussion: L. J. Le Conte, R. B. H. Begg, R. G. Clifford, Robert E. Horton, J. William Link, and J. K. Finch, LXXVII, 364. 364.

"Flood Flows." Weston E. Fuller. (With Discussion.) LXXVII, 564 (1914). "Forests and Reservoirs in Their Relation to Stream Flow, with Particular Ref-erence to Navigable Rivers." H. M. Chit-tenden. (With Discussion.) LXII - 481 LXII, 245 (With Discussion.) tenden. (1909).

"Hydrology of the Panama Canal." Caleb Mills Saville. (With Discussion.)

"Hydrology of the Panama Canal." Caleb Mills Savillo. (With Discussion.) LXXVI, 871 (1913).
"Maximum Rates of Rainfall at Boston." Charles W. Sherman. (With Discussion.) LIV, 173 (1905).
"Rain and — near San Francisco, California." C. E. Grunsky. (With Discussion.) LXI, 496 (1908).
"Rainfall, and — in Storm-Water Sewers." Charles Emerson Gregory. (With Discussion.) LVIII, 458 (1907).
Rainfall and — near San Diego, Cal.

Rainfall and — near San Diego, Cal. LXXV, 29, 54 (1912). — assumed for Stony River Dam. LXXXI, Diego,

926 (1917). in San Bernardino Basin, California. LXXXII, 819 (1918). of Cedar River, Washington. XLI, 10 – in

(1899).

(1899).

of Hudson River, 1888 to 1899. XLIII, 325 (1900).

"Storage to be Provided in Impounding Reservoirs for Municipal Water Supply." Allen Hazen. (With Discussion.) LXXVII, 1539 (1914).

"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." W. Clapp, E. C. Murphy, and W. F. Martin. (With Discussion.) LXI, 281 (1908).

RUN-OFF—(Continued).

"The Storage of Flood-Waters for Irriga-tion: A Study of the Supply Available from Southern California Streams," A. M. Strong. (With Discussion.) LXXVII,

M. Strong. 67 (1914). "Twenty Years'—, at Holyoke, Mass., of the Connecticut River." Clemens Her-schel. (With Discussion.) LVIII, 20

See also RAINFALL.

SAFETY LAMPS.

"Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) bert M. Wilso LXX, 190 (1910).

SALT.

"An Aerial Tramway for the Saline Valley Salt Company, Inyo County, California."
F. C. Carstarphen. (With Discussion.)
LXXXI, 709 (1917).
"One Way of Obtaining Brine." Charles
B. Brush. (With Discussion.) XXIII,

95 (1890).

SAND.

SAND.

"An Investigation of — Clay Mixtures for Road Surfacing." John C. Koch. (With Discussion.) LXXVII, 1454 (1914).

Analyses of — for test specimens of concrete to be immersed in sea water. LXXXI, 651 et seq. (1917).

Construction of earth and — clay roads. LXXXII, 1409 (1918).

"Impurities in — for Concrete." An Informal Discussion. Sanford E. Thompson, R. W. Lesley, C. P. Howard, Richard L. Humphrey, G. S. Davison, S. Whinery, Charles M. Mills, T. F. Richardson, and E. G. Haines, LXV, 250 (1909). (1909).

Preparation of — for filters at Washington, D. C. LVII, 326 (1906).
Sands near Monterrey, Mexico. LXXII. 492 (1911).
Testing — for use with cement. XXXII, 415 (1904).

415 (1894).

ests of specific gra LXXXII, 1436 (1918). gravity, etc., of -. Tests

SAND BLAST.

"—Cleaning of Structural Steel." George W. Lilly. L, 254 (1903). Discussion: Charles E. Fowler, William Anderson Polk, J. P. Snow, Theodore Belzner, Theodore Paschke, A. H. Sabin. H. B. Seathan, and E. A. H. Tays, L, 277.
—for cleaning metal. XXXIX, 28 (1898). Sand-blasting and painting Niagara Railway Arch Bridge. LXXXIII, 1990 (1919-1999)

SAND-JACKS.

-used in bridge erection. LXVII, 21

(1910). used in placing Harlem River Bridge. LXXXII, 689 (1918).

SANITATION.

"Prevention of Mosquito Breeding." Spencer Miller. (With Discussion.) LXXVI, 759 (1913).
"The — of Construction Camps." Harold Farnsworth Gray. LXXVI, 493 (1913). Discussion: R. C. Hardman, Spencer Miller, Frank E. Winsor, W. E. Britton, F. W. Austin, and Harry G. Payrow, LXXVI, 509.

SCALES.

"Thermometer -. " Fred. Brooks. XV, 381

SCIENCE.

- and Engineering." Presidential Address at the Annual Convention at San Francisco, Cal." June 30th, 1896. Thomas Curtis Clarke. XXXV, 508 (1896).

SCREENS.

"Rotating Screen of Power Canal, Salt River Project." F. Teichman, LX, 337 (1908).

- for grading sand, gravel, and broken stone. LXXXII, 1406, 1443 (1918). "The Clarification of Sewage by Fine —." Kenneth Allen. (With Discussion.) LXXVIII, 880 (1915).

SCREW PILES.

See PILES.

SEA WALLS.

See RETAINING WALLS.

SEDIMENTATION.

"On —." Allen Hazen. LIII, 45 (1904).
Discussion: Galen W. Pearsons, Robert
Spurr Weston, and George W. Fuller,
LIII, 72.
"Water Purification at St. Louis, Mo."
Edward E. Wall. (With Discussion.)
LX, 170 (1908).
"Water Purification Plant Washington.

"Water Purification Plant, Washington, D. C., Results of Operation." F. D. Hardy. (With Discussion.) LXXII, 301 (1911).

SEEPAGE.

"Designing an Earth Dam Having a Gravel Foundation, with the Results Obtained in Tests on a Model." James B. Hays. (With Discussion.) LXXXI, 1 (1917). —flow and surface rnn-off. LXXIX, 1131

(1915).

"The Action of Water under Dams." J.
B. T. Colman. (With Discussion.)
LXXX, 421 (1916).

"The Economic Aspect of—and Other Losses in Irrigation Systems." E. G. Hopson. (With Discussion.) LXXVI, 336 (1913).

SEPTIC TANKS.

"The Antecedents of the Septic Tank."
Leonard Metcalf. XLVI, 456 (1901). Discussion: Frank Herbert Snow, Rudolph Hering, George W. Rafter, and James Owen, XLVI, 472.
"The Improved Water and Sewage Works of Columbus, Ohio." John H. Gregory. (With Discussion.) LXVII, 206 (1910).

SETTLING BASINS.

"The Vicksburg --." Clarence Delafield.

See also RESERVOIRS.

SEWAGE DISPOSAL.

Analysis of sowage at Gleiwitz screening plant. LXXVIII, 910 (1915).
Brief bibliography of works relating to the clarification of sewage by fine screens. LXXVIII, 952 (1915).
"Chantauqua, N. Y.,— Works." William B. Landreth. XXXII, 1 (1894).
"Disposal of Sewage in Massachusetts."

SEWAGE DISPOSAL-(Continued).

Frederic P. Stearns. XVIII, 1 (1888). Discussion. XVIII, 24.

"European Sewage and Garbage Removal."
W. Howard White. XV, 849 (1886).
"Inland—, with Special Reference to the
East Orange, N. J., Works." Carrol
Ph. Passett. (With Discussion.) XXV, Ph. Bassett. 125 (1891),

125 (1891).

"Purification of Sewage and of Water by Filtration." Hiram F. Mills. XXX, 350 (1893). Discussion, XXX, 702.

"Sewage and Wastes Disposal for the United States Army." Leonard S. Doten. LXXXIII. 337 (1919-20). Discussion: Leonard Metealf. Nicholas S. Hill, Jr., Almon L. Fales, Kenneth Allen, G. Bertram Kershaw, Edmund B. Besselicvre, George T. Hammond A. L. Sherman, J. F. Brown, and Lynn E. Perry, LXXXIII, 353.

Sewage Disposal." Charles A. Allen.
(With Discussion.) XVIII, 8 (1888).
"Sewage Disposal." An Informal Discussion. G. C. Whipple, E. Knichling, George W. Rafter, William S. Johnson, J. P. A. Maignen, Clyde Potts, R. Winthrop Pratt, John W. Alvord, John H. Gregory, H. W. Clark, and C-E. A. Winslow, LVII, 91 (1906).

Sewage Disposal. Discussion on Inter. Eng. Cong. Papers, 1904. J. L. Van Ornum, M. N. Baker, Samuel Rideal, Gilbert Fowler, J. M. Coane, W. Thwaites, H. Ross Hooper, Andrew Rosewater, Allen Hazen, H. N. Ogden, E. J. Hanley, H. Birch Killon, Rudolph Hering, Robert Spurr Weston, M. O. Leighton, John W. Alvord, F. A. Barbour, and George W. Fuller. LIV. Part E, 207 (1905).
"—in America." George W. Fuller. (Inter. Eng. Cong. 1904.) LIV, Part E, 147 (1905).

(1905).

"—in France." M. Bechmann. (Translated from the French by George W. Fuller.) (Inter. Eng. Cong. 1904.) LIV, Part E. (Inter. En 195 (1905).

works and irrigation lands at Monter-rey, Mexico. LXXII, 545 (1911).
"Sewage Purification." An Informal Dis-cussion. Rudolph Hering, George W. Rafter, and L. J. Le Conte. LI, 415 (1903), and th. J. Le Conte. LI, 415
"Stream Contamination and Sewage Purification." An Informal Discussion

fication." An Informal Discussion. R. E. McMath and others. XLII, 160 (1899). Tables relating to sewage treatment works

and filtration statistics of German cities. LXXVIII, 968 (1915).

"The Absorption of Oxygen by De-Aerated Water," Earle B. Phelps. LXXVI, 1624 (1913). Discussion: W. E. Adeney, LXXVI, 1637.

LXXVI, 1637.

"The Antecedents of the Septic Tank."

Leonard Metcalf. (With Discussion.)

XLVI, 456 (1901).

"The Clarification of Sewage by Fine Screens." Kenneth Allen. LXXVIII, 880 (1915). Discussion: G. Bertram de B. Kershaw, W. L. Stevenson, George C. Whipple, C. A. Jennings, G. Franze and Hermann Schaefer, George W. Fuller, J. X. Cohen, F. T. Robson, Alexander Potter, Charles E. Gregory, Rudolph Hering, J. H. Granbery, Langdon Pearse, L. C. Whittemore, Samuel A. Greeley, E. Kuichling, George T. Hammond, J. C. Riedel, David T. Pitkethly, William L. D'Olier, John H. Gregory, and George A. Soper, LXXVIII, 954.

"The Improved Water and Sewage Works of Columbus, Ohio." John H. Gregory.

SEWAGE DISPOSAL—(Continued).

LXVII. 206 (1910). Discussion: Joseph W. Ellms, Julian Griggs, C-E. A. Winslow, R. D. Scott and R. F. McDowell, Samuel Tobias Wagner, J. Corbett, W. R. Cardend, W. A. Sparny, J. W. Sale. Samuel Tobias Wagner, J. Corbett, W. R. Copeland, W. A. Sperry, J. W. Sale, C. P. Hoover, C. B. Hoover, A. Elliott Kimberly, Samuel Rideal. Alexander Potter, Gilbert Fowler. William Gavin Taylor, Allen Hazen, William B. Fuller, Emil Kulchling, Langdon Pearse, Rudolph Hering, George A. Johnson, and George W. Fuller, LXVII, 324.

"Tidal Phenomena in the Harbor of New York." H. de B. Parsons. (With Discussion.) LXXVI, 1979 (1913).

Various methods of — described briefly. L, 145 (1903).

145 (1903).

SEWERAGE.

"A Concrete Sewer on Piles." Eugène Len-tilhon. (With Discussion.) XXXI, 569 (1894)

Method of Determining Storm-Water Run-Off," Charles B. Buerger (With Run-Off," Charles B. Buerger. (*)
Discussion.) LXXVIII, 1139 (1915).
Brick Arches for Large Sewers." R.
ing. VII, 252 (1878). Discussion,

R. Her-

"Concrete Sewer at Mt. Vernon." William E. Worthen. (With Discussion.) XXIV, 393 (1891).

"Cost of Sewer Construction, Denver, Colo."
W. W. Follett. (With Discussion.)
XXXV, 102 (1896).
"Design and Construction Table for EggShaped Sewers." C. G. Force, Jr. IX.

(1880)"Determination of the Size of Sewers."
Robert E. McMath. XVI, 179 (1887).
Effect of San Francisco earthquake on sewers. LIX, 214 (1907).
"Excessive Rainfalls Considered with Especial Reference to their Country."

"Excessive Kainfalls Considered with Especial Reference to their Occurrence in Populous Districts." R. L. Hoxie. (With Discussion.) XXV, 70 (1891).
"Flood Waves in Sewers and their Automatic Measurement." Alva J. Grover, XXVIII; 1 (1893). Discussion, XXVIII,

"Flow in the Sewers of the North Metropolitan — System in Massachusetts."
Theodore Horton. (With Discussion.)
XLVI, 78 (1901).
"Flushing in Pipe Sewers." H. N. Ogden.
(With Discussion.) XL, 1 (1898).
"History of the Pennsylvania Avenue Subway. Philadelphia and Sawar Construct

"History of the Pennsylvania Avenue Subway, Philadelphia, and Sewer Construction Connected Therewith." George S, Webster and Samuel Tobias Wagner. (With Discussion.) XLIV. 1 (1990). New York City —, Brief description of. LXXVI, 1721, 1775 (1913). "Rainfall, and Run-Off in Storm-Water Sewers." Charles Emerson Gregory, LYVII. 458 (1907). Discussion. Williams

Sewers." Charles Emerson Gregory. LVIII, 458 (1907). Discussion: William C. Hoad. A. Marston, W. B. Ruggles. Emmet A. Steece, L. J. Le Cont. Charles B. Burdick, LVIII, 491.

wer pipe of wooden staves. (1899). Sewer

(1899).

—in New Orleans, La., in wet soil. LXXXII, 423 et seq. (1918).

—Systems." Rudolph Hering. (With Discussion). X, 361 (1881).

"Some Specialties of the System for Flushing the New Sewers of the City of Mexico." Roberto Gayol. LV, 262 (1905). Discussion: Alexander Potter, LV, 283.

"The Flow of Water in Small Channels, after Ganguillet and Kutter, with Kutter's Diagram Modified, and Graphical

SEWERAGE—(Continued).

Tables with Special Reference to Sewer Calculations." R. Hering. VIII, 1 (1879).

"The Infiltration of Ground-Water into Sewers." John N. Brooks. LXXVI. 1909 (1913). Discussion: John H. Greg-ory. Edward S. Rankin, Kenneth Allen. G. L. Christian, E. Kuichling, E. G. Bradbury, and Marshall R. Pugh,

waukee River Flushing Works." G. H. Benzenberg. XXX, 367 (1893). Discussion. XXX, 709.

"The Shone Hydro-Pneumatic System of —," Urban H. Broughton. XXVII. 659 (1892). Discussion. XXVIII. 57 (1893).

"The Single Trap System of House Drainage." Latham Anderson. (With Discussion.) XXV, 394 (1891).

"The Walworth Sewer. Cleveland. Ohio." Walter Camp Parmley. LV, 341 (1905). Discussion: C. G. Force, C. E. Gregory, and L. J. Le Conte, LV, 401.

"The Water Supply. Drainage and — of the Lawrenceville School." Frederick S. Odell. XVI, 66 (1887).

Odell, XVI, 66 (1887).

"The Water-Works and — of Monterrey, N.
L., Mexico." George Robert Graham
Conway, (With Discussion.) LXXII, 475 (1911).

e of wood stave nip LXXXII, 436, 481 (1918). nipe for sewers.

SHAFTS.

Elevator shaft, Oneensborough LXXXII, 289 (1918).

"Experiments on Retaining Walls and Pressures on Tunnels" William Cain. (With Discussion.) LXXII, 403 (1911).

"Freezing as an Aid to Excavation in Unstable Material." James H. Brace. (With Discussion.) LIL 365 (1904).
"Pressure, Resistance, and Stability of Earth." J. C. Meem. (With Discussion.) LXX. 352 (1910).

Shaft-sinking, Astoria Gas Tunnel. LXXX. 609 (1916).

Shaff sinking, Cross-Town Tunnels, Penn-sylvania Railroad, LXVIII, 398 (1910). Shaft Shking Cross-Town Tunnets, Pennsylvania Railroad, LXVIII, 398 (1910).
 "Shaft Sinking under Difficulties at Dorchester Bay Tunnet Boston, Mass." D. McN. Stauffer. X, 343 (1881).
 for Colorado River siphon, LXXVII, 4

(1914)

- for East River Tunnels, Pennsylvania Railroad, LXVIII, 67 (1910).

SHAFTS-(Continued).

for North River Tunnels. LXVIII, 153 (1910).

(1910).

(Sinking a Wet Shaft," John P. Hogan.
LXXIII, 398 (1911). Discussion: Mason
D. Pratt, Charles B. Buerger, L. White,
H. M. Hale, H. F. Dunham, T. Kennard
Thomson, Bertrand H. Wait, T. H. Wiggin, and V. H. Hewes, LXXIII, 414.

"The New York Tunnel Extension of the
Pennsylvania Railroad. The East River
Tunnels." James II. Brace, Francis Mason, and S. H. Woodard. LXVIII, 419
(1910).

(1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The Lining of the Four Permanent—of the East River Division." F. M. Green. LXIX, 78 (1910).

SHEATHING.

"Pressure, Resistance, and Stability of

Earth." J. C. Meem. (With Discussion.) LXX, 352 (1910).

"The Bracting of Trenches and Tunnels, with Practical Formulas for Earth Pressures." J. C. Meem. (With Discussion.) LX, 1 (1908).

SHEET-PILING. See PILES.

SHIP-BUILDING.

"Experiments on Vibration of the Japanese Torpedo-Boat Destroyers, Harusame and Hayatori." F. P. Purvis, F. Omori, S. Terano, and C. Shiba. (Inter. Eng. Cong. 1904.) LIV, Part D, 89 (1905).

Naval Architecture. Discussion on Inter. Eng. Cong. Papers, 1904. L. E. Bertin, William P. Craighill, E. L. Corthell, W. F. Durand, and Sir William H. White. LIV, Part D, 117 (1905).

"Naval Architecture in Great Britain." Sir William H. White. (Inter. Eug. Cong. 1904.) LIV, Part D, 3 (1905).

— on the Clyde and its tributaries. XXIX, 163 (1893). "Experiments on Vibration of the Japan-

163 (1893). The Development Terano. (Inter. Eng. Cong. 1904.) LIV, Part D, 43 (1905). "The

SHIP CANALS. See CANALS.

SHIP RAILWAYS.

"The Chignecto Ship Railway," John F. O'Rourke. XXIV, 13 (1891).

Dockyards in Japan, LIV, Part D, 58 (1905).

The Construction of the Lorain Dry Dock and Shipyard of the Cleveland Ship-Building Company." James Ritchie. Building Compan XXXIX, 323 (1898).

SHORE PROTECTION.

"Littoral Movements of the New Jersey Coast, with Remarks on Beach Protec-tion and Jetty Reaction." Lewis M. Haupt. (With Discussion.) XXIII, 123 Haupt.

(1890).

"The Preservation of Sandy Beaches in the Vicinity of New York City." Elliott J. Dent. LXXX, 1786 (1916). Discussion: Lewis H. Haupt. Charles H. Higgins, Allen Hoar, F. William Schwiers, A. W. Buel. and B. F. Cresson, Jr., LXXX, 1906.

"The Proper Profile for Resisting Wave

SHORE PROTECTION—(Continued).

Action." (Abstract.) Robert Fletcher.

XXXVI, 514 (1896).
"The Protection and Improvement of Forewave Action." R. G. Allanson-Winn. L., 66 (1903). Discussion: L. M. Haupt, Francis L. Pruyn, E. Burslem Thomson, and F. Collingwood, L., 86.

See also JETTIES: WAVES.

SHORING.

See UNDERPINNING.

SIEVES.

-for cement. LXXXII, 172 (1918).

SIGNALING.
Comparison of methods of—in the Pennsylvania and Hudson and Manhattan Railroad tunnels. LXIX, 409 (1910).
Interlocking plant for Washington Passenger Terminals. LXXI, 112 (1911).
"Railroad—: The Block System." John P. O'Donnell. (With Discussion.) XXXII, 421 (1894).
"Railway—" G. Kecker. (Translated from the German by George F. Swain.) XXIX, 491 (1893). Discussion, XXX, 546 (1893).
"Railway—as Applied to Large Installations." John P. O'Donnell. XXVII, 515 (1892). Discussion, XXVIII, 276 (1893).
"Railway Signals." Report of the Com-

"Railway Signals." Report of the Committee. IV, 147 (1875). Discussion, IV,

-, Philadelphia, Germantown and Norris-town Railroad. LXXVI, 1884 (1913). -system in use at Pennsylvania Railroad Terminal, New York. LXIX, 266, 368 (1910). Signals at South Boston Terminal. XLIII,

141 (1900).

SILT.

"Notes on Tunnel Lining for Soft Ground."
S. Johannesson and B. H. M. Hewett.
(With Discussion.) LXXXIII, 1829 (1919-20).

"The — Problem of the Zuni Reservoir." H. F. Robinson. (With Discussion.)

F. Robinson. (With LXXXIII, 868 (1919-20).

"The Suspension of Solids in Flowing Water." Elon Huntington Hooker. (With Discussion.) XXXVI, 239 (1896).

SINKING FUNDS.

Data in relation to -. LXIV, 18 (1909).

SIPHONS.

SIPHONS.

"Colorado River Siphon." George Schobinger. LXXVII, 1 (1914). Discussion: H. T. Cory, LXXVII, 35.

"Liberation of Air in—" Charles Anthony, Jr. LIX, 63 (1907). Discussion: P. M. Pritchard, LIX. 65.
Rosemary Siphon of Sudbury Aqueduct. XXXV, 241 (1896).
Sewer – under subways, New York City. LXXVI, 1721 (1913).

"Syphons of the Kansas City Water-Works." G. W. Pearsons. (With Discussion.) XVIII, 130 (1888).

SLABS.

"Cinder Concrete Floor Construction Between Steel Beams." Harold Perrine and George E. Strehan. (With Discussion.) LXXIX, 523 (1915).
"Cinder Concrete Floors." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914).

SLABS—(Continued).

SLABS—(Continued).

Final report of the Special Committee on Concrete and Reinforced Concrete. Discussion by L. J. Mensch and others. LXXXII, 1541 (1918).
Floor — of concrete and reinforced concrete. LXXXI, 1124 et seq. (1917).

"Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports." A. C. Janni. (With Discussion.) LXXXI, 1689 (1916).

Progress report of Special Committee on Concrete and Reinforced Concrete. LXXVII, 416 (1914).

"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat Slab Floors." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).

"Steel Stresses in Flat—." H. T. Eddy. (With Discussion.) LXXVII, 1338 (1914).

Stresses in wedge-shaped reinforced concrete beams. Discussion by A. C. Janni, and William Cain. LXXVIII, 734 (1915).

SLATES.

"The Strength and Weathering Qualities of Roofing —." Mansfield Merriman. of Roofing—," Mansfield Merriman, First Paper, XXVII, 331 (1892); Discussion, XXVII, 348, 685; Supplementary Paper (With Discussion.) XXXII, 529 (1894).

SLIDE RULES.

Stadia slide rule. XLVIII, 101 (1902).

SLUICES.

"Experiments on the Power of Water to Transport Sand in —." F. Collingwood. I, 246 (1872).

SMALL ARMS.

"The Art of Designing and Constructing
—." John T. Thompson. (Inter. Eng.
Cong. 1904.) LIV, Part B, 351 (1905).

SNOW.

"Forests and Reservoirs in Their Rela-tion to Stream Flow, with Particular Reference to Navigable Rivers." H. M. Chittenden. (With Discussion.) LXII, 245 (1909).

The Floods of the Mississippi Delta: Their Causes, and Suggestions as to Their Control." William D. Pickett. LXIII, 53 (1900).

SNOW SHEDS.

"The Canadian Pacific Railway." Presidential Address at the Annual Conven-tion at Milwaukee, Wisconsin, June 28th, 1888. Thomas C. Keefer. XIX, 55 (1888).

SOCIAL PROBLEMS.

"Some Tendencies and Problems of the Present Day and the Relation of the Engineer Thereto." Address at the An-nual Convention, in Ottawa, Ontario, June 18th, 1913. George Fillmore Swain. June 18th, 1913. George Fillmore Swain. LXXVI, 1112 (1913). "The Philosophy of Engineering." Maurice G. Parsons. (With Discussion.) LXXVII, 38 (1914).

SOCIETY HOUSE.

Addresses delivered at the opening of the New—, November 24th, 1897. Rt. Rev. H. C. Potter, President B. M. Harrod, Gen. Wm. P. Craighill, J. G. Schurman, LL.D., Hon. Joseph H. Choate. XXXVIII, 422 (1897) 423 (1897).

SOILS.

"Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion." William Cain. (With Discussion.) LXXX, 1315 (1916).

Measurement of pressures transmitted through granular matter by the soil pressure cell. LXXXIII, 1763 (1919-20). Tests of bearing value of—on site of Pearl Harbor Dry Dock. LXXX, 259

"The Subsidence of Muck and Peat—in Southern Louisiana and Florida." Charles W. Okey. (With Discussion.) LXXXII, 396 (1918).

SPILLWAY.

"Detention Reservoirs with — Outlets as an Agency in Flood Control." H. M. Chit-tenden. (With Discussion.) LXXXII, 1473 (1918). of Huacal

– of

of Huacal Dam, Sonora, Mexico. LXXVIII, 579 (1915). - provision, Stony River Dam. LXXXI, 926, et seq. (1917).

SPIRALS.

See CURVES.

SPONGILLA.

— in water pipes. XXVI, 38 (1892). "The — in Main Pipes." Desmond Fitz-Gerald. (With Discussion). XV, 337 (1886).

STADIUM.

See GRANDSTANDS AND STADIA.

STAND-PIPES.

STAND-PIPES.
"A Concrete Water Tower." A. Kempkey, Jr. LXX, 334 (1910). Discussion: Maurice C. Couchot, L. J. Mensch, and A. H. Markwart, LXX, 348.
"A Reinforced Concrete Stand-Pipe." W. W. Clifford. LXXIV, 375 (1911). Discussion: William Fry Scott, William Mueser, W. J. Douglas, and Joseph A. Powers, LXXIV, 392.
"The Design of Elevated Tanks and —." C. W. Birch-Nord. (With Discussion.) LXIV, 526 (1909).
"The Differential Surge Tank." Raymond D. Johnson. (With Discussion.) LXXVII, 760 (1915).

LXXVIII, 760 (1915).

STANDARD TIME.

"On Uniform—, for Railways, Telegraphs and Civil Purposes Generally." Sandford Fleming. X, 387 (1881).

STAVE PIPE.

See WOOD PIPE.

STEAM.

"District — Systems." Charles E. Emery. XXIV, 188 (1891). Discussion, XXIV,

"Efficiency of Furnaces Burning Wet Fuel, as Determined by Experiments on a Large Scale." R. H. Thurston. III, 290 (1874). Discussion, III, 316, 334; IV, 88 (1875).

"Efficiency of — Vacuum Pumps." J. Fos-ter Flagg. V, 381 (1876).
"Electricity versus — for Branch Railroad Lines." An Informal Discussion. H. S. Haines and others. XLII, 375 (1899). "Motive Power for Street Railways." Al-

STEAM-(Continued).

fred F. Sears. XXVII, 313 (1892). Discussion, XXVII, 574.

cussion, XXVII, 574.

"On the Application of a New System of Distillation with Conservation of Heat." Thomas Prosser. I, 79 (1872).

"Some Typical Tests of — Turbines." Francis Hodgkinson. (With Discussion.) (Inter. Eng. Cong. 1904). LIV, Part E, 85 (1905).

"—Heating." Wm. E. Worthen. (With Discussion.) XXIV. 206 (181)

85 (1905).
"—Heating." Wm. E. Worthen. (With Discussion.) XXIV, 206 (1851).
"The Purification of Water for the Production of —." J. O. Handy. (With Discussion.) (Inter. Eng. Cong. 1904.) LIV, Part A, 3 (1905).
"The Relative Merits of Working Holsting Machinery by —, Water and Electricity." George A. Goodwin. XXIX, 695 (1893).
"The Substitution of Electricity for — as a Motive Power." Alexander Siemens. (Inter. Eng. Cong. 1904.) LIV, Part E, 51 (1905).

Motive Policy (Inter. Eng. Cong. 1904.)

51 (1905).

"The Substitution of Electricity for — as a Motive Power." J. G. White. (Inter. Eng. Cong. 1904.) LIV, Part E. 3 (1905).

The Substitution of Electricity for — as a Motive Power. Discussion on Inter. Eng. Cong. Papers, 1904. LIV, Part E, 59

Motive Power for Suburban Traffic."

John Findley Wallace. (With Discussion.) XXXVII, 133 (1897).

See also ENGINES: STEAM POWER.

STEAM BOATS.

See STEAMBOATS.

STEAM ENGINES. See ENGINES.

STEAM PIPES.

"An Accident to — Arising from the Use of Blast Furnace Wool." T. Egleston. (With Discussion.) XII, 253 (1883).

STEAM POWER.

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).
Cost of—. XXXI, 32 (1894).
"The Cost of—." Charles E. Emery. (With Discussion.) XII, 425 (1883).

STEAM PUMPS. See PUMPS.

STEAM SHOVELS.

The steam shovel. LIV, Part C, 296 (1905).

STEAM TURBINES. See TURBINES (STEAM).

STEAMBOATS.

"Iron Hulls for Western River --." Theodore Allen. (With Discussion.) II, 271 (1873).

Mississippi River - XXV, 386 (1891). See also STEAMERS; STEAMSHIPS.

STEAMERS.

"The Railroad Ferry Steamer Solano." Robert L. Harris, XXII, 247 (1890). See also STEAMBOATS: STEAMERS.

STEAMSHIPS.

"Screw Steamship and Tow Barge Efficiency on the Northwestern Lakes of America."

STEAMSHIPS—(Continued).

Joseph R. Oldham. (With Discussion.) XXV, 373 (1891). "The Steamship America." Robert Gordon. XV, 384 (1886).

See also STEAMBOATS; STEAMERS.

STEEL.

"A Note on the Resistance of Materials."
Robert II. Thurston. II, 239 (1873).
"A Proposed Method of Testing Structural—." Alfred E. Hunt. XXX, 181 (1893). Discussion, XXX, 666.
"An Instructive Eye-Bar Test." A. C. Cunningham. (With Discussion.) XXXI, 415 (1894)

415 (1894)

"Compressive Strength of—and Iron." Charles A. Marshall. XVII, 53 (1887). Discussion on structural—. XXVII, 374

(1892).

(1892).

Effect of cinder concrete on —. LXXIX, 539, 579, 648 (1915).

"Experiments on the Protection of — and Aluminum Exposed to Sea Water." A. H. Sabin. First Paper, (With Discussion.) XXXVI, 483 (1896); Supplementary Paper, (With Discussion.) XLIII, 444 (1900).

sion.)
tary Paper, (With Discussion.)
444 (1900).
"Hardening Structural—." A. C. Cunningham. XXVII, 351, (1892). Discussion,
XXVII, 374.
"Impact Tests of Structural—." S. Bent
Russell. (With Discussion.) XLIII, 1

Improvements in - for guns. LIV, Part B, 213 (1905).

213 (1905).

"Nickel—Eye-Bars for Blackwell's Island Bridge." William R. Webster. LXIV, 280 (1909). Discussion: Gustav Lindenthal, LXIV, 302.

"Nickel—for Bridges." J. A. L. Waddell. (With Discussion.) LXIII, 101 (1909).

"Note on the Resistance of Materials." Robert H. Thurston. IV, 334 (1875).
"Notes on the Metallography of—." Bradlev Stoughton. (Inter. Eng. Cong. 1904.)

"Notes on the Metallography of —," Bradley Stoughton. (Inter. Eng. Cong. 1904.) LIV, Part E, 357 (1905).
"Painting Structural —: The Present Situation." A. H. Sabin. (With Discussion.) LXXVII, 952 (1914).
"Qualities of Iron and —." William Metcalf. V, 323 (1876).
Relation between tenacity and resistance to torsion. VII, 169 (1878).
"Relative Performance of — and Masonry Construction." An Informal Discussion. Charles G. Darrach. Eugene W. Stern. Construction." An Informal Discussion. Charles G. Darrach, Eugene W. Stern, George F. Swain, Charles C. Wentworth, Oberlin Smith, William R. Webster, James Owen, E. T. D. Myers, Jr., W. Hildenbrand, H. S. Haines, A. L. Johnson, F. Lynwood Garrison, and J. F. O'Rourke. XLIX, 74 (1902). Resilience tests of —. XXXIX, 237 (1898). Resilience tests of —. XXXIX, 237 (1898). Resilience tests of —. XXXIX, 237 (1898).

(1905).
"Rust—As Shown in the Removal of a Seventeen-Story Building." T. Kennard Thomson. (With Discussion.) LXXI,

200 (1911).
"Sand-Blast Cleaning of Structural—."
George W. Lilly. (With Discussion.) L, 254 (1903).

204 (1903).

"Some Constants of Structural—." Palmer C. Ricketts. XVI, 138 (1887).

"Some Experiments on the Strength of Bessemer—Bridge Compression Members." James G. Dagron. (With Discussion.) XX, 254 (1889).

"Some Tests of Large—Columns." James E. Howard. (With Discussion.) LXXIII, 429 (1911).

STEEL-(Continued).

Specifications for, and tests of —, Kentucky and Indiana Bridge. XVII, 134 (1887). Specifications for — in reinforced concrete:

Progress report of Special Committee on Concrete and Reinforced Concrete.

Progress repute V. Concrete. Concrete and Reinforced Concrete and LXXVII, 425 (1914).

Specifications for—in reinforced concrete, Stony River Dam. LXXXI, 1017 (1917).

Specifications for—street bridging and station building, Pennsylvania Railroad Terminal, New York. LXIX, 214, 220

"Specifications for Structural —." H. H. Campbell. (With Discussion.) XXXIII,

297 (1895).

"Statical Limitations Upon the — Requirement in Reinforced Concrete Flat Slab Floors." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).
"—Concrete Construction." George Hill. (With Discussion.) KXXXIX, 617 (1898).
"—Concrete Construction." An Informal Discussion. R. S. Buck and others. XLVI, 93 (1901).
"—: Its Properties; Its Use in Structures and in Heavy Guns." William Metcalf. (With Discussion.) XVI, 283 (1887).
"—Production in the United States." William Metcalf. (Inter. Eng. Cong. 1904.) LIV. Part E, 349 (1905).
"—Stresses in Flat Slabs." H. T. Eddy. (With Discussion.) LXXVII, 1338

LXXVII. Discussion.) (With 1338 (1914).

- used in elevated railroads. XXXVII, 310 (1897).

(1897).

— used in Hell Gate Arch Bridge, LXXXII, 865, 887, 905, 1033 (1918).

— used in marine boilers and engines, LIV, Part C, 198 (1905).

"Structural—." Edward B, Dorsey. (With Discussion.) First Paper, XIII, 41 (1884); Supplementary Paper, XIV, 197 (1884). (1885).

(1885).
Tests of bridge — XXXVIII, 41 (1897).
"Tests of Built-Up — and Wrought-Iron
Compression Pieces." Arthur N. Talbot
and Herbert F. Moore. (With Discussion.) LXV, 202 (1909).
Tests of — II, 349 (1873); III, 1 (1874).
"Tests of —," L. Baclé. (Translated from
the French by Paul A. Seurot.) (Inter.
Eng. Cong. 1904.) LIV, Part F, 55

Eng. Cong. 1904.) LIV, Part F, 55 (1905).

"Tests of—" William R. Webster. (Inter. Eng. Cong. 1904.) LIV, Part F, 63 (1905).

Tests of—Discussion on Inter. Eng. Cong. Papers, 1904. Gaetano Lanza, F. Schüle, Sir William H. White, A. A. Stevenson, and J. P. Snow. LIV, Part F, 71 (1905).

"The Condition of—in Bridge Pins." A. C. Cunningham. (With Discussion.) XXXVI, 91 (1896).

"The Economics of—Arch Bridges." J. A. L. Waddell. (With Discussion.) LXXXIII, 1 (1919-20).

"The Effects of Straining Structural—and Wrought Iron." Henry S. Prichard. LXXX, 1429 (1916). Discussion: J. A. L. Waddell, Henry B. Seaman, C. A. P. Turner, T. D. Lynch, James E. Howard, H. F. Moore, F. N. Speller, J. A. McCulloch, Ernst F. Jonson, T. E. Stanton, Henry M. Howe, A. C. Irwin, David A. Molitor, and Clement E. Chase, LXXX, 1464.

"The Heavy Gun Ouestion" O. E. Mich.

"The Heavy Gun Question." O. E. Michaelis. XIII, 215 (1884).

The Manufacture of — Discussion on Inter. Eng. Cong. Papers, 1904. R. A. Hadfield, Albert Sauveur, Henry M. Howe, Oswald Erlinghagen, William R.

STEEL-(Continued).

Webster, J. P. Snow, William Metcalf, and Bradley Stoughton. LIV, Part E,

and Bradley Stoughton. LIV, Part E, 407 (1905).

"The Physical Qualities of Acid Open-Hearth Nickel—, as Compared with Carbon Steel of Similar Tensile Strength."
H. H. Campbell. XXXIV, 285 (1895).

"The Possibilities in Bridge Construction by the Use of High-Alloy Steels." J. A. L. Waddell. (With Discussion.) LXXVIII, 1 (1915).

"The Preservation of Materials of Construction." An Informal Discussion. William Barclay Parsons and others. L, 293 (1903).

293 (1903).
"The Relation of Tensile Strength to Com-

"The Relation of Tensile Strength to Composition in Structural—" A. C. Cunningham. XXXVIII, 78 (1897). Discussion, XXXVIII, 84: XL, 449 (1898). "The Results Obtained from Tests of Full-Sized—Eye-Bars." Frederick H. Lewis. (With Discussion.) XXVII, 358 (1892). "The Strength and Elasticity of Structural—, and its Efficiency in the Form of Beams and Struts." James Christie. XIII, 253 (1884). Discussion, XIII, 267. "The Structural Design of Buildings." (Charles C. Schneider. (With Discussion.) LIV. 371 (1905). "The Treatment of Metals for Structural Purposes." James Christie. XXX, 155 (1893). Discussion, XXX, 655. "The Use of Basic Mild—as Material for Construction in Germany." C. Weyrich. XXX, 219 (1893). Discussion, XXX, 681. "The Use of Mild—for Engineering Structural Transcription of Mild—for Engineering Mild—

rich, XXX, 219 (1893). Discussion, XXX, 681.
"The Use of Mild—for Engineering Structures." George C. Mehrtens. XXX, 204

(1893)."The Use of — for Bridges." Theodore Cooper. VIII, 263 (1879). Discussion, VIII, 277; IX, 315 (1880).

STEEL PIPE.

Construction of—at Ogden, Utah. XXXVIII, 258 (1897).

"Friction Coefficient for Riveted—." An Informal Discussion. A. McL. Hawks. XLII, 155 (1899).

- at Astoria, Oregon, Water Works. XXXVI, 21 (1896).

"The Distortion of Riveted Pipe by Back-Filling." D. D. Clarke. (With Discussion.) XXXVIII, 93 (1897).

See also PIPE: PIPE-LINES.

STEEL TAPES.

"Invar (Nickel-Steel) Tapes on the Measurement of Six Primary Base Lines."
Owen B, French, (With Discussion.)
LX, 219 (1908).

"Recent Experience on the U. S. Coast and Geodetic Survey in the Use of Long — for Measuring Base Lines." R. S. Woodward. XXX, 81 (1893). Discussion,

"Some Devices for Increasing the Accuracy or Rapidity of Surveying Operations." Walter Loring Webb. (With Discussion.) XLVIII, 98 (1902).

STONE.

Analyses of—for test specimens of concrete to be immersed in sea water. LXXXI, 651 (1917).

—for roads. LXXXII, 1405 (1918).

Tests of specific gravity, etc., of—. LXXXII, 1436 (1918).

See also BUILDING STONE.

STONE CUTTING.

Tools used in -. VI, 298 (1877).

STRAIN.

"An Analysis of General Flexure in a Straight Bar of Uniform Cross-Section." L. J. Johnson. LVI, 169 (1906). "An Investigation to Determine the Strains

in a Hollow Cast-Iron Disk, Cooled from the Interior." G. Leverich, XVIII, 43 (1888).

(1888).

"Experimental Strains upon a Bowstring Trussed Girder." Theo. G. Ellis. II, 107 (1873).

"Final Report of the Special Committee on Steel Columns and Struts." (With Discussion.) LXXXIII, 1583 (1919-20).

"Loads and Strains of Bridges." John Griffen and Thomas C. Clarke. II, 93 (1873)

Griffen and Thomas C. Clarke. 11, 10. (1873).

"On a New Principle in the Theory of Structures." George F. Swain. (With Discussion.) LXXXIII. 622 (1919-20).

"On the Permanent Effects of —in Metals: on their Self-Registration and Mutual Interactions." Robert H. Thurston. XXIV. 159 (1891). Discussion, XXIV, 164: XXV, 17 (1891).

"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving Drawbridges Having Two Spans or Openings. and Built as Continuous Girders, more especially as Continuous Panel Girders." Clemens Herschel. III. 395 (1874). Discussion, IV, 203 (1875).

on the Variation due to Orthogonal Strains in the Elastic Limit in Metals, and on its Practical Value and More Important Applications," Robert H. Thurston, IX, 173 (1880). Discussion. "On

Thurston, IX, 173 (1880). Discussion, IX, 362.

"Stress Measurements on the Hell Gate Arch Bridge," D. B. Steinman. (With Discussion.) LXXXII. 1040 (1918).

"The Effects of Straining Structural Steel and Wrought Iron." Henry S. Prichard. (With Discussion.) LXXX, 1429 (1916).

"The Rate of Set of Metals Subjected to—for Considerable Periods of Time." Robert H. Thurston. VI, 28 (1877).

"Web Strains in Simple Trusses with Parallel or Inclined Booms." Eluathan Sweet. IX, 415 (1880). Discussion, X, 20 (1881). 20 (1881).

See also STRESS.

STRAIN GAUGES. See EXTENSOMETERS.

STREAM CONTAMINATION.

"Disposal of Sewage in Massachusetts."
Frederic P. Stearns, XVIII, 1 (1888).
Discussion, XVIII, 24.
Legislation in relation to pollution of
streams. LXXXI, 795 (1917).
Pollution of rivers. XXV, 125 (1891).
"Self-Purification of Flowing Water and
the Influence of Polluted Water in the
Causation of Discase." Charles G. Currier. (With Discussion.) XXIV, 21
(1891). XXIV, 21 (1891). ewage

(1891).

"Scwage Disposal." Charles A. Allen.

(With Discussion.) XVIII, 8 (1888).

"—and Sewage Purification." An Informal Discussion. R. E. McMath, W. C. Parmley, Gardner S. Williams, Peter Milne, Kenneth Allen, James Owen, Charles G. Darrach, E. W. Harrison, P. A. Maignen, L. L. Tribus, Palmer C. Ricketts, James

STREAM CONTAMINATION-(Continued). Haring, and James H. Fuertes. XLII,

5. Harring, and sames L. L. (1899).
"The Control of Non-Navigable Streams by the National Government." An Informal Discussion. Rudolph Hering and others. XLIX, 14 (1902).

STREAM FLOW.

See WATER, FLOW OF, IN OPEN CHANNELS.

STREAMS.

See RIVERS.

STREET GRADES. See GRADES.

STREET LINES.

"On the Marking of -.." C. M. Broomall. (With Discussion.) XXXII, 65 (1894).

STREET RAILWAYS.

"A Brief Description of a Modern Street Railway Track Construction." A. C. Polk. (With Discussion.) LXXVI, 455 (1913).

(1913).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

Effect of San Francisco earthquake on —.

LIX, 256 (1907).

"Electricity versus Steam for Branch Railroad Lines." An Informal Discussion.

H. S. Haines, H. G. Prout, Oberlin Smith, W. B. Reed, G. S. Davison.

W. L. Webb, J. James R. Croes, W. J. Baldwin, D. C. Jackson, Gustav Lindenthal, Edward Wegmann, Robert Moore, C. W. Buchholz, A. P. Davis, and Charles H. Davis, XLII, 375 (1899).

"Motive Power for —." Alfred F. Sears. XXVII, 313 (1892). Discussion, XXVII, 574.

574.

AXVII, 313 (1892). Discussion, XXVII, 574.

"Notes on Cost of Operating Cable Rail-ways." D. Bontecou. XXVIII, 250 (1893). Discussion, XXVIII, 456.

"Street Motors on the Government Tramways at Sydney, New South Wales." George Downe. XXVIII, 150 (1893).

"Street Railway Track." T. G. Gribble. (With Discussion.) XXIV, 80 (1891).

"Test of Power Required to Drive Electric Street Cars, and Total Efficiency of Motor." Louis B. Bonnett. XXVII, 307 (1892). Discussion. XXVII, 675.

"The Improvement of Railway and Street Railway Track." E. E. Russell Tratman. XXII, 135 (1890).

"The Ninety-Sixth Street Power Station of the Metropolitan Street Railway Company, of New York City." L. G. Montony. (With Discussion.) XLIV, 119 (1900). (1900)

"Transmission of Power in Operating Cable Railways." Robert Gillham. XXIX, 543 (1893). Discussion, XXX, 548 (1893). See also ELECTRIC RAILWAYS: ELE-

VATED RAILROADS.

STREET SPRINKLING.

"Has Experience Demonstrated that the Oiling of Roads is the Most Satisfactory or Economical Method of Preventing Dust and Preserving the Road Surface?"

An Informal Discussion. S. Whinery and others. LXV, 462 (1909).

"—in St. Paul, Minn." C. L. Annan. LXXVI, 77 (1913). Discussion: S. Whinery, and A. H. Blanchard, LXXVI, 57

STREET SPRINKLING-(Continued).

Use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIII, 33 (1911).

STRENGTH OF MATERIALS.

New Formula for the Strength of Columns." A. J. Du Bois. (With Dis-cussion.) XXVII, 69 (1892).

cussion.) XXVII, 69 (1892).

"A Note on the Resistance of Materials."
Robert H. Thurston. II, 239 (1873).

"A Record of Experiments Showing the Character and Position of Neutral Axes, as Seen by Polarized Light." Louis Nickerson. III, 31 (1874). Discussion, III, 48; IV, 277 (1875).

"Faults in the Theory of Flexure, and an Epitome of Certain I-Beam Tests Made at Ambridge, Pa." Henry S. Prichard. LXXV. 895 (1912). Discussion: Charles Worthington, Edward Godfrey, S. Vilar y Boy, H. F. Dunham, Eugene W. Stern, Theodore Belzner, J. P. J. Williams, and Edgar Marburg, LXXV, 920. 920.

Impact testing experiments. XXXIX, 237 (1898).

"Note on the Resistance of Materials."
Robert H. Thurston. IV. 334 (1875).
"Note on the Resistance of Materials, as
Affected by Flow and by Rapidity of
Distortion." Robert H. Thurston. V, 199 (1876).

"On a Newly Discovered Relation between the Tenacity of Metals and their Resist-ance to Torsion," Robert H. Thurston. VII, 169 (1878).

VII. 169 (1878).

"On the Strength. Elasticity, Ductility and Resilience of Materials of Machine Construction, and on Various Hitherto Unobserved Phenomena. Noticed during Experimental Researches with a New Testing Machine, Fitted with an Autographic Registry." R. H. Thurston, II, 349 (Section I) (1873); III, 1 (Section II), (1874). Discussion, IV, 265 (1875); II.) (1874). I V, 102 (1876).

On the Variation due to Orthogonal Strains in the Elastic Limit in Metals, and on its Practical Value and More Important Applications." Robert H. Thurston. IX, 173 (1880). Discussion, "On

IX, 362.

IX, 362.

"Some Constants of Structural Steel."
Palmer C. Ricketts. XVI. 138 (1887).

"Some Experiments on the Transverse
Breaking Strain of Plate Glass." G. W.
Plympton. XXV, 223 (1891). Discussion. XXV, 226, 635.

"The Six-Hundred Ton Testing Machine at the Works of the Union Bridge Company at Athens, Pa." Charles Macdonald. (With Discussion.) XVI, 1 (1887).

"The Strength and Other Properties of Materials of Construction, as Deduced from Strain Diagrams Automatically Produced by the Autographic Recording Testing Machine." Robert H. Thurston. V, 9 (1876). V, 9 (1876).

"The Strength and Weathering Qualities of Roofing Slates." Mansfield Merriman. First Paper. XXVII, 331 (1892); Discussion, XXVII, 348, 685; Supplementary Paper (With Discussion), XXXII, 529

(1894).

"The Transverse Strength of Beams as a Direct Function of the Tensile and Crushing Stresses of Material." M. Lewinson. (With Discussion.) XXXV, 484 (1896).

STRENGTH OF MATERIALS-(Continued). "Thermo-Electric Measurement of Stress." C. A. P. Turner. XLVIII, 140 (1902).

See also BRICK: BUILDING STONE: CAST IRON: CEMENT: CONCRETE: IRON: METALS: MORTARS: REIN-FORCED CONCRETE: STEEL: TIM-BER: WROUGHT IRON.

STRESS.

"A Graphical Method for the Solution of Stresses in the Continuous Girder, as Applied to Draw-Bridges." George F. George F. XLVIII, 72 (With Discussion.) Barton.

Barton (With Discussion.) XLVIII, 72 (1902).

"A New Graphical Solution of the Problem, What Position a Train of Concentrated Loads must have in Order to Cause the Greatest—in any Given Part of a Bridge Truss or Girder." Henry T. Eddy, XXII, 259 (1890).

"An Analysis of General Flexure in a Straight Bar of Uniform Cross-Section." L. J. Johnson. LVI, 169 (1906).

"Approximate Determination of Stresses in the Eye-Bar Head." William H. Burr. VI, 127 (1877). Discussion, VI, 263; VII, 189 (1878).

Calculation of stresses for trusses of the new Kenova Bridge. LXXIX, 423

Kenova Bridge. LXXIX,

(1915).

new Kenova Bridge. LXXIX, 423 (1915).

"Cinder Concrete Floors." Guy B. Waite. (With Discussion.) LXXVII, 1773 (1914).

"Determination of the Stresses in Elastic Systems by the Method of Least Work." William Cain. XXIV, 265 (1891).

"Faults in the Theory of Flexure, and an Epitome of Certain I.Beam Tests Made at Ambridge, Pa." Henry S. Prichard. (With Discussion.) LXXV, 895 (1912).

"Final Report of the Special Committee on Steel Columns and Struts." (With Discussion.) LXXXIII, 1583 (1919-20).

"General Criterion for Position of Loads Causing Maximum—in any Member of a Bridge Truss." L. M. Hoskins. (With Discussion.) XXIII, 240 (1899).

"Insufficient Provision for Counterstresses in Railroad Bridges." Henry S. Prichard. (With Discussion.) XLII, 547 (1899).

(1899)

Intensities of working stresses. XXVI, 98 (1892).

(1892).
Loads and unit stresses, Hell Gate Arch Bridge. LXXXII, 903, 908, 987 (1918).
"Maximum Stresses in Bascule Trusses."
W. Watters Pagon. LXXVI, 73 (1913).
Measurements of stresses by strain gauges.
LXXXIII, 1947 (1919-20).
"Ohservations on the Stresses Developed in Metallic Bars by Applied Forces."
Theodore Cooper. VII, 174 (1878).
"On a New Principle in the Theory of Structures." George F. Swain. (With Discussion.) LXXXIII, 622 (1919-20).
"On the Calculation of the Stresses in Bridges for the Actual Concentrated Loads." George Fillmore Swain. XVII, 21 (1887). 21 (1887)

"Progress Report of the Special Committee

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191 (1918). "Revision of the Niagara Railway Arch Bridge." Charles Evan Fowler. (With Discussion.) LXXXIII, 1919 (1919-20). "Safe Stresses in Steel Columns." J. R. Worcester. (With Discussion.) LXI, 156 (1908)

"Second Progress Report of the Special Committee to Report on Stresses in Rail-

STRESS-(Continued).

road Track." (With I LXXXIII, 1409 (1919-20). Discussion.)

LXXXIII, 1409 (1919-20).
"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat Slab Floors." John R. Nichols. (With Discussion.) LXXVII, 1670 (1914).
"Steel Stresses in Flat Slabs." H. T. Eddy. (With Discussion.) LXXVII, 1338 (1914).
— in tunnel lining. LXXXIII, 460 (1919-

1920).

Measurements on the Hell Gate Arch Bridge." D. B. Steinman. (With Dis-cussion.) LXXXII, 1040 (1918). resses in arched dams. LXXXIII, 2034 Stresses

(1919-20).

(1919-20).

"Stresses in Bridges." William H. Booth.

XX, 137 (1889).

"Stresses in Columns Subject to Combined

Axial and Transverse Loading." Charles

Worthington. XLVIII, 462 (1902).

"Stresses in Railway Bridges on Curves."

Ward Baldwin. (With Discussion.)

XYV 450 (1891).

XXV. 459 (1891). Stresses in steel structures, Manhattan Elevated Railways, LXXXII, 565 (1918). Stresses in tunnel linings. LXXXIII, 1824.

Stresses in tunnel linings. LXXXIII, 1824, 1830 (1919-29).
"Temperature Stresses in a Series of Spans." Tresham D. Gregg. (With Discussion.) LXXX, 1626 (1916).
"The Determination of the Safe Working—for Railway Bridges of Wrought Iron and Steel." E. Herbert Stone. (With Discussion.) XLI, 467 (1899).
The distribution of stresses in mitering lock-gates, with special reference to the gates of the Panama Canal. Discussion by David A. Molitor. LXXXII, 1469 (1918).
"The Transverse Strength of P.

"The Transverse Strength of Beams as a Direct Function of the Tensile and Crushing Stresses of Material." M. Lewinson, (With Discussion.) XXXV. (1896).

"Thermo-Electric Measurement of —." C. A. P. Turner. NLVIII, 140 (1902). Unit stresses used in revision of Niagara Railway Arch Bridge. LXXXIII, 1956 (1919-20).

See also STRAIN.

STRINGERS.

"Pine - and Floor-Beams for Bridges." Onward Bates. (XXIII, 261 (1890). (With Discussion.)

STRUCTURAL STEEL. See STEEL.

STRUTS.

See COLUMNS.

SUBMARINE BLASTING. See BLASTING.

SUBSTRUCTURE.

See CONCRETE: FOUNDATIONS: MA-SONRY.

SUBWAYS.

"History of the Pennsylvania Avenue Subway, Philadelphia, and Sewer Construc-tion Connected Therewith," George S. Webster and Samuel Tobias Wagner. (With Discussion.) XLIV, 1 (1900).

—for pipes, wiring, and baggage transfer, Pennsylvania Railroad Terminal, New York. LXIX, 175, 237 (1910).

SUBWAYS—(Continued).

"The I'ennsylvania Avenue Subway and Tunnel, Philadelphia, Pa." George S. Webster and Samuel Tobias Wagner. (With Discussion.) XLVIII, 470 (1902).

See also TUNNELS: UNDERGROUND RAILWAYS.

SULPHITE FIBER.

"Some Remarks on the Chemistry of the Processes of Lime — Manufacture." Mar-tin L. Griffin. XX, 281 (1889).

SURGE TANKS.

SURGE TANKS.

"Penstock and Surge-Tank Problems."
Minton M. Warren. LXXIX, 238 (1915).
Discussion: Irving P. Church, R. D.
Johnson, John C. Trautwine, Jr., Gardner S. Williams, J. T. Noble Anderson,
and H. C. Vensano, LXXIX, 272.

"Pulsations in Pipe Lines, as Shown by
Some Recent Tests." H. C. Vensano
(With Discussion.) LXXXII, 185 (1918).

"The Differential Surge Tank." Raymond
D. Johnson, LXXVIII, 760 (1915). Discussion: Roy Taylor, and D. L. Webster,
LXXVIII, 785.

SURVEYING.

"A Method of Taking Cross-Sections in Deep Rock Cuts by Triangulation." F. W. Watkins. XXII, 386 (1890). "A Method of Tunnel Alignment." H. F. Dunham. (With Discussion.) XXVII,

453 (1892)

"A New Method of Calculating Cross-Secthe Mathematical Chichard Cross-Sections of Roads and Railroads." Francisco Da Silva Ribeiro. (Translated from the French by Foster Crowell.) XXIX, 447 (1893). Discussion, XXX, 533 (1893). Novel Railroad Survey." Thomas S. Hardee. (With Discussion). VI, 258

(1877).

Resurvey of the Williamsport Division of the Philadelphia and Reading Railroad." (Abstract.) George D. George (Abstract.)

Raifroad, (Abstract.)
Snyder, XXXVI, 509 (1896).
"A Review of the Report of Captain Andrew Talcott, Chief Engineer, Mexico and Pacific Railroad, Eastern Division, and Pacific Railroad, Eastern Division, from Vera Cruz to Mexico: Explorations, Surveys, Estimates, 1858." Emile Low. (With Discussion.) LXXX, 1543 (1916). "A Simple Method of Running in a Transition Curve." John F. Ward. XXVII, 18 (1892). Discussion, XXVIII, 32, 205

(1893).

"Accuracy of Measurement as Increased by Repetition," Stephen S. Haight, XI, 242 (1882).

"Availability of the Cañons of the Colorado River of the West for Railway Purposes." Robert Brewster Stanton. (With Discussion.) XXVI, 233 (1892). "Co-ordinate —." Henry F. Walling. VI,

88 (1877). Cost of survey of the Rio Grande from Roma to the Gulf of Mexico. LXXVII,

Roma to the Gulf of Mexico. LXXVII, 1025 (1914).

"Data for Flattening the Ends of Railroad Curves," Albon P. Man, Jr. (With Discussion.) XV, 359 (1886).

"Description of Survey for Determining the Slope of Water Surface in the Eric Canal." W. H. Searles. VI, 289 (1877).

"Early Surveys and Reports in Reference to the Transmission of Trade across the Allegheny Mountains in the State of Pennsylvania, known as the Allegheny

SURVEYING—(Continued).

Portage." Moncure Robinson. XV, 181

Conomic Canal Location in Uniform "Economic Countries." Lyman E. Bishop. (With Discussion.) LXXIV, 178 (1911). "Errors in Railroad Levels." Howard V. Hinckley. (With Discussion.) XV, 893

(1886).

"Experiments on the Stability of Bench Marks." George W. Cooley. (With Dis-cussion.) XX, 73 (1889). "Geodetic Field Work." Geo. Y. Wisner.

cussion.) XX, 73 (1889).

"Geodetic Field Work." Geo. Y. Wisner. XII, 267 (1883).

"Historical Notes upon Ancient and Modern—and Surveying Instruments." H. D. Hoskold. XXX, 135 (1893).

"Invar (Nickel-Steel) Tapes on the Measurement of Six Primary Base Lines." Owen B. French. LX, 219 (1908). Discussion: J. A. Ockerson, Horace Andrews, and Noah Cummings, LX, 243.

"Line and Surface for Railway Curves." Charles C. Wentworth. (With Discussion.) XLVIII, 357 (1902).

"Methods of Location on the Choctaw, Oklahoma and Gulf Railroad." F. Lavis. LIV, 104 (1905). Discussion: E. Sherman Gould. Wilford A. Thompson. S. Whinery. C. P. Howard. Emile Low, F. T. Oakley and O. H. Tripp, LIV, 139.

"Mule-Back Reconnaissances." William J. Millard. LXXV, 12 (1912). Discussion: George D. Snyder. Ernest McCullough, and F. Lavis. LXXV, 19.

"Notes on a Tunnel Survey." Frederick C. Noble. LXXV, 68 (1912). Discussion: George D. Snyder, Robert Ridgway, B. F. Cresson, Jr.. S. M. Purdy, and Lazarus White, LXXV, 80.

"On Increasing the Accuracy of a System of Magnetic Bearings of a Survey." Olin

on Increasing the Accuracy of a System of Magnetic Bearings of a Survey." Olin H. Landreth. (With Discussion.) XV, 342 (1886).

"On the Marking of Street Lines." C. M. Broomall. (With Discussion.) XXXII,

Brooman. (1994).
(55 (1894).
"Railroad Location." Michael L. Lynch.
(With Discussion.) XXXI, 81 (1894).
"Rapid Methods in Topographical—."
William Bell Dawson. XI, 397 (1882). William Bell Dawson. Discussion, XI, 405.

"Recent Experience on the U. S. Coast and Geodetic Survey in the Use of Long Steel Tapes for Measuring Base Lines." R. S. Woodward XXX, 81 (1893). Dis-

cussion, XXX, 638. "Recent Improvements in Leveling Instru-ments." Dunbar D. Scott. LXXVI, 1172

(1913).

"Recent Stadia Topographic Surveys: Notes Relating to Methods and Cost." William B. Landreth. (With Discussion.) XLIV, 92 (1900).

"92 (1900).

"Retracement-Resurveys — Court Decisions and Field Procedure." N. B. Sweitzer. LXXV, 393 (1912). Discussion: W. Newbrough, J. Francis Le Baron, A. M. Strong, Leonard S. Smith, H. V. Hinckley, James L. Davis, A. T. Parsons, and J. C. Carpenter, LXXV, 420.

"Some Devices for Increasing the Accuracy or Rapidity of — Operations." Walter Loring Webb. XLVIII, 98 (1902). Discussion: Gerard H. Matthes, C. A. Sundstrom, John F. Hayford. Willard D. Lockwood, L. C. Sabin, Oscar Brlandsen, Horace Andrews, George A. Taber, and Leonard S. Smith, XLVIII, 105.

SURVEYING-(Continued).

Their Cost per Mile." W. S. McFetridge.

Their Cost per Mile." W. S. McFetridge. LXV, 105 (1909). Discussion: Clinton S. Bissell, F. Lavis, E. W. Lewis, and George L. Dillman, LXV, 131.
"Spirals and their Use on Railroads." A. S. C. Würtele. XXXI, 329 (1894).
"Spirit Leveling of the United States Geological Survey." Herbert M. Wilson. (With Discussion. XXXIX, 339 (1898). (Surveying." Officers of the U. S. Coast and Geodetic Survey: John F. Hayford, W. C. Hodgkins, D. B. Wainwright, L. A. Bauer, Isaac Winston, and E. G. Fischer. (Inter. Eng. Cong. 1904.) LIV, Part B, 399 (1905).

A. Bauer, Isaac Winston, and E. G. Fischer. (Inter. Eng. Cong. 1904.) LIV, Part B, 399 (1905).
"Surveying." Officers of the U. S. Geological Survey: Herbert M. Wilson, Edward C. Barnard, and John C. Hoyt. (Inter. Eng. Cong. 1904.) LIV, Part B, 419 (1905).

Papers, 1904. F. R. Helmert, O. V. P. Stout, E. C. Murphy, F. W. Hanna, J. L. Van Ornum, Lewis M. Haupt, Alfred Chatterton, H. K. Barrows, Ch. Lallemand, Officers of the U. S. Coast and Geodetic Survey, and Officers of the U. S. Geological Survey. LIV. Part B, 440, (1905) 449 (1905).

449 (1905).
Surveys for classifying irrigable lands.
LXXXI, 222 (1917).
"Surveys for Railway Location." F. A.
Gelbcke. (Translated from the German
by R. P. Miller.) XXIX. 429 (1893). Discussion, XXX, 525 (1893).
"The Adjustment of a Transit Survey as
Compared with that of a Compass Survey." Charles L. Crandall. (With Discussion.) XLV, 453 (1901).
"The Aneroid Barometer and its Use in

"The Aneroid Barometer and its Use in Estimating Altitudes." Theo. G. Ellis. I, 277 (1872).

Estimating Altitudes." Theo. G. Ellis. 1, 277 (1872).

"The Approximate Value of a Reduction of Ruling or Maximum Grades, Especially for the Use of Engineers on Location of Railroads." John G. Clarke. (With Discussion.) II, 399 (1873).

"The First Trip through Big Horn Cañon." E. Gillette. XXV, 8 (1891).

"The Location of the Chimbote Tunnels." Othniel F. Nichols. IX, 365 (1880).

"The Location of the Knoxville, La Follette and Jellico Railroad, of the Louisville and Nashville System." W. D. Taylor. (With Discussion.) LII, 467 (1904).

"The Proper Compensation for Railroad Curves." William R. Morley. (With Discussion.) XIII, 181 (1884).

"The Stereoscopic Method of —, and a First Trial of Its Application to a Railway Survey in China." Georg A. G. Müller. LXXIX, 665 (1915). Discussion: F. Lavis, LXXIX, 706.

"The Theory and Practice of Precise Spirit Leveling." David A. Molitor. (With Discussion.) XLV, 1 (1901).

"The Topographic Map of the United States." Herbert M. Wilson. XXXIII, 405 (1895).

"The Transition Curve whose Curvature

States." Herbert M. Wilson. AXXII, 405 (1895).
"The Transition Curve whose Curvature Varies Directly as its Length from the P. C. or Point where it Connects with the Tangent." William Cain. XXVI, 473 (1892). Discussion, XXVIII, 32, 205 (1893).

"Topographic Surveys." Herbert G. Ogden, XXX, 62 (1893). Discussion, XXX, 611. "Topographical Surveys Made by the American Section of the International

SURVEYING-(Continued).

Boundary Commission United States and Mexico." W. W. Follett. LXXVII, and Mexico." W. W. Follett. LXXVII, 989 (1914). Discussion: William B. Landreth, W. N. Brown, N. T. Blackburn, and Leonard S. Smith, LXXVII,

"Topography on the Survey of the Mexico-United States Boundary." J. L. Van Or-num. (With Discussion.) XXXIV, 259 (1895).

"Transition Curves." W. B. Lee. (With Discussion.) XLVI, 379 (1901). Triangulation and alignment of Astoria Gas Tunnel. LXXX, 658 (1916). Tunnel alignment of Colorado River siphon.

Tunnel alignment of Colorado River siphon, LXXVII, 21 (1914).

"Tunnel—on Division No. 6, New Croton Aqueduct." F. W. Watkins. (With Discussion.) XXIII, 17 (1890).

United States land survey, Imperial Valley, California. LXXVI, 1269 (1913).

SURVEYS.

See SURVEYING.

SUSPENSION BRIDGES.

"A Rational Form of Stiffened Suspension

A Kational Form of Stiffened Suspension Bridge." Gustav Lindenthal. (With Discussion.) LV, 1 (1905).
A Simple Method of Computing Deflections of a Cable Span Carrying Multiple Loads Evenly Spaced." F. C. Carstarphen. (With Discussion.) LXXXIII, 1333 (1919-20).

Dumparative designs for captileyer, comparative designs for captileyer.

Comparative designs for cantilever, continuous girder, and suspension types for Hell Gate Arch Bridge. LXXXII, 865

(1918).

"Description of a Combined Triangular and Suspension of a Combined Triangular and Suspension Bridge Truss, and Comparison of its Cost with that of the Warren, Pratt, Whipple and Howe Trusses." Edwin Thacher. XIII, 123 (1884).

"Historical Sketch of the Successive Improvements in — to the Present Time." Charles Bender. I, 27 (1872).

Niagara Suspension Bridge, History of. XL, 125 (1898).

"Notes on the Masonry of the East River Bridge." Francis Collingwood. VI, 7 (1877).

"Progress of Work at the East River Bridge." F. Collingwood. IX, 162 (1880). "Replacing the Stone Towers of the Niagara Railway Suspension Bridge, with Iron Towers." L. L. Buck. XVII,

204 (1887).

"Restoration of the Cable Ends of the

"Restoration of the Cable Ends of the Covington and Cincinnati Suspension Bridge." G. Bouscaren. XXVIII, 47 (1893). Discussion, XXVIII, 358.
"—: A Study." George S. Morison. (With Discussion.) XXXVI, 359 (1896).
"The Footbridge for Building the Cables of the New East River Bridge." Isaac Harby. (With Discussion.) XLIX, 165 (1992). (1902).

"The Re-Enforcement of the Anchorage and Renewal of the Suspended Super-structure of the Niagara Railroad Sus-pension Bridge." L. Buck. X, 195

"The Stiffening System of Long-Span — for Railway Trains." Joseph Mayer. XLVIII, 371 (1902). Discussion: L. S. Moisseiff, H. A. La Chicotte, W. Hilden-brand, L. L. Buck, and Edwin Duryea, Jr., XLVIII, 422.

SUSPENSION BRIDGES—(Continued).

"Theory and Formulas for the Analytical Computation of a Three-Span Suspension Bridge with Braced Cable." Leon S. Moisseiff. (With Discussion.) LV, 94 (1905).

See also ANCHORAGE: BRIDGES.

TANKS.

"The Design of Elevated—and Stand-Pipes." C. W. Birch-Nord. LXIV, 526 (1909). Discussion: Charles B. Burdick, O. E. Selby, Charles C. Hopkins, William Murray Black, J. Madison Porter, E. G. Walker, and A. W. Carpenter, LXIV,

See also AIR TANKS: SURGE TANKS.

TAR.

"Sampittic Surfacing." Walter Wilson Crosby. (With Discussion.) LXIV, 352 (1909).

Tests of bituminous materials. LXXXII, 1448 (1918).

TELEGRAPH.

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).
Telephones and —, Pennsylvania, Railroad
Terminal, New York. LXIX, 364 (1910).

TELEPHONES.

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).
"Submarine Telephoning." Charles Ward Raymond. VII, 310 (1878).
—and telegraph, Pennsylvania Railroad Terminal, New York. LXIX, 364 (1910).
"The Load Line in Telephone Exchanges."
A. V. Abbott. XXXII, 74 (1894).

TEMPERTURE.

Effects of — on concrete in arch dams. LXXXIII, 590 (1919-20).

LXXXIII, 590 (1919-20).

at Calgary and Gleichen, Alberta.
LXXXI, 225 (1917).

at various places in Mexico and Southwestern United States, and relation to evaporation. LXXX, 1829 (1916).

"—Changes in Mass Concrete." Charles H. Paul and A. B. Mayhew. (With Discussion.) LXXIX, 1225 (1915).

—in Mines. XIII, 80 (1884).

"of Water at Various Depths in Lakes and Oceans." Hamilton Smith. (With Discussion.) XIII, 73 (1884).

"The—of Lakes." Desmond FitzGerald. (With Discussion.) XXXIV, 67 (1895).

TEREDO.

"Marine Wood-Borers." Charles H. Snow. (With Discussion.) XL, 178 (1898).
"Protecting Piles against the — Navalls on the Louisville and Nashville Railroad Company's Lines." R. Montfort. (With Discussion.) XXXI, 221 (1894).
"The Preservation of Timber." J. W. Putnam. IX, 206 (1880).
"The Navalls, or Ship-Worm." G. W. P.

nam. IX, 206 (1880). "The — Navalis, or Ship-Worm." G. W. R. Bayley. (With Discussion.) III, 155 (1874).

TERMINAL STATIONS.

See RAILROAD STATIONS: RAIL-ROAD TERMINALS.

TESTING MACHINES.

Data relating to —. LXVI, 402 (1910). Description of Emery testing machine at Bureau of Standards, Washington, D. C. LXXXIII, 1584 (1919-20).

Description of testing machine at Watertown, Mass., Arsenal. XI, 3 (1882).
"Experiments with a New Machine for Testing Materials by Impact." S. Bent Russell. (With Discussion.) XXXIX, 237 (1898).

"Experiments with Appliances for Testing Cement." Alfred Noble. 1X, 186 (1880). "Federal Investigations of Mine Accidents, Structural Materials, and Fuels." Herbert M. Wilson. (With Discussion.) LXX,

190 (1910).

190 (1910).

"On the Strength, Elasticity, Ductility and Resilience of Materials of Machine Construction, and on Various Hitherto Unobserved Phenomena, Noticed during Experimental Researches with a New Testing Machine, Fitted with an Autographic Registry." R. H. Thurston. II, 349 (Section I) (1873); III, 1 (Section II) (1874). Discussion, IV, 265 (1870); V. 102 (1876) V, 102 (1876).

"Portland Cement Testing." Henry Faija.

Tortiand Cement Testing." Henry Faija.
XVII, 218 (1887).
"Tensile Tests of Cement, and an Appliance for More Accurate Determinations."
D. J. Whittemore. (With Discussion.)
IX, 329 (1880).

for impact tests of steel VIIII

impact tests of steel. XLIII, 6 - for

(1900).

"The Six-Hundred Ton Testing Machine at the Works of the Union Bridge Com-pany at Athens, Pa." Charles Macdon-ald. (With Discussion.) XVI, I (1887).

"The Strength and Other Properties of Materials of Construction, as Deduced from Strain Diagrams Automatically Produced by the Autographic Recording Testing Machine." Robert H. Thurston. V, 9 (1876).

"Uniform System for Tests of Cement." Final Report of the Committe. XIV,

475 (1885).

THERMODYNAMICS.

"Note Relating to Rumford's Determina-tion of the Mechanical Equivalent of Heat." Robert II. Thurston. 11, 289 (1873).

THERMOMETERS.

"Thermometer Scales." Fred. Brooks. XV, 381 (1886).

as Applied at Wilmington, Cal." Clinton B. Sears. V. 388 (1876). Discussion, VI, 189 (1877).

Tidal phenomena, Galveston, Tex., Harbor. XXV, 543 (1891).

"Tidal Phenomena in the Harbor of New York." H. de B. Parsons. (With Discussion). LXXVI, 1979 (1913).

affecting the hydraulies of the Care Cod. "Principles of Tidal Harbor Improvement

- affecting the hydraulies of the Cape Cod Canal. LXXXII, 65 (1918).

TIES.

"Longitudinals vs. Cross—for Railway Tracks." E. E. Russell Tratman, (With Discussion.) XXV, 615 (1891). "Maintenance Expenses of Track on Wooden and Metal—." J. W. Post. (With Discussion.) XVIII, 253 (1888).

TIES—(Continued).

TIES—(Continued).

"Pioneer Railway Development in the United States." W. D. Taylor. (With Discussion.) LXXIV, 94 (1911).

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191 (1918).

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." (with Discussion.) sion.) LXV, 498 (1901).

"The Artificial Preservation of Railroad—by the Use of Zinc Chloride." Walter W. Curtis. (With Discussion.) XLII, 288 (1899).

"The Increasing Cost of Railway Tie Renewals." Benjamin Reece. (With Discussion.) XXVII, 640 (1892).

cussion.) XXVII, 640 (1892).

"The Preservation of Railway—in Europe." O. Chanute. (With Discussion.) XLV, 498 (1901).

See also TRACK.

TIMBER.

Bibliography of - tests. LIV, Part F, 87 (1905)

Durability of, and time for felling tropical—. XXXVI, 76 (1896).

Jarrah—used in construction. LXXVI,

1948, 1972 (1913).

"Modern Practice in Wood Stave Pipe Design and Suggestions for Sta Specifications." J. F. Partridge, Discussion.) LXXXII, 433 (1918) Standard (With

Resilience tests of various woods. XXXIX,

"Tests of Creosoted—" W. B. Gregory. LXX, 11910).
"Tests of Creosoted—" W. B. Gregory. LXX, 17 (1910).
"Tests of Creosoted—" W. B. Gregory. LXXVI, 1192 (1913).
Tests of Guatemalian woods. LXXXIII,

ests of Guard. 1695 (1919-20). ... Gaetano Lanza. "Tests of—." Gaetano Lanza. (Inter. Eng. Cong. 1904.) LIV, Part F, 77 (1905). Discussion: W. K. Hatt, James E. Howard, and Sir William H. White, LIV, Part F, 93.
Tests of—made at West Milwaukee, 1889. XXIII, 261 (1890).
Tests of various woods. II, 349 (1873); III, 1 (1874).

"The Permanent Way of Railways in Great

Britain and Ireland, with Especial Reference to the Use of — Preserved and Unpreserved." John Bogart. VIII, 17 (1879).

"The Freservation of Materials of Con-struction," An Informal Discussion. William Barclay Parsons and others. L, 293 (1903).

"The Properties of Balsa Wood (Ochroma Lagopus)." R. C. Carpenter. LXXXI, 125 (1917). Discussion: A. P. Lundin, and Leonard M. Cox, LXXXI, 156.
"Tests." An Informal Discussion. W. K. Hatt, Hermann von Schrenk, Gaetano

Lanza, A. L. Johnson, and S. Bent Russell. LI, 67 (1903).

See also PRESERVATION OF TIMBER.

TIMBERING.

Methods used in exeavating tunnels for Lexington Avenue Subway, New York City. LXXXI, 341 (1917).
"Secure Subway Supports." A. B. Lueder and W. J. R. Wilson. (With Discussion.) LXXX, 914 (1916).

TIME.

"On Uniform Standard—, for Railways, Telegraphs and Civil Purposes Gener-ally." Sandford Fleming. X, 387 (1881).

TOLUOL.

"The Production of — from Gas Plants." Myron S. Falk. LXXXIII, 904 (1919-20). Discussion: A. C. Klein, and Horace C. Porter. LXXXIII, 293.

TOOLS.

used in stone cutting. VI, 298 (1877).
 Wrecking — for railroad emergencies.
 XXVII, 39 (1892).

TOPOGRAPHY.

"Geology in its Relation to -." John C. Branner. (With Discussion.) 53 (1898). XXXIX.

"Methods of Location on the Choetaw. Oklahoma and Gulf Railroad." F. Lav (With Discussion.) LIV, 104 (1905). F. Lavis.

"New Method of Making Conventional Signs

"New Method of Making Conventional Signs on Original Topographical Maps." J. A. Ockerson. XIV, 399 (1885).
"Railroad Location." Michael L. Lynch. (With Discussion.) XXXI, 81 (1894).
"Rapid Methods in Topographical Surveying." William Bell Dawson. XI, 307 (1882). Discussion, XI, 405.
"Recent Stadia Topographic Surveys: Notes Relating to Methods and Cost." William B. Landreth. (With Discussions).

William B. Landreth. (With Discussion.) XLIV, 92 (1900).
The Topographic Map of the United States." Herbert M. Wilson. XXXIII, 405 (1955)

"The

405 (1895).

"Topographic Surveys." Herbert G. Ogden. XXX, 62 (1893). Discussion, XXX, 611. XXX, 62 (1893). Discussion, XXX, 611.

"Topographical Surveys Made by the American Section of the International Boundary Commission United States and Mexico." W. W. Follett. (With Discussion.) LXXVII, 989 (1914).

"—on the Survey of the Mexico-United States Boundary." J. L. Van Ornum. (With Discussion.) XXXIV, 259 (1895).

"Probable Wind Pressure Involved in the Wreck of the High Bridge over the Mississippi River on Smith Avenue, St. Paul, Minn, August 20th, 1904." C. A. P. Turner. (With Discussion.) LIV, 31 (1905).

"Wind Pressures in the St. Louis Tornado, with Special Reference to the Necessity of Wind Bracing for High Buildings." Julius Baier. (With Discussion.) XXXVII, 221 (1897).

TORRENTS.

"Characteristics of the Ravine du Sud in the Island of Hayti, and I'lan for Averting Its Overflow." J. Foster Cro-well. XXIV, 470 (1891). Discussion, XXIV, 478; XXV, 343 (1891).

See also RIVERS.

TOWERS.

"A Concrete Water Tower." A. Kempkey, Jr. (With Discussion.) LXX, 334 (1910). "Reinforced Concrete—." D. W. Kreli-witz. (With Discussion.) LX, 160 (1908).

"Replacing the Stone — of the Niagara Railway Suspension Bridge, with Iron —." L. L. Buck, XVII, 204 (1887).

TOWERS-(Continued).

"The Tower of the New City Hall at Philadelphia, Pa." C. R. Grimm. (With Discussion.) XXXI, 249 (1894).

TOWING.

"Steam and Electric Cableways for Logg-ing and Canal-Boat —." Richard Lamb, (With Discussion.) XXXII, 44 (1894).

TRACK.

"A Brief Description of a Modern Street
Railway — Construction." A. C. Polk.
LXXVI, 455 (1913). Discussion: E. E.
R. Tratman, Walter C. Howe, Louis A.
Mitchell, William J. Boucher, and C. B.
Vorce, LXXVI, 466.
"Car Tracks and Pavements." James
Owen, XXXVII, 63 (1897). Discussion,
XXXVII, 78.
Comparison of — in the Pennsylvania and

XXXVII, 78.
Comparison of—in the Pennsylvania and Hudson and Manhattan Railroad tunnels. LXIX, 409 (1910).
"Construction and Maintenance of—."
Julien A. Hall. (With Discussion.)
XXIII, 330 (1890).
Cost of— LXIX, 409, 424 (1910).
"Cylindrical Wheels and Plat-Topped Rails for Railways." D. J. Whittemore. XXI, 133 (1889). Discussion. XXI, 133.
"Development of the American Rail and—." J. Elfreth Watkins. XXII, 209 (1890).

(1890).

Effect of increased weight of rolling stock

Effect of increased weight of rolling stock on roadbed. Lt. 105 (1903).

"English Railroad—" E. E. Russell Tratman. XVIII, 217 (1888). Discussion, XX, 61 (1889).

"Line and Surface for Railway Curves." Charles C. Wentworth. (With Discussion.) XLVIII, 357 (1902).

"Longitudinals vs. Cross-Ties for Railway Tracks." E. E. Russell Tratman. (With Discussion.) XXV, 615 (1891).

"Maintenance Expenses of—on Wooden and Metal Ties." J. W. Post. (With Discussion.) XVIII, 253 (1888).

"Management of Forces Engaged in Railway—Repairs." Benjamin Reece. XIII, 396 (1884).

396 (1884).

396 (1884).

"On the Gauges of Railroad — in General, with Special Consideration of Narrow-Gauge Railroads." E. A. Ziffer. (Translated from the German by Wolfgang G. Triest.) XXIX, 453 (1893). Discussion, XXX, 537 (1893).

"On the Theoretical Resistance of Railroad Curves." S. Whinery. VII, 79 (1878). Discussion, VII, 97; VIII, 179 (1879).

(1879).

"(1819).
"Pioneer Railway Development in the United States." W. D. Taylor, (With Discussion.) LXXIV, 94 (1911).
"Progress Report of the Special Committee to Report on Stresses in Railroad—." LXXXII, 1191 (1918).

road—" LXXXII, 1191 (1918).
"Second Progress Report of the Special Committee to Report on Stresses in Railroad—." (With Discussion.) LXXXIII, 1409 (1919-20).
"Some Notes on the Creeping of Rails." Samuel Tobias Wagner. (With Discussion.) LIII, 466 (1904).
"Street Railway—." T. G. Gribble. (With Discussion.) XXIV, 80 (1891).
"The Advantages of a Longitudinal Bearing System for Railway Tracks." Thom as C. Clarke. (With Discussion.) XXV. 234 (1891).

as C. Clar 234 (1891).

"The Improvement of Railway and Street

TRACK—(Continued).

Railway—." E. E. Russell Tratman, XXII, 135 (1890).
"The Influence of Rails on Street Pavements." Edward P. North. (With Discussion.) XXXVII, 70 (1897).
"The Permanent Way of Railways in Great

Britain and Ireland, with Especial Reference to the Use of Timber Preserved and Unpreserved." John Bogart. VIII, 17 (1879).

"The Rearrangement of Railroad Tracks and Stations in Cologne, Prussia." F.
Lohse. (Translated from the German by
Mansfield Merriman.) XXIX, 277 (1893).
"The Relation of Wheels to Frog Points
and to Guard Rails." Archibald A.
Schenck. (With Discussion.) XXXI, 509

changes, Manhattan Elevated Railway improvements. LXXXII, 556, 729, 735

(1918)

New York terminus of the Pennsylvania Railroad. LXIX, 305, 345 (1910).

See also RAILS: TIES.

TRADE WINDS.

"On the Cause of —." Franz A. Velschow. (With Discussion.) XXIII, 101 (1890).

TRAFFIC.

"An Account of Some Observations of Street --." Francis V. Greene. XV, 123 (1886).

Daily vehicular—count over East River bridges. LXXXIII, 436 (1919-20). Methods of taking—census. LXXIII, 1

(1911).

(1911).

"Street—in New York City, 1885 and 1904." Clifford Richardson. LVII, 181 (1906). Discussion: S. Whinery, N. P. Lewis, and G. W. Tillson, LVII, 191.

"The Concurrent Development of—on Improved Waterways and on Railroads." Edward P. North. (Inter. Eng. Cong. 1904.) LIV, Part B, 475 (1905). Discussion: Leo Sympher, Lionel B. Wells, and Th. Hoech, LIV, Part B, 495.

"The Economic Depth for Canals of Large—" Joseph Mayer. (With Discussion.)

"The Economic Depth for Canals of Large
—." Joseph Mayer, (With Discussion.)
XXXIX, 273 (1898).
"The Elements of Cost of Railroad Freight
—." O. Chanute. II, 381 (1873).
"The Problem of the Lower West Side
Manhattan Water-Front of the Port of
New York." B. F. Cresson, Jr. (With
Discussion.) LXXV, 226 (1912).
"The Production of—and the Transportation of Freight and Passengers." Mar-

tation of Freight and Passengers." Martin Coryell. (With Discussion.)

census, Druid Hill Park LXXVII, 1135 (1914). Hill Park, Baltimore. - census,

- census for roads and pavements. LXXXII, 1387, 1430 (1918). - on subways at Grand Central Station, New York City. LXXXII, 326, 328 (1918). See also TRANSPORTATION.

TRAIN LOADS.

"Locomotive Performance on Grades of Various Lengths." Beverly S. Randolph. (With Discussion.) LXX, 321 (1910). "The Maximum Weights of Slow Freight Trains." C. S. Bissell, LXIV, 303 (1909). Discussion: L. A. Riley, 2d, LXIV, 312. "The Traction of Freight Trains at Dif-

TRAIN RESISTANCE.

ferent Speeds." Clinton S. Bissell. (With Discussion.) LAVI. 58 (1910).
"Air Resistances to Trains in Tube Tun-

nels." J. V. Davies. (With Discussion). LXXV, 982 (1912).

"Experiments on the Resistances of Rolling Stock." A. M. Wellington. VIII, 21 (1879).

Zperiments with New Apparatus of Journal Friction at Low Velocities. A. M. Wellington, (With Discussion. "Experiments

A. M. Wellington. (With Discussion. XIII, 409 (1884).

"Locomotive Performance on Grades (Various Lengths." Beverly S. Randolp' (With Discussion.) LXX, 321 (1910).

"Resistances of Railway Trains." (Report of Dynagraph Experiments of P. E. Dudley.) William P. Shinn. V, 341 Dudley.) (1876).

"The Approximate Value of a Reduction of Ruling or Maximum Grades, Espe-cially for the Use of Engineers on Loca-tion of Railroads." John G. Clarke.

tion of Kanrouds.

II, 399 (1873).

"The Construction of the Atchison, Topeka and Santa Fé Railroad over the Raton Mountains, and the Performance of Locomotives on its Steep Grades." James (With Discussion.) VIII, 295

(1879).

"The Location of the Knoxville, La Follette and Jellico Railroad, of the Louisville and Nashville System." W. D. Taylor. (With Discussion.) LII, 407 (1904). "The Maximum Weights of Slow Freight Trains." C. S. Bissell. (With Discussion.) LXIV, 303 (1909).

"The Proper Compensation for Railroad Curves." William R. Morley. (With Discussion.) XIII, 181 (1884).

"The Traction of Freight Trains at Different Speeds." Clinton S. Bissell. LAVI, 58 (1910). Discussion: A. C. Dennis, LXVI, 68.

—in its relation to broad and narrow gauge. LXXVIII, 351 (1915).

"Virtual Grades for Freight Trains." A. C. Dennis. (With Discussion.) L, 1 (1903).

(1903).

TRAIN SHEDS.

See RAILROAD STATIONS: RAILROAD TERMINALS.

TRAMWAYS.

See CABLEWAYS: STREET RAIL-WAYS.

TRANSFER BRIDGES.

"New Transfer Bridge, Harsimus Cove, Jersey City, N. J." J. A. Bensel. (With Discussion.) XIX, 309 (1888).

TRANSFER TABLES.

"A Cheap Transfer Table." William P. Shinn. V, 377 (1876). See also TURN-TABLES.

TRANSPIRATION.

Loss of water caused by plants: Experiments at Owens Valley, California, and elsewhere. LXXVIII, 193, 226 (1915).
"The Duty of Water in the Pacific North-West." J. C. Stevens. (With Discussion.) LXXXIII, 2094 (1919-20).
—for various standard crops. LXXXIII, 224, 258 (1919-20).

TRANSPIRATION-(Continued).

Water requirements of growing plants in their relation to run-off. LXXIX, 1090 (1915).

TRANSPORTATION.

"Chean - rs. Rapid Transit and Delivery."

"Chean — rs. Rapid Transit and Delivery."
Martin Coryell. IX, 401 (1880).
Commercial importance of river improvements. XLIX, 277 et seq. (1902).
"How can Railways be made more Efficient in the — of Freight?" (Discussion on Paper No. 248, Vol. VI. p. 365.)
William P. Shinn. XII, 189 (1883). Discussion XII 339

William P. Shinn. XII, 189 (1883). Discussion, XII, 339
"Inland —" F. A. Mahan. XXIX, 97 (1893).
Discussion. XXX, 457 (1893).
"On the Increased Efficiency of Railways for the — of Freight." Wm. P. Shinn. XI. 365 (1882). Discussion, XII, 126, 180, 189, 339 (1883).
"Rivers and Railroads in the United States." William W. Harts. (With Discussion.) LXXIX, 919 (1915).
"The Approaches and — Facilities of the Paris Exposition of 1900." E. D. Corthell NLI 208 (1899).
"The 'Light Railways' of the Battle Front.

"The 'Light Railways' of the Battle Front in France." Frank G. Jonah. (With Discussion.) LXXXIII. 1220 (1919-20). "The Production of Traffic and the—of Freight and Passengers." Martin Corvell. (With Discussion.) II, 240 (1873).—on Russian rivers. LII, 215 (1904).

See also CANALS: RAILROADS: RIVERS: TRAFFIC.

TREMIES.

Denositing concrete by —. Cherry Street Bridge, Toledo, Ohlo. LXXX, 764 (1916). Placing of concrete by —at Pearl Har-bor Dry Dock. LXXX, 255, 296, 299 (1916).

TRIANGULATION.

"A Method of Taking Cross-Sections in Deep Rock Cuts by —." F. W. Wat-kins, XXII, 386 (1890). — and alignment of Astoria Gas Tunnel. LXXX, 658 (1916).

See also SURVEYING.

TRUCKING.

The Problem of the Lower West Side Manhattan Water-Front of the Port of New York" B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912). "The Problem

TRUSSES.

"A New Graphical Solution of the Problem, What Position a Train of Concentrated Loads must have in Order to Cause the Greatest Stress in Any Given Part of a Bridge Truss or Girder." Henry T. Eddy. XXII, 250 (1890).
"Componential—for Traveling Crane."

"Componential—for Traveling Crane." Henry B. Seaman. XXIII, 277 (1890). "Description of a Combined Triangular and Suspension Bridge Truss, and Comand Suspension Bridge Triss, and Com-parison of its Cost with that of the Warren, Pratt, Whipple and Howe—." Edwin Thacher, XIII, 123 (1884). "Experimental Strains upon a Bowstring Trussed Girder." Theo. G. Ellis, II,

107 (1873).

"Formulas for the Weights of Bridges." A. J. Du Bois. First Paper, XVI, 191

TRUSSES-(Continued).

(1887); Discussion, XVI. 218, 257; Supplementary Paper, XVIII, 179 (1888).
"General Criterion for Position of Loads Causing Maximum Stress in any Member of a Bridge Truss." L. M. Hoskins. (With Discussion.) XLII, 240 (1890) (1899).

"Maximum Stresses in Bascule—." W. Watters Pagon. LXXVI, 73 (1913).
"On Truss Bridge Building." S. Whipple.

I. 239 (1872).

"Reconstruction of the Norfolk and West-"Reconstruction of the Norfolk and West-ern Railway Company's Bridge Over the Ohio River at Kenova, West Virginla." William G. Grove and Henry Taylor. (With Discussion.) LXXIX, 411 (1915). "Some Observations on—and Trussed Arches." T. Willis Pratt. I, 346 (1872). Stiffening—for suspension bridges. XLVIII, 371 (1902); LV, 1 (1905). "The Reconstruction of the Baltimore and Ohio Railread Bridge over the Ohio

Ohio Railroad Bridge over the Ohio River, at Benwood, West Virginia." J. E. Greiner. (With Discussion.) LV, 146

(1905)"Web

Veb Strains in Simple—with Parallel or Inclined Booms." Elnathan Sweet, Jr. IX, 415 (1880). Discussion, X, 20 (1881).

See also BRIDGES.

TUBERCULATION.

Flow of water in 48-in. pipes. XXXV, 241 (1896).

"On the Removal of Incrustation in Water Mains. A Description of the Operations Performed in Halifax, N. S., Canada." E. H. Keating. XI, 127 (1882). "The Effect of—on the Delivery of a 48-in. Water Main." James Duane. XXVIII, 26 (1893). Discussion, XXVIII, 257 259.

257, 352.

-in water pipe. XLIV, 55 (1900).

TUNNEL SHIELDS.

-for Detroit River Tunnel, LXXIV, 304

et seg. (1911).

for North River Tunnels. Pennsylvania Railroad. LXVIII, 52, 167, 237 (1910).

for proposed New York-New Jersey vehicular tunnel. LXXXIII, 443 (1919-

used in construction of East River Tun-nels, Pennsylvania Railroad. LXVIII,

420 (1910).

- used in construction of Pennsylvania
Railroad Tunnels, New York. LXIX, 39 (1910).

TUNNELS.

"A Method of Tunnel Alignment." H. F. Dunham. (With Discussion.) XXVII. (With Discussion.) 453 (1892).

453 (1892).

"Air Resistances to Trains in Tube —."
J. V. Davies, LXXV, 982 (1912). Discussion: George Gibbs, George H. Pegram, Charles S. Churchill, and L. J. Le Conte, LXXV, 1018.

"American Irrigation Engineering." Herbert M. Wilson, (With Discussion.)

XXV, 161 (1891).

"Arching Rergen Tunnel on Erie Railroad."

"Arching Bergen Tunnel on Eric Railroad."
John Houston, I, 75 (1872).
"Brafford's Ridge Tunnel." Charles W.
Staniford. (With Discussion.) XXXII,

53 (1894). Brief descr

lef description of — under North and East Rivers, New York City. LXXVI. 1690 (1913).

TUNNELS—(Continued).

"Caisson Disease and Its Prevention." Henry Japp. (With Discussion.) LXV, 1 (1909).

"Colorado River Siphon." George Schobinger. (With Discussion.) LXXVII, 1

Concrete lining for —, Lexington Avenue Subway, New York City. LXXXI, 382 (1917).

"Construction Methods for Rogers Pass Tunnel." A. C. Dennis, LXXXI, 448 (1917). Discussion: E. Lauchli, Robert A. Shailer, R. H. Keays, F. Lavis, James F. Sanborn, Lazarus White, T. Kennard Thomson, Francis Lee Stuart, J. V. Davies, S. A. Knowles, R. E. Dougherty, C. R. Hulsart, and J. G. Sullivan, LXXXI, 471.

"Construction Problems of the Manhattan-Bronx, and Lexington Avenue Subway Junction and Queensborough Tunnel Connections." George Perrine. (With Discussion.) LXXXII, 278 (1918).

Description of Alpine railroad —. LXXV, 751 (1918).

751 (1912).

751 (1912).

Description of the pioneer or auxiliary heading method of construction used for the Rogers Pass Tunnel. LXXXI, 457 et seq. (1917).

"Detroit River Tunnel." E. S. Chesbrough. (With Discussion.) II, 233 (1873).

Drainage—to stop a land-slide. LXXXII, 767 (1918).

767 (1918).

Economic construction of - for hydro-elec-

tric plants. LXXIX, 1012 (1915).
"Experiments on Retaining Walls and Pressures on—." William Cain. (With Discussion.) LXXII, 403 (1911).
First St. Tunnel, Washington, D. C. LXXI, 124 (1011)

134 (1911).

Flooding and unwatering of Astoria Gas Tunnel. LXXX, 642, et seq. (1916). General dimensions of the world's sub-

aqueous highway -. LXXVIII,

"Grouting Operations, Catskill Water Sup-ply." James F. Sanborn and M. E. Zipser. (With Discussion.) LXXXIII, 980 (1919-20).

"Harper's Ferry Improvement." William Lee Sisson, XXXII, 351 (1894).

Lee Sisson. XXXII, 351 (1894).

"Heavy Railway Construction in Wyoming." J. I. Boggs. (With Discussion.) XLVI, 1 (1901).

"Lining a Water-Works Tunnel with Concrete." Desmond FitzGerald. (With Discussion.) XXXI, 294 (1894).

Lining for Astoria Gas Tunnel. LXXX, 620, 651 (1916).

Masonry lining. Pennsylvania Railroad—, New York. LXVIII, 192, 413, 417 (1910).

Method of tunneling for subway under Trinity Vestry Building. LXXXI, 92, 102 (1917). 102 (1917).

Method of tunneling on part of New Croton Aqueduct, LXIX, 388 (1910).
"Nesquehoning Tunnel." J. Dutton Steele.

1, 349 (1872).

"Notes on a Tunnel Survey." Frederick
C. Noble. (With Discussion.) LXXV, 68 (1912)

68 (1912).

"Notes on Tunnel Lining for Soft Ground."
S. Johannesson and B. H. M. Hewett,
LXXXIII, 1822 (1919-20). Discussion: J.
C. Meem, E. G. Haines, Philip Aylett,
Walter C. Parmley, C. M. Holland, T.
Kennard Thomson, and Orrin L. Brodie,
LXXXIII, 1856.

TUNNELS—(Continued).

"Pressure, Resistance, and Stability of Earth." J. C. Meem. (With Discus-sion.) LXX, 352 (1910). "Reconstruction and Enlargement of Cork

Run Tunnel on the Pittsburgh, Cincinnati & St. Louis Railway." 1870-3.
Max J. Becker. VI. 1 (1877).
Sewer—in Philadelphia, Pa. XLIV, 1

(1900)

(1900).

"Shaft Sinking under Difficulties at Dorchester Bay Tunnel, Boston, Mass." D.
McN. Stauffer. X, 343 (1881).

"Sinking a Wet Shaft." John P. Hogan.
(With Discussion.) LXXIII, 398 (1911).

"Sketch of the Plans and Progress of the
Detroit River Tunnel." E. S. Chesbrough. (With Discussion.) II, 85

(1873).

Stress in tunnel lining, LXXXIII, 460 (1919-20).

Stresses in tunnel linings. LXXXIII, 1824,

Stresses in tunnel linings. LXXXIII, 1824, 1839 (1919-20).
"Subaqueous Highway—." George Duncan Snyder. LXXVIII, 252 (1915). Discussion: J. V. Davies, and Duncan D. McBean, LXXVIII, 306.
"Tequixquiac Tunnel, Valley of Mexico." Albert Johnstone Campbell and Frederick William Abbot. XXXII, 171 (1894). Discussion, XXXII, 267.
"The Astoria Tunnel under the East River for Gas Distribution in New York

Discussion, XXXII, 267.

"The Astoria Tunnel under the East River for Gas Distribution in New York City." John Vipond Davies. LXXX, 594 (1916). Discussion: F. Lavis, Milton H. Freeman, W. H. Bradley, James F. Sanborn, Edward Wegmann, R. C. Kellogg, W. W. Brush, Thomas H. Wiggin, and William Cullen Morris, LXXX, 675.
"The Bracing of Trenches and —, with Practical Formulas for Earth Pressures." J. C. Meem. (With Discussion.) LX, 1 (1908).

"The Detroit River Tunnel." Wilson Sherman Kinnear. LXXIV, 288 (1911). Discussion: H. A. Carson, H. F. Dunham, Charles B. Buerger, E. M. Walker, and Olaf Hoff, LXXIV, 357.

"The Hudson River Tunnel." Arthur Spielmann and Charles B. Brush. (With Discussion.) IX, 259 (1880).

"The Hudson River Tunnel." William Sooy Smith. (With Discussion.) XI, 314 (1882).

(1882). "The Laramie-Poudre Tunnel." Burgis G. 1912). Discussion: Coy. LXXV, 724 (1912). Discussion: W. C. Hanmatt, W. L. Saunders, Lazarus White, O. J. Swensson, R. H. Wait, and C. Raymond Hulsart, LXXV, 750.

750.

"The Location of the Chimbote—," Othniel F. Nichols. IX, 365 (1880).

"The Main Relief Sewer of Brooklyn."

Willard Beahan. XXVI, 484 (1892). Discussion, XXVI, 507; XXVII, 97 (1892).

"The New York Tunnel Extension of the Pennsylvania Railroad." Charles W. Permend IXVIII. 1 (1910)

Pennsylvania Railroad." Charles W.
Raymond. LXVIII, 1 (1910).
"The New York Tunnel Extension of the
Pennsylvania Railroad. Contractors'

Pennsylvania Railroad. Contractors'
Plant for East River—" Henry Japp.
LXIX, 1, 393 (1910).
The New York Tunnel Extension of the

Pennsylvania Railroad. Discussion the Sixteen Papers Descriptive of This Work. Edward Wegmann, Charles E. Fraser, Henry Japp, A. Bartoccini, C. L. Harrison, J. V. Davies, William J. Wilgus, Charles S. Churchill, G. R. Henderson, Edwin B. Katte, George A. TUNNELS-(Continued).

Harwood, N. W. Storer, J. H. Gandolfo, E. R. Hill, and George Gibbs. LXIX,

388 (1910).

"The New York Tunnel Extension of the Pennsylvania Rallroad. Station Construction, Road, Track, Yard Equipment, Electric Traction, and Locomotives." George Gibbs. LXIX, 226, 434 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The Bergen Hill—." F. Lavis. LXVIII, 84 (1910).

"The New York Tunnel Extension of the Pennsylvania Rallroad. The Cross-Pennsylvania Rallroad. The Cross-Town—." James II. Brace and Francis Mason. LXVIII. 391 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The East River Division." Alfred Noble. LXVIII, 62

(1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The East River—" James H. Brace, Francis Mason, and S. H. Woodard. LXVIII, 419 (1910).
"The New York Tunnel Extension of the Pennsylvania Railroad. The Lining of

the Four Permanent Shafts of the East River Division." F. M. Green. LXIX, 78 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The Long Island Approaches to the East River—." George C. Clarke. LXIX, 91 (1910). "The New York Tunnel Extension of the Pennsylvania Railroad. The North River Division." Charles M. Jacobs. LXVIII, 22 (1910).

32 (1910).

32 (1910).

"The New York Tunnel Extension of the Pennsylvania Railroad. The North River—." B. H. M. Hewett and W. L. Brown. LXVIII, 152 (1910).

"The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa." George S. Webster and Samuel Tobias Wagner. (With Discussion). XLVIII, 470 (1902).

Webster and Samuel Tobias Wagner.
(With Discussion.) XLVIII, 470 (1902).
"The Philadelphia Tunnel of the Baltimore and Ohio Railroad, its Construction and Cost." W. W. Thayer. XXVI,

529 (1892).

"The Problem of the Lower West Side

"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." B. F. Cresson, Jr. (With Discussion.) LXXV, 226 (1912).
"The Proposed New York and New Jersey Vehicular Tunnel." An Informal Discussion. Edward A. Byrne, John F. O'Rourke, Paul G. Brown, J. V. Davies, James Forgle, W. C. Parmley, T. Kennard Thomson. F. Lavis. Calvin Tomkins, Amos Schaeffer, and E. E. R. Tratman, LXXXIII, 427 (1919-20).
"The Protection from Corrosion, of Iron-Work Used as Covering for Railroad.—."
James G. Dagrou. (With Discussion.) XXVII, 324 (1892).
"The Scranton Tunnel of the Lackawanna and Wyoming Valley Railroad." George

and Wyoming Valley Railroad." George B. Francis and W. F. Dennis. LVI, 219 (1906). Discussion: F. Lavis, and V. II, Hewes, LVI, 242.

"The Ventilation of —." Charles S. Churchill. LVII, 227 (1906). Discussion: George S. Rice, and R. P. Bolton, LVII,

240. The Ventilation of —." N. XXIII "The Ventilation of —." N. W. Eayrs. (With Discussion.) XXIII, 288 (1890). Tunnel lining, Bergen Hill —, Pennsylvania Railroad. LXVIII, 114 (1910). TUNNELS—(Continued).

Tunnel lining, East River—, Pennsylvania Railroad. LXVIII, 459 (1910).
Tunnel lining, North River—, Pennsylvania Railroad. LXVIII, 200, 254 (1910).
"Tunnel Surveying on Division No. 6, New Croton Aqueduct." F. W. Watkins. (With Discussion.) XXIII, 17

(1890). "Tunnel Work on Sections 8, 9, 10, and 11, Broadway-Lexington Avenue Subway, New York City." Israel V. Werbin. LXXXI, 341 (1917). Discussion: Maurice Griest, John H. Madden, Robert H. Jacobs, T. Kennard Thomson, John H. Myers, H. G. Moulton, Robert Ridgway, C. V. V. Powers, and Francis Donaldson, LXXXI, 392.

son, LXXXI, 392.

Tunneling in compressed air without a shield. LXVIII, 424 (1910).

of Bear Valley Irrigation Company, California. XXXIII, 83 (1895).

"of the Pacific Railroad." John R. Gilliss. I, 153 (1872).

"Ventilation of —." Charles S. Churchill. (Inter. Eng. Cong. 1904.) LIV, Part C, 1505 (1905) (1905).

"Ventilation of —." Francis Fox. (Inter. Eng. Cong. 1904.) L1V, Part C, 553 (1905).

Ventilation of —. Discussion on Inter. Eng. Cong. Papers, 1904. L1V, Part C, 567 (1905).

Water pressure —. LXXX, 156 (1916). Water tunnel, New York City. LXXVI, 1805 (1913).

See also UNDERGROUND RAILWAYS.

TURBINES (STEAM).

"Naval Architecture in Great Britain."

Sir William II. White. (Inter. Eng. Cong. 1904.) LIV, Part D, 3 (1905).

"Some Typical Tests of Steam Turbines."

Francis Hodgkinson. (Inter. Eng. Cong. 1904.) LIV, Part E, 85 (1905). Discussion: M. L. Holman, G. O. M. Olsson, J. N. Chester, Charles Hermany, Elmo G. Harris, Charles A. Hague, F. R. Low, Karl P. Dahlström, and R. N. Ehrhart, LIV, Part E, 105. LIV, Part E, 105.
The steam turbine in marine service. LIV, Part C, 219 (1905).

TURBINES (WATER).

"Characteristics of Modern Hydraulic Tur-bines." Chester W. Larner. LXVI, 306 (1910). Discussion: Lewis P. Moody, John C. Parker, C. M. Allen, E. Kuich-ling, Daniel W. Mead, and S. J. Zowski, ling, Danie LXVI, 347.

"Chemi-Hydrometry and Its Application to

"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX, 951 (1916). "Comprehensive Plotting of Water Turbine Characteristics." Karl IV. Kennison. LXXXIII, 861 (1919-20). "Experiments on the Humphrey Turbine Water-Wheel, at the Tremont and Suffolk Mills, in Lowell, Mass." James B. Francis. XIII, 295 (1884). "Induced Currents of Fluids." F. zur Nedden. (With Discussion.) LXXX, 844 (1916).

"Investigation of the Performance of a Reaction Turbine." R. L. Daugherty, LXXVIII, 1270 (1915). Discussion: S. J. Zowski, H. Birchard Taylor, Daniel W.

TURBINES (WATER)-(Continued). Mead, and R. C. Carpenter, LXXVIII, 1288.

1288.

"Pressures in Penstocks Caused by the Gradual Closing of Turbine Gates."
Norman R. Gibson. (With Discussion.)
LXXXIII, 707 (1919-20).

"The Design of Hydro-Electric Power Plants." J. D. Galloway. (With Discussion.)
LXXIX, 1000 (1915).

"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company." A. H. Van Cleve. (With Discussion.) LXII, 199 (1909). (1909).

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." E. L. Sayers and A. C. Polk.

(With Discussion.) LXXVIII, 1409 (1915).
"The Pulp Mill of the Cliff Paper Company of Niagara Falls, N. Y." Wallace C. Johnson (With Discussion.) XXXII, 214 (1894).

Water-wheel at Grass Valley, Cal. Power Plant. XXXVI, 177 (1896).

- affected by or affecting pulsations in pipe lines. LXXXII, 180 (1918).

- at Ogden, Utah, Power Plant. XXXVIII,

286 (1897).

TURN-TABLES.

"Draw-Spans and Their —." C. Shaler Smith. III, 129 (1874). Discussion, III, 139; IV, 203 (1875). "The Turn-Table on the Main Track of the

Silverton Railroad in Colorado." Gibbs. XXIII, 120 (1890). C. W.

See also TRANSFER TABLES.

UNDERGROUND RAILWAYS.

"Air Resistances to Trains in Tube Tun-nels." J. V. Davies. (With Discussion.) LXXV, 982 (1912). "Compressed Air as a Motor for Subterran-ean Railways." J. Dutton Steele. I, 244

(1872).

"Construction Problems of the Manhattan-Bronx, and Lexington Avenue Subway Junction and Queensborough Tunnel Connections." George Perrine. LXXXII, 278 (1918). Discussion: John Hays Myers, Clarence E. Carpenter, Robert A. Shailer, Robert Ridgway, Henry H. Quimby, and C. V. V. Powers, LXXXII, 290 320. York

New City -Brief description of.

New York City—, Brief description of. LXXVI, 1717 (1913).

"Secure Subway Supports." A. B. Lueder and W. J. R. Wilson. LXXX, 914 (1916). Discussion: H. G. Moulton, Richard A. Fiesel, J. H. O'Brien, B. C. Collier, and Lazarus White, LXXX, 939.

"Specifications for the Design of Bridges and Subways." Henry B. Seaman. (With Discussion.) LXXV, 313 (1912).

"The Sixth Avenue Subway of the Hudson and Manhattan Railroad." H. G. Burrowses. LXXVI, 1 (1913). Discussion. T. B. Whitney, Jr., William J. Boucher, Lazarus White, and H. L. Oestreich, LXXVI, 66.

"Tunnel Work on Sections 8, 9, 10, and 11, Broadway-Lexington Avenue Subway,

"Tunnel Work on Sections 8, 9, 10, and 11,
Broadway-Lexington Avenue Subway,
New York City." Israel V. Werbin.
(With Discussion.) LXXXI, 341 (1917).
Underground Railways. Discussion on
Inter. Eng. Cong. Papers, 1904. Robert
Moore, Samuel B. Fisher, Moritz Wormser, E. E. R. Tratman, W. M. Camp,
George A. Kimball, George W. Parsons,

UNDERGROUND RAILWAYS—(Continued). INDERGROUND RAILWAYS—(Continued).
Wilkie Woodard, and Howard A. Carson.
LIV, Part F, 367 (1905).
— in Great Britain." Basil Mott and David Hay. (Inter. Eng. Cong. 1904.)
LIV, Part F, 325 (1905).
— in Paris. XLI, 308 (1899).
— in Paris. XLI, 308 (1899).
— in the United States." William Barclay Parsons. (Inter. Eng. Cong. 1904.)
LIV, Part F, 349 (1905).
—: The Metropolitan System of Paris."
L. Biette. (Translated from the French.) (Inter. Eng. Cong. 1904.)
LIV, Part F, 299 (1905).

299 (1905).

299 (1905).
"Underpinning Trinity Vestry Building for Subway Construction." H. de B. Parsons. LXXXI, 74 (1917). Discussion: James C. Meem. Elias Cahn, T. Kennard Thomson, James F. Fouhy, Charles Rufus Harte, Joseph A. A. Connelly, J. S. Branne, and A. W. Buel, LXXXI, 102. Ventilation in New York Subway and other —. LVII, 227 (1906).

UNDERGROUND WATER,

See GROUND-WATER.

UNDERPINNING.

Foundations and shoring of structures on Manhattan Elevated Railways, LXXXII, 634 (1918).

"On the Mode of — Adopted for the Croton Lake Bridge, N. Y. C. & N. R. R., during the Repairs to the Masonry Piers." Affred P. Boller. XI, 150 (1882).
Roadway support at portals, Lexington Avenue Subway, New York City.

Avenue Subway, LXXXI, 352 (1917).

"Secure Subway Supports." A. B. Lueder and W. J. R. Wilson. (With Discus-sion.) LXXX, 914 (1916). "Sub-Aqueous —." A. G. Menocal. XI, 181

(1882).

"The Failure and Righting of a Million-Bushel Grain Elevator." Alexander Al-laire. (With Discussion.) LXXX, 799 (1916).

"The — of Heavy Buildings." Jules Breuchaud. (With Discussion.) XXXVII, 31

buildings. XLVIII, 482 (1902).
buildings near tunnel caissons. LXIX,

391 (1910)

of (1910)

elevated railway and buildings on line
of Hudson and Manhattan Railroad,
New York. LXXVI, 1 (1913).

Ninth Avenue during work on Pennsylvania Railroad Terminal. LXVIII, 305

(1910).

"—the Cambridge Building, New York City." T. Kennard Thomson. LXVII, 553 (1910). Discussion: Henry Gorton Opdycke, E. A. Yates, Ogden Merrill, Oscar Lowinson, and J. C. Meem, LXVII, 565.

Onstruction." H. de B. Parsons. (With Discussion.) LXXXI, 74 (1917).

See also FOUNDATIONS.

UNIT COSTS.

See COSTS OF WORK.

UNITED STATES WEATHER BUREAU.

"Suggested Changes and Extension of the — Service in California." George S. Binckley, and Charles H. Lee. (With Discussion.) LXXXI, 161 (1917).

VALUATION.

"A Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. (With Discussion.) LXXXI, 413 (1917). "Bibliography on—of Public Utilities." LXXVI, 2133 (1913).
"Depreciation as an Element for Consideration in the Appraisal of Public Service Properties." C. E. Grunsky. LXXIX, 727 (1915). Discussion: James D. Mortimer, Joseph Mayer. F. W. Green, Richard J. McCarty, Philip W. Henry, Clinton S. Burns, Halbert P. Gillette, W. Kiersted, J. N. Dodd, and William B. Bosley. LXXIX, 780.
"Final Report of the Special Committee to Formulate Principles and Methods for the—of Railroad Property and Other Public Utilities." (With Discussion.) LXXXI, 1311 (1917).
"Fundamental Principles of Public Utility—" John W. Alvord. LXXIX, 117 (1915). Discussion: Lewis M. Haupt, L. L. Jewel, Richard T. Dana, F. Lavis, Louis L. Tribus, Joseph Mayer, Philip Burgess, J. P. Newell, Charles Rufus Harte, Alexander C. Humphreys, H. F. Dunham, Stuart K. Knox, C. E. Grunsky, W. Klersted, and Clinton S. Burns, L.XIX, 166.
"Method Used by the Railroad Commission of Texas, under the Stock and Bond Law, in Valuing Railroad Properties." R. A. Thompson. (With Discussion.) LII, 328 (1904).
"Physical—of Railroads." William J. Wilgus. (With Discussion.) LXXVII, 203 (1914).
"The Appraisal of Public Service Properties as a Basis for the Regulation of Texas. Universed.

203 (1914).

"The Appraisal of Public Service Properties as a Basis for the Regulation of Rates." C. E. Grunsky. LXXV, 770 (1912). Discussion: William Brokaw Bamford, James V. Oxtoby, Charles H. Higgins, Henry Floy, J. Martin Schreiber, William J. Boucher, R. D. Coombs, A. H. Van Cleve, and W. Kiersted, LXVV 844. ber, Willian A. H. Van LXXV, 844.

A. H. Van Cleve, and W. Kiersted, LXXV, S44.

"The Depreciation of Public Utility Properties as Affecting Their—and Fair Return." John W. Alvord. LXXVII, 788 (1914). Discussion: W. J. Wilgus, J. E. Willoughby, Frank C. Boes, Allen Hazen, H. C. Vensano, Leonard Metcalf, William B. Jackson, F. Lavis, Alexander C. Humphreys, Henry Floy, Clinton S. Burns, Stuart K. Knox, J. H. Gandolfo. Charles Rufus Harte, W. Kiersted, and George B. Stone, LXXVII, 804.

"The Financial Management of Water-Works." E. Kuichling. (With Discussion.) XXXVIII, 1 (1897).

"The Going Value of Water-Works." Leonard Metcalf and John W. Alvord. (With Discussion.) LXXIII, 326 (1911).

"The Just Value of Monopolies, and the Regulation of the Prices of Their Products." Joseph Mayer. LXXV, 455 (1912). Discussion: P. L. Reed, Maurice G. Parsons, and D. C. Serber, LXXV, 472.

"The Prospective Competitor Method of—of Property." M. L. Byers, LXXXIII, 1313 (1919-20). Discussion: J. P. Snow, C. E. Grunsky, Joseph Mayer, J. E. Willinghby, and R. W. Hawley, LXXXIII, 1360.

"The—of Land" L. P. Jerrard. LXXXI.

1360.

1360.
"The—of Land" L. P. Jerrard, LXXXI, 582 (1917). Discussion: W. I. King, Hugh A. Kelly, Edward S. Rankin, T. Kennard Thomson, J. S. Walker, William J. Boucher, and Franklin F. Mayo, LXXXI, 618.

VALUATION—(Continued).

VALUATION—(Continued).

"The—of Public Service Corporation Property." Henry Earle Riggs. LXXII. 1
(1911). Discussion: F. Lavis, Charles H. Higgins, S. D. Newton, William V. Polleys, C. P. Howard, J. E. Willoughby, Henry C. Adams. Carl C. Witt, R. A. Thompson, Charles H. Ledlie, William G. Raymond, W. H. Williams, P. E. Green, E. Kuichling, Richard T. Dana, George T. Hammond, Leonard Mctcalf, Charles Hansel, J. Martin Schreiber, Clinton S. Burns, Halbert P. Gillette, Arthur L. Adams, C. D. Purdon, A. Mordecai, and W. E. Ruggles, LXXII, 174.

"The—of Public Utility Property." J. H. Gandolfo, LXXIX, 872 (1915). Discussion: Alex Dow, F. Lavis, Charles Rufus Harte, F. W. Green, and Joseph Mayer, LXXIX, 879.

"—of Water-Works Property." Wynkoop Kiersted. (With Discussion.) XXXVIII, 115 (1897).

115 (1897)

Light of the Maine Supreme Court Decisions in the Waterville and Brunswick Cases." Leonard Metcalf, (With Discussion.) LXIV, 1 (1909). "Water-Works - and Fair Rates,

VALVES.

"Experiments on the Discharge of a 30-In. Stop Valve." J. Waldo Smith. (With Discussion.) XXXIV, 235 (1895).
"On the Loss of Head Resulting from the Passage of Water through a 24-Inch Stop Valve." E. Kuichling. (With Discussion.) XXVI, 439 (1892).
"Some Details of—and other Apparatus in Use by the National Water-Works Company at Kansas City, Mo." Frederick E. Sickels. XXIV, 385 (1891).

VARNISHES.

"Experiments on the Protection of Steel and Aluminum Exposed to Sea Water." A. H. Sabin First Paper (With Discus-sion), XXXVI, 483 (1896); Supplementary Paper, XLIII, 444 (1900).

VENTILATION.

"Air Resistances to Trains in Tube Tun-

nels." J. V. Davies. (With Discussion.)
LXXV, 982 (1912),
Description of the ventilating apparatus
used in the tunnels of the New York
terminus of the Pennsylvania Railroad.
LXIX, 299 (1910).

"Experiments with a New Method of Heating and —." Charles Carroll Gilman. XXXVII. 59 (1897).

Heating and ventilating South Boston Ter-minal, XLIII, 156 (1900). Heating and—of the Pennsylvania Rail-road Station, New York, LXIX, 274

(1910).

"Mechanical Installation in the Modern Office Building." Charles G. Darrach. (With Discussion.) XLVIII. 1 (1902).

"On the —of Halls of Audience." Robert Brirgs. X, 53 (1881).

Proposed — for the Pennsylvania Avenue Subway. XLVIII. 494 et seq. (1902).

Tests of — in Hudson and Manhattan Railroad tunnels. LXIX. 414 (1910).

"The —of Tunnels." Charles S. Churchill. (With Discussion.) LVII. 227 (1906).

(1906).

"The — of Tunnels." N. W. Eayrs. (With Discussion.) XXIII. 288 (1890). —, Bergen Hill Tunnels, Pennsylvania Railroad. LXVIII, 100 (1910).

VENTILATION—(Continued).

in East River Tunnels, Pennsylvania Railroad, LXIX, 420 (1910).
 in tunneling by the pioneer heading method, LXXXI, 448 (1917).
 of Astoria Gas Tunnel, LXXX, 657

(1916).

of the First St. Tunnel, Washington, D. C. LXXI, 144 (1911).
"of Tunnels." Charles S. Churchill.

(Inter. En 525 (1905). Eng. Cong. 1904.) LIV, Part C,

Tunnels." Francis Fox. (Inter. Cong. 1904.) LIV, Part C, 553 of Eng (1905).

of Tunnels, Discussion on Inter. Eng., Cong. Papers, 1904. Charles C. Wentworth, Thomas H. Johnson, P. F. Brendlinger, and Charles S. Churchill. LIV, Part C, 567 (1905).

VIADUCTS.

"Erection of the Verrugas Bridge." L. Lefferts Buck. V, 103 (1876). Discus-sion. V, 240. "Probable Wind Pressure Involved in the

Wreck of the High Bridge over the Mississippi River, on Smith Avenue, St. Paul, Minn., August 20th, 1904." C. A. P. Turner. (With Discussion.) LIV, 31 (1905).

(1905).
"Tomperature Stresses in a Series of Spans." Trosham D. Gregg. (With Discussion.) LXXX. 1626 (1916).
"The American Railroad Viaduct: Its Origin and Evolution" J. E. Greiner. (With Discussion.) XXV. 349 (1891).
"The Design and Construction of Four Reinforced Concrete—at Fort Worth. Texas." S. W. Bowen. LXXVIII. 1206 (1915). Discussion: Carl Gayler, LXXVIII. 1259. LXXVIII, 1259,

"The Detroit I'nion Depot Viaduct." J. W. Schaub. (With Discussion.) XXVIII,

W. Schaub. (With Discussion.) XXVIII, 309 (1893).

"The Hell Gate Arch Bridge and Approaches of the New York Connecting Railroad over the East River in New York City." O. H. Ammann. (With Discussion.) LXXXII. 852 (1918).

"The Kinzua Viaduct of the Eric Railroad Company." C. R. Grimm. XLVI. 21 (1901). Discussion: George S. Morison, R. S. Buck, L. S. Moisseiff, H. A. La Chicotte. Gustav Lindenthal, and F. H. (1910x. XLVI. 38.)

"The Marent Gulch Viaduct." George S.

"The Marent Gulch Viaduct," George S. Morison. XXV, 305 (1891).
"The Merchants' Bridge Terminal Railway Viaduct at St. Louis, Mo." Robert Moore. XXXI, 500 (1894).
"The New Portage Bridge," George S. Morison. V, 1 (1876). Discussion, V, 225

"The Sixth Street Viaduct, Kansas City."
E. E. Howard, LXV, 42 (1909), Discussion: Daniel Bontecou, Victor H. Cochrane, O. E. Mogensen, N. T. Blackburn, and George H. Pegram, LXV, 95.
"—, or the Effect of Passing Trains on Iron Bridges, Masonry and other Structures." James L. Randolph, (With Discussion.) XII, 444 (1883).
"The Twelfth Street Trafficway Viaduct, Kansas City, Missouri." E. E. Howard, LXXX, 484 (1916). Discussion: F. W. Green, L. J. Mensch, Howard W. Holmes, M. M. Upson, E. A. Slettum, L. R. Ash, and John Lyle Harrington, LXXX, 533.
"The Weehawken Elevators and Viaduct."

"The Weehawken Elevators and Viaduct."

VIADUCTS-(Continued).

Thomas E. Brown and George H. Blake-

ley. XXVII, 1 (1892).

- crossing terminal yard, Pennsylvania
Railroad, New York, LXVIII, 305; Railroad, New York, LXVIII, 305: LXIX. 155 (1910). —, elevation of railroad tracks, Philadel-phia. LXXVI, 1845 (1913).

See also BRIDGES.

VIBRATION.

"- of Bridges." S. W. Robinson, XVI, 42 (1887).

WASTE WEIRS.

See WATER, FLOW OF, OVER DAMS AND WEIRS.

WATER.

WATER.

Aeration of — supplies. XXI, 536 (1889).

Analyses of effluent from sewage disposal works. XXV, 141 (1891).

Analyses of —, New River, Colorado River, Salton Sea, etc. LXXVI, 1411 (1913).

Analyses of — supplies for Monterrey, Mexico. LXXII, 532 (1911).

"Bacteria and Other Organisms in —,"
John W. Hill. (With Discussion.)

XXXIII, 423 (1895).

Comparison of ground — with river —, LXXV, 706 (1912).

"Filtration for Public — Supplies, with Especial Reference to the Double Filtration

pecial Reference to the Double Filtration Plant at Bremen, Germany." Eugeu Goetze. (With Discussion.) LIII, 210 (1904).

(1904).

"Filtration of—for Public Use." An Informal Discussion. Rudolph Hering and others. XLIV, 399 (1900).

"On Sedimentation." Allen Hazen. (With Discussion.) LHI, 45 (1904).

"On the Fresh—Algre and their Relation to the Purity of Public—Supplies." George W. Rafter. (With Discussion.) XXL 483 (1889). XXI, 483 (1889).

XAI, 485 (1889).

"Purification of Sewage and of by Filtration." Hiram F. Mills. XXX, 350 (1893). Discussion, XXX, 702.

"Purification of for Domestic Use: American Practice." Allen Hazen. (Inter. Eng. Cong. 1904.) LIV, Part D, 131

(1905).

Purification of—for Domestic Use. Discussion on Inter. Eng. Cong. Papers, 1904. Andrew Howatson, George C. Whipple, Edwin O. Jordan, Edmund B. Weston, L. J. Le Conte, J. P. A. Maignen, J. N. Chester, Robert Spurr Weston, Gardner S. Williams, Rudolph Hering, F. L. Fuller, E. E. Wall. John F. Wixford, George W. Fuller, Allen Hazen. Adolph Kemna, and M. Bechmann. LIV. Part D. 191 (1905).

"Purification of—for Domestic Use: European Practice." Adolph Kemna. (Inter. Eng. Cong. 1904.) LIV, Part D. 155 (1905).

(1905).

Purification of — for Domestic Use: French Practice." M. Bechmann. (Translated from the French by Allen Hazen.) (Inter. Eng. Cong. 1904.) LIV, Part D. "Purification 183 (1905).

"Reinforced Concrete Reservoir and Coag-ulation Plant at St. Louis, Mo." Ed-ward Flad. (With Discussion.) LXXVII, 1052 (1914). "Remarks on the Aeration of—." Charles B. Brush. (With Discussion.) XV, 139 (1886).

Report of tests of - from filtration plant

WATER—(Continued).

and Ohio River at Parkersburg, W. Va.

and Ohio River at Parkersburg, W. Va. LXXXI, 785 et seq. (1917).

"Self-Purification of Flowing — and the Influence of Polluted — in the Causation of Disease." Charles G. Currier. (With Diseassion.) XXIV, 21 (1891).

"Some Questions Concerning the Filtration of —." W. Kümmel. XXX, 330 (1893).

"Stream Contamination and Sewage Purification." An Informal Diseussion. R. E. McMath, W. C. Parmley, Gardner S. Williams. Peter Milne. Kenneth Allen, James Owen, Charles G. Darrach. E. W. Harrison, P. A. Maignen, L. L. Tribus, Palmer C. Ricketts, James S. Haring and James H. Fuertes. XLII, 160 (1899).

"Temperature of — at Various Depths in Lakes and Oceans." Hamilton Smith, Jr. (With Discussion.) XIII, 73 (1884).

"The Absorption of Oxygen by De-Aerated

"The Absorption of Oxygen by De-Aerated —." Earle B. Phelps. (With Discussion.) LXXVI, 1624 (1913).
"The Albany—Filtration Plant." Allen Hazen. (With Discussion.) XLIII, 244

(1900).

Part A, 35,

"The Quality of — Supplies." John Hill (With Discussion.) XXXII, John W.

(1894).

"The Suspension of Solids in Flowing —,"
Elon Huntington Hooker. (With Discussion.) XXXVI. 239 (1896).
"The Temperature of Lakes." Desmond
FitzGerald. (With Discussion.) XXXIV.

67 (1895).

67 (1895).

"The Vicksburg Settling Basins." Clarence Delafield. XXI, 88 (1889).

"— Purification at St. Louis, Mo." Edward E. Wall, LX, 170 (1998). Discussion: Philip Burgess, Edward Prince, George A. Soper, G. C. Whipple, L. L. Tribus, and L. J. Le Conte, LX, 196.

"— Purification Plant, Washington, D. C., Results of Operation." E. D. Hardy.

WATER—(Continued).

LXXII, 301 (1911). Discussion: Allen Hazen, George A. Johnson, Morris Knowles, George C. Whipple, and F. F. Longley, LXXII, 362. Weights per cubic foot of distinct—at

Weights per cubic foot of distilled—at different temperatures. XL, 531 (1898). "Works for the Purification of the—Supply of Washington, D. C." Allen Hazen and E. D. Hardy. LVII, 307 (1906). Discussion: Francis F. Longley, William C. Woodward, George M. Kober, Theodore A. Leisen, W. L. Butcher, J. P. A. Majgnen, D. C. Henry, J. A. Vogleson, Charles Moore, Nora Stanton Blatch, W. T. Sedgwick, H. F. Labelle, G. Lloyd Magruder, George W. Fuller, William B. Fuller, Theodore Horton, and John H. Gregory, LVII, 364 (1906): Mansfield Merriman and Winter L. Wilson, LVIII, 511 (1907). 511 (1907).

See also FILTRATION.

WATER, CONSUMPTION OF.

Prohable — San Francisco Metropolitan District. LXXX, 25 (1916). — in army camps. LXXXIII, 509 (1919-

1920). See also WATER, WASTE OF.

WATER, DUTY OF.

"Determination of the — by Analytical Ex-periment." W. C. Hammatt. (With Discussion.) LXXXIII, 200 (1919-20). Duty of water in certain districts in Call-fornia. LXXX, 58, 151, 167, et seq., 198

"The Duty of Water in the Pacific Northwest." J. C. Stevens. (With Discussion.) LXXXIII, 2004 (1919-20).

WATER. FLOW OF, IN OPEN CHAN-

NELS,

"A Mathematical Analysis of the Influence of Reservoirs Unon Stream-Flow," James A. Seddon, XL, 401 (1898).

"A Proposed Solution of Some Hydraulic Problems." Charles H. Tutton, XLVII, 392 (1902). Discussion: Clemens Herschel, I. P. Church, and Edward C. Murphy, XLVII, 410.

"Back-Water in Streams as Produced by Dams." De Volson Wood, (With Discussion.) II, 255 (1873).

"Calculations of the Mean Horse-Power of a Variable Stream and the Cost of Replacing the Power Lost by a Partial Diversion of the Flow." William H.

Diversion of the Flow." William H. Grant. (With Discussion.) XXII, 389 (1890).

(1890).

"Characteristics of Cup and Screw Current Meters: Performance of These Meters in Tail-Races and Large Mountain Streams: Statistical Synthesis of Discharge Curves." B. F. Groat. (With Discussion.) LXXVI, 819 (1913).

"Characteristics of the Raylne du Sud in the Island of Hayti, and Plan for Averting Its Overflow." J. Foster Crowell. XXIV. 470 (1891). Discussion. XXIV, 478; XXV. 348 (1891).

"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." Benjamin F. Groat. (With Discussion.) LXXX, 951 (1916).

"Current Meter and Weir Discharge Comparisons." Edward C. Murphy. (With Discussion.) XLVII, 370 (1902).

"Cut-Offs on the Mississippi River. Their

WATER, FLOW OF (Channels)—(Con'd).

Effect on the Channel Above and Below." Caleb G. Forshey. V, 317 (1876). "Description and Results of Hydraulic Experiments with Large Apertures, at Holyoke, Mass., in 1874." Theodore G. Ellis.

V, 19 (1876). Discussion, V, 297.
"Description of the Lower Weser and Its
Improvement." L. Franzius. (Transla-"Description of the Lower weser and its Improvement." L. Franzius. (Translated from the German by T. H. McCann, assisted by Alfred Beyer.) XXIX, 173 (1893). Discussion, XXX, 483 (1893). "Erosion of River Banks on the Mississippi and Missouri Rivers." J. A. Ockerson.

XXVIII, 396 (1893). Discussion, XXXI, 1 (1894).

"Experiments on the Flow of Water Through Contractions in an Open Channel." E. W. Lane. LXXXIII, 1149 (1919-1920). Discussion: William T. Lyle, D. C. Henny, Karl R. Kennison, and R. D. Goodrich, LXXXIII, 1209.
Flow of water in Cape Cod Canal. LXXXII, 65 (1918). "Forests and Reservator in Other P. L.

"Forests and Reservoirs in Their Relation to Stream Flow, with Particular Ref-erence to Navigable Rivers." H. M. LXII, (With Discussion.) Chittenden. 245 (1909).

"Gauging of Cedar River, Washington." Theron A. Noble. (With Discussion.)

XLI, 1 (1899)

XLI, 1 (1899).
"Gauging of Streams." A Discussion.
David M. Greene. V, 251 (1876).
Gaugings of Missouri River at Great Falls,
Mont. XXVII, 65 (1892).
"History of the Conversion of the River
Clyde into a Navigable Water-Way, and
of the Progress of Glasgow Harbour
from its Commencement to the Present of the Progress of Glasgow Harbour from its Commencement to the Present Day." James Deas. XXIX, 128 (1893). Discussion, XXX, 478 (1893).
"Hydrometry as an Aid to the Successful Operation of an Irrigation System."
J. C. Stevens. (With Discussion.) LXXI, 314 (1911).
"Hee Discussion. Hydronia Models and Marketing of the Comments of the

"Ice Diversion, Hydraulic Models, and Hydraulic Similarity." Benjamin F. Groat. (With Discussion.) LXXXII, 1138 (1918). (With Discussion.) LXXXII, 1138 (1915).
"Measurement of the Flow of Streams by
Approved Forms of Weirs with New
Formulas and Diagrams: Details and
Summaries of the Results of Experiments by Francis, Bazin, Fteley and
Stearns, and at the Hydraulic Laboratories of Cornell University and the Stearns, and at the Hydraulic Laboratories of Cornell University and the University of Utah." Richard R. Lyman. LXXVII, 1189 (1914). Discussion: E. A. Moritz. Allen Hazen, Clarence T. Johnston, R. B. Robinson, L. M. Winsor, H. W. King. Robert E. Horton, G. E. P. Smith. Clarence S. Jarvis, and Gardner S. Williams, LXXVII, 1282.

"Notes on the Flow of the West Branch of the Croton River." J. James R. Croes. III, 76 (1874). Discussion, IV,

297 (1875).

297 (1875).

"Notes on the Improvement of the Mouth of the Mississippi." W. Milnor Roberts. IV. 321 (1875). Discussion, IV, 332; V, 275 (1876).

"Notes on the South Pass Jetties." Max E. Schmidt. IX, 290 (1880).

"Obstruction of Bridge Piers to the Flow of Water." Floyd A. Nagler. (With Discussion.) LXXXII, 334 (1918).

"On Flood Heights in the Mississippi River, with Especial Reference to the Reach between Helena and Vicksburg." William Starling. XX, 195 (1889).

WATER, FLOW OF (Channels)-(Con'd).

"On the Cause of the Maximum Velocity of Water Flowing in Open Channels being below the Surface." James B. Francis. VII, 109, 168 (1878). Discussion, VII, 122,

"On the Current-Meter, together with a Reason Why the Maximum Velocity of Water Flowing in Open Channels is be-low the Surface." F. P. Stearns. XII, 301 (1883).

"On the Determination of the Flood Dis-charge of Rivers and of the Backwater Caused by Contractions." William R. Hutton. (With Discussion.) XI, 211 (1882).

"On the Effect of a Rapidly Increasing Supply of Water to a Stream, on the Flow below the Point of Supply." Jas. (With Discussion.) B. Francis. 558 (1889).

558 (1889).

"On the Flow of Water in Rivers." De Volson Wood. VIII, 173 (1879).

"On Waves of Translation that Emanate from a Submerged Orifice, together with an Examination of the Feasibility of the Proposed Bale Verte Canal." Clemens Herschel. IV, 185 (1875).

"Physiography of Water-Sheds and Channels, and Analysis of Stream Action of Southern California Rivers, with Reference to the Problems of Flood Control." A. L. Sonderegger. (With Discussion.) LXXXIII, 1111 (1919-20).

"Practical Consequences of Variation of the Wet Section of Rivers under General and Special Conditions." Robert E. McMath. IX, 377 (1880).

"Rainfall and River-Flow." Cyrus C. Babb. (With Discussion.) XXVIII, 323 (1893).

"Rainfall, Flow of Streams, and Storage," Desmond FitzGerald. (With Discussion.)

XXVII, 253 (1892). "Reservoir System of the Great Lakes of the St. Lawrence Basin; Its Relation to the Problem of Improving the Naviga-tion of These Bodies of Water and of Their Connecting Channels." Hiram M. Chittenden. (With Discussion.) XL, 355 (1898). "River Hydi

"River Hydraulics." James A. Seddon.
(With Discussion.) XLIII, 179 (1900).
"Storage and Pondage of Water." Joseph
P. Frizell. XXXI, 29 (1894). Discussion. XXXI. 552

Stream flow data, Owens Valley, California.

LXXVIII, 167 et seq. (1915).
"Surges in an Open Canal." R. D. Johnson. LXXXI, 112 (1917). Discussion: Discussion: Karl R. Kennison, and Irving P. Church, LXXXI, 116.

"The Automatic Volumeter." E. G. Hopson.
(With Discussion.) LXXX, 572 (1916).
"The Brazos River Harbor Improvement."
George Y. Wisner. XXV, 519 (1891).
Discussion, XXV, 537; XXVI, 518 (1892).

"The Causes of the Formation of Bars at the Mouths of Rivers, as Shown in an Examination of the Connecticut River." Theodore G. Ellis, II, 313

(1873).

"The Dangers Threatening the Navigation of the Mississippi River and the Reclamation of its Alluvial Lands." B. M. Harrod. VII, 243 (1878).
"The Delta of the Mississippi, Considered in Relation to an 'Open River Mouth." John G. Barnard. IV, 104 (1875). Discussion, IV, 290, 297.

WATER, FLOW OF (Channels)—(Con't).

"The Discharge of the Mississippi River."
William Starling. XXXIV, 347 (1895).
Discussion, XXXV, 305 (1896).
"The Flow of the Sudbury River, Massachusetts, for the Years 1875 to 1879."
Alphonse Fteley. (With Discussion.) X,

Alphonse Freiey. (With Discussion.) A, 225 (1881).

"The Flow of Water in Irrigation Channels." George Henry Ellis. LXXX, 1644 (1916). Discussion: H. B. Muckleston, Harold F. Gray, S. T. Harding, Allen Hazen, R. B. Sleight, W. G. Hoyt, William S. Aldrich, and M. J. Orbeck, C. N. Ward and W. O'B. Henderson, LXXX, 1669 1662.

"The Flow of Water in Open Channels."
Theodore G. Ellis. VI. 250 (1877).
"The Gauging of Streams." Clemens Herschel. VII, 236 (1878).
"The Hydraulic Jump, in Open-Channel Flow at High Velocity." Karl R. Kennison. LXXX, 338 (1916). Discussion:
B. F. Groat, H. B. Muckleston, Frederic P. Stearns, Carl B. Andrews, R. D. Johnson, Mansfield Merriman, E. G. Walker. son, Mansfield Merriman, E. G. Walker, Edward W. Bush, H. F. Dunham, Rob-ert F. Ewald, L. D. Cornish, and Caleb Mills Saville, LXXX, 354.

"The Hydrography of the Potomac Basin." (With Discussion.)

Cyrus C. Babb. XXVII, 21 (1892).

"The Improvement of Channels in Sedi-mentary Rivers." George H. Henshaw. XX, 109 (1889). Disenssion, XX, 116,

XX, 109 (1889). Discussion, XX, 116, 229.

"The Improvement of James River, Virginia." H. D. Whitcomb. XXVIII, 209 (1893). Discussion, XXVIII, 445.

"The Improvement of the Mississippi River." William Starling. XX, 85 (1889). Discussion, XX, 229.

"The Limits Attainable in Improving the Navigability of Rivers by Means of Regulation." H. Engels. (Translated from the German by Kenneth Allen.) XXIX, 202 (1893). Discussion, XXX, 492 (1893).

XXIX, 202 (1895).
492 (1895).
492 (1895).
"The Low Stage of Lakes Huron and Michigan." C. E. Grunsky. (With Discussion.) LXIII, 31 (1905).
"The Mean Velocity of Streams Flowing in Natural Channels." Robert E. Mc-Math. VI. 186 (1882).

"The Overflow of the Mississippi River." Lyman Bridges. (With Discussion.) XI, 251 (1882).

"The Reaction Breakwater as Applied to the Improvement of Ocean Bars." Lewis M. Haupt. XLII, 485 (1899). Discussion, XLII, 501; XLIII, 93 (1900).
"The South Pass Jetties. Descriptive and Incidental Notes and Memoranda." E. L. Corthell. VII, 131 (1878). Discussion,

VII, 159.
"The South Pass Jetties. Notes on the Consolidation and Durability of the Works, with a Description of the Concrete Blocks and Other Constructions of the Last Year." Max E. Schmidt. VIII, the Last Year." 189 (1879)

189 (1879).
"The South Pass Jetties. Ten Years' Practical Teachings in River and Harbor Hydraulies." E. L. Corthell. XIII, 313 (1884). Discussion, XV, 223 (1886).
"The Suspension of Solids in Flowing Water." Elon Huntington Hooker. (With Discussion.) XXXVI, 239 (1896).
"The Ticton Canal." E. G. Hopson. (With Discussion.) LXXI. 158 (1911).

Discussion.) LXXI, 158 (1911).

WATER, FLOW OF (Channels)—(Contt).

WATER, FLOW OF (Channels)—(Cont).

"The Use and Care of the Current Meter, as Practiced by the United States Geological Survey." John C. Hoyt. LXYI, 70 (1910). Discussion: Arthur H. Diamant, E. C. Murphy, H. K. Barrows, C. E. Grunsky, E. Kuichling, Gerard H. Matthes, D. G. Thomas, Walter Pearl, and C. M. Allen, LXVI, 108.

"The Water Power of the Falls of St. Anthony." Joseph P. Frizell. (With Discussion.) XII, 412 (1883).

"Twenty Years' Run-Off, at Holyoke, Mass., of the Connecticut River." Clemens Herschel. (With Discussion.) LVIII,

Herschel. (With Discussion.) LVIII,

"Waves of Translation in Fresh Water."
Wm. J. McAlpine. I, 333 (1872).
"Wing Dams in the Mississippi above the Falls of St. Anthony." Edward P. North. VI, 268 (1877).

"Yield of the Sudbury River Water-Shed in the Freshet of Feb. 10th-13th, 1886." Desmond FitzGerald. XXV, 253 (1891).

WATER, FLOW OF, IN PIPES

"A Mechanism for Metering and Recording

"A Mechanism for Metering and Recording the Flow of Fluids Through Venturi Tubes, Orifices, or Conduits, by Integrating the Velocity Head." J. W. Leddoux. LXXVI, 1148 (1913).
"A Solution of the Problem of Determining the Economic Size of Pipe for High-Pressure Water-Power Installation." Arthur L. Adams. LIX, 173 (1907). Discussion: W. L. Butcher, W. E. Buck, P. E. Stevens, C. L. DeMott, E. Knichling, William J. Roberts, Charles D. Marx and C. B. Wing, James H. Wise, E. W. Myers, Asahel C. Toll, and F. G. Baum, LIX, 178.
"A Study of Fluid Resistance." Luther Wagoner. LXXVII, 890 (1914).
"Air Tanks on Pipe Lines." Minton M. Warren." (With Discussion.) LXXXII, 250 (1918).

250 (1918).

250 (1918).

"An Experimental Study of the Resistances to the Flow of Water in Pipes."
Augustus V. Saph and Ernest W. Schoder. LI, 253 (1903). Discussion: A. Flamant, Hiram F. Mills, Edgar C. Thrupp. Allen Ilazen, E. G. Coker, George H. Fenkell, and Gardner S. Williams. LI, 313.

Capacity of Astoria, Oregon, pipe line. XXXVI, 24 (1896).

"Curve Resistance in Water Pipes." Er-

"Curve Resistance in Water Pipes." Ernest W. Schoder. LXII, 67 (1909). Discussion: George Jacob Davis, Jr., LXII, 97.

Data on discharge of rivted pipes of various diameters. XL, 498 (1898).

Data regarding the flow of water in pipes. LXX, 178 (1910).

"Description and Results of Hydraulic Ex-

periments with Large Apertures, at Hol-yoke, Mass., in 1874." Theodore G. Ellis. V, 19 (1876). Discussion, V, 297. "Description of Some Experiments Made on the Providence, R. I., Water-Works, to Ascertain the Force of Water Ram in Edmund B. Weston, XIV, 238 Pipes.'

(1885).

"Description of Some Experiments on the Flow of Water made during the Construction of Works for Conveying the Water of Sudbury River to Boston."

A. Fteley and F. P. Stearns. XII, 1 (1883)

"Description of Some Experiments on the

WATER, FLOW OF (Pipes)-(Continued). Flow of Water through 2½-Inch Rubber Hose, and Nozzles of Various Forms and Sizes, made on the Providence, R. I., Water-Works. Also Results of Investigations Relating to the Height of Jets of Water." Edmund B. Weston. XIII, 376 (1884).

"Determination of the Size of Sewers." Robert E. McMath. XVI, 179 (1887). "Excessive Rainfalls Considered with Es-

pecial Reference to their Occurrence in Populous Districts." R. L. Hoxie. (With Discussion.) XXV, 70 (1891).
"Experimental Determination of Loss of Head Due to Sudden Enlargement in Circular Pipes." W. H. Archer. LXXVI,

999 (1913).

Experiments at Detroit, Mich., on the Effect of Curvature upon the Flow of Water in Pipes." Gardner S. Williams, Clarence W. Hubbell, and George H. Fenkell. XLVII. 1 (1902). Discussion: E. C. Murphy, Hiram F. Mills, Irving P. Church, Charles H. Tutton, J. L. Campbell, Charles W. Sherman, D. Farrand Henry, George Y. Wisner, Edgar C. Thrupp, Rudolph Hering, James A. Seddon, J. P. Frizell, Henry Bazin, E. Kuichling, Walter Ferris, E. Sherman Gould, H. W. Brinckerhoff, Edward S. Cole, E. E. Haskell, Wager Fisher, Robert E. Horton, W. M. White, A. V. Saph and E. W. Schoder, Arthur Adams, and W. E. Wilson, XLVII. 197. Experiments on the Discharge of a 30-In. "Experiments at Detroit, Mich., on the Ef-

W. E. Wilson, XLVII, 194.
"Experiments on the Discharge of a 30-In,
Stop Valve." J. Waldo Smith. (With
Discussion.) XXXIV, 235 (1895).
"Experiments on the Flow of Water in a
48-Inch Pipe." F. P. Stearns. (With
Discussion.) XIV, 1 (1885).
"Experiments on the Flow of Water in the
Six-Foot Steel and Wood Pipe Line of

Six-Foot Steel and Wood Pipe Line of the Pioneer Electric Power Company, at Ogden, Utah." Charles D. Marx, Charles B. Wing, and Leander M. Hoskins. First Paper (With Discussion), XL, 471 (1898); Supplementary Paper (With Dis-

cussion), XLIV, 34 (1900).

"Experiments on the Flow of Water in Wood Stave Pipes." E. A. Moritz. LXXIV, 411 (1911). Discussion: Robert G. Dieck. Melvin L. Enger, J. L. Campbell, Rudolph Hering, Gardner S. Williams, J. S. Moore, and Charles G. Darrach, LXXIV, 452.

"Experiments Relating to Hydronlings."

rach, LXAIV, 402.

"Experiments Relating to Hydraulics of Fire Streams." John R. Freeman. (With Discussion.) XXI, 303 (1889).

"Flood Waves in Sewers and their Antomatic Measurement." Alva J. Grover. XXVIII, 1 (1893). Discussion, XXVIII. 10, 199.

"Flow in the Sewers of the North Metropolitan Sewerage System of Massachu-setts." Theodore Horton. XLVI, 78 (1901). Discussion: Rudolph Hering, J. Waldo Smith, George W. Tillson, and G. C. Whipple, XLVI, 87.
Flow of sand and water in pipes. LVII,

340 et seq. (1906). "Flow of Water in 48-In. Pipes." Desmond FitzGerald. (With Discussion.) XXXV, 241 (1896).

"Flow of Water in Wrought- and Cast-Iron Pipes from 28 to 42 Ins. in Diam-eter." Isaac W. Smith. (With Discus-sion.) XXXVI, 197 (1896). "Foundation Flow of Water in Vertical Pipes." F. E. Lawrence and P. L. Braunworth. LVII, 265 (1906). Discus-

WATER, FLOW OF (Pipes)—(Continued). sion: A. Flamant, Edgar C. Thrupp, Frank L. Getman, and Ernest W. Scho-der, LVII, 302.

"Friction Coefficient for Riveted Steel Pipe." An Informal Discussion. A. McL. Hawks. XLII, 155 (1899).
"Induced Currents of Fluids." F. zur Nedden. LXXX, 844 (1916). Discussion: Clemens Herschel, Carl George de Laval, and Lyke Computation. clemens Herschel, Carl George de Laval, and John C. Trautwine, Jr., LXXX, 897. "Memorandum and Tables, Exhibiting the Results of Some of Darcy's Experiments on the Flow of Water through Pipes." James B. Francis. II, 45 (1873). "Note on Kutter's Diagram." Charles H. Swan. IX, 326 (1880). "On the Hydraulies of the Hemlock Lake Conduit of the Rephyster, N. V. Water.

Conduit of the Rochester, N. Y., Water-Works." George W. Rafter. XXVI, 13 (1892). Discussion, XXVI, 28.
"On the Loss of Head Resulting from the Passage of Water through a 24-Inch Stop Valve." E. Kuichling. (With Discussion, XXVII, 429, 4390).

Passage of Water through a Francisco-Valve." E. Kuichling. (With Discussion.) XXVI, 439 (1892). "Penstock and Surge-Tank Problems." Minton M. Warren. (With Discussion.)

Minton M. Warren. (With Discussion)
LXXIX, 238 (1915).

"Pressures in Penstocks Caused by the
Gradual Closing of Turbine Gates."
Norman R. Gibson. (With Discussion.)
LXXXIII, 707 (1919-20).

"Pressures Resulting from Changes of Velocity of Water in Pipes." J. P. Frizell.
(With Discussion.) XXXIX, 1 (1898).

"Pulsations in Pipe Lines, as Shown by
Some Recent Tests." H. C. Vensano.
(With Discussion.) LXXXII, 185 (1918).

"Some Facts in Relation to Friction, Waste

"Some Facts in Relation to Friction, Waste and Loss of Water in Mains," Charles B. Brush. (With Discussion.) XIX, 89 (1888).

"The Automatic Volumeter." son. (With Discussion.) E. G. Hop-LXXX, 572 (1916)

"The Effect of Tuberculation on the Delivery of a 48-ln. Water Main." James Duane. XXVIII, 26 (1893). Discussion, XXVIII, 257, 352.
"The Flow of Water in Cylindrical Conduits." Sidney A. Reeve. LXXIV, 206

(1911).

"The Flow of Water in Pipes under Pres-"The Flow of Water in Fipes under Fles-sure." Charles G. Darrach. VII, 114 (1878). Discussion, VII, 122. "The Flow of Water in Small Channels,

after Ganguillet and Kutter, with Kutter's Diagram Modified, and Graphical Tables with Special Reference to Sewer Calculations." R. Hering, VIII. 1 (1879).

(1879).

"The Flow of Water in Wood Pipes."
Theron A. Noble. XLIX, 112 (1902).
Discussion: E. W. Schoder, A. V. Saph,
Mansfield Merriman, Rudolph Hering,
and Gardner S. Williams, XLIX, 145.

"The Flow of Water through Pipes."
Hamilton Smith, XII, 119 (1883).

"The Power Plant, Pipe Line and Dam
of the Pioneer Electric Power Company at Ogden, Utah." Henry Goldmark.
(With Discussion.) XXXVIII, 246 (1897).

"The Relation between the Rainfall and the

(With Discussion.) XXXVIII, 246 (1897).
"The Relation between the Rainfall and the Discharge of Sewers in Populous Districts." Emil Kuichling. (With Discussion.) XX, 1 (1889).
"The Results of Investigations Relative to Formulas for the Flow of Water in Pipes." Edmund B. Weston. (With Discussion.) XXII, 1 (1890).
"The Venturi Water Meter: An Instrument

WATER, FLOW OF (Pipes)—(Continued). Making Use of a New Method of Gauging Water; Applicable to the Cases of Very Large Tubes, and of a Small Value Only, of the Liquid to be Gauged." Clemens Herschel. XVII, 228 (1887). Discussion, XVIII, 133 (1888).

"Water Power with High Pressures and Wrought-Iron Water Pipe." Hamilton (With Discussion.) Smith. XIII. 15

(1884).

WATER, FLOW OF, OVER DAMS AND

"American Irrigation Engineering." Herbert M. Wilson, (With Discussion.) bert M. Wilson, XXV, 161 (1891).

"An Automatic Waste Weir." A. D. Foote

XVIII, 59 (1888). Automatic registers for use on weirs. XLIV,

158 (1900).

Comparison of current meter and weir weir

discharges. XLVII, 203 (1902).
Comparison of current meter and measurements, Sudbury Conduit. XII, 316 (1883).

"Current Meter and Weir Discharge Comparisons." Edward C. Murphy. (With Discussion.) XLVII, 370 (1902). "Description and Results of Hydraulic Experiments with Large Apertures, at Holyoke, Mass., in 1874." Theodore G. Ellis. V, 19 (1876). Discussion, V, 297. Description of Bazin's experime

Bazin's experiments weirs of irregular cross-sections. XLIV.

229, 364 (1900).

"Description of Some Experiments on Flow of Water Made During the Construction of Works for Conveying the Water of Sudbury River to Boston." A. Fteley and F. P. Stearns. XII, 1 (1883).

Experiments at Cornell University. XLIV,

266 (1900).

Experiments on flow in Alameda Creek

LXXX, 179 (1916).

"Experiments on the Flow of Water over Submerged Weirs." James B. Francis. XIII, 303 (1884).

XIII, 303 (1884).

"Experiments on the Humphrey Turbine Water-Wheel, at the Tremont and Suffolk Mills, in Lowell, Mass." James B. Francis. XIII, 295 (1884).

"Experiments on Weir Discharge." W. G. Steward and J. S. Longwell. LXXVI, 1045 (1913). Discussion: C. H. Pierce, and Francis F. Longley, LXXVI, 1078.

"Fountain Flow of Water in Vertical Pipes." F. E. Lawrence and P. L. Braunworth. (With Discussion.) LVII, 265 (1906).

265 (1906).

"Measurement of the Flow of Streams by Approved Forms of Weirs with New For-Approved Forms of Weirs with New Formulas and Diagrams: Details and Summaries of the Results of Experiments by Francis, Bazin, Fteley and Stearns, and at the Hydraulic Laboratories of Cornell University and the University of Utah." Richard R. Lyman. (With Discussion.) LXXVII, 1189 (1914).

Measuring weirs. LV, 180 (1905).

Maritz of weirs and filmes for the measure.

Measuring weirs. LV, 180 (1995).

Merits of weirs and flumes for the measurement of water. XLIV, 160 (1900).

"On the Flow of Water over Dams."
George W. Rafter. (With Discussion.)
XLIV, 220 (1900).

"Some Notes on the Holland Dikes."
William Starling. (With Discussion.)

XXVI, 559 (1892).

WATER, FLOW OF (Dams)—(Continued). "The Cippoletti Trapezoidal Weir." A. D. Flinn and C. W. D. Dyer. XXXII, 9 (1894).

"The Hydraulic Jump, in Open-Channel Flow at High Velocity," Karl R. Ken-nison. (With Discussion.) LXXX, 338

(1916)

"The Problem of the Submerged Weir."
Clemens Herschel, XIV, 189 (1885).
"Verification of the Bazin Weir Formula
by Hydro-Chemical Gaugings." Floyd
A. Nagler, LXXXIII, 105 (1919-20). A. Nagler. LXXXIII, 105 (1919-20). Discussion: Clemens Herschel, David A. Molitor, Frederic P. Stearns, and B. F. Groat, LXXXIII, 157.

WATER, FLOW OF, THROUGH ORI-FICES.

"The Automatic Volumeter." son. (With Discussion.) (1916). E. G. Hop-LXXX, 572

WATER FRONT.

"The Improvement of the — of the City of New York." John D. Van Buren. (With Discussion.) III, 172 (1874).

(With Discussion.) III, 172 (1874).
"The Lake Front Improvements of the Illinois Central Railrond in Chicago."
John Findley Wallace. (With Discussion.) XXXVIII, 315 (1897).
"The Problem of the Lower West Side Manhattan — of the Port of New York."
B. F. Cresson, Jr. (With Discussion.)
LXXV, 226 (1912).

WATER-HAMMER.

"Air Tanks on Pipe Lines." Minton M. (With Discussion.) LXXXII, Warren. 250 (1918).

and Surge-Tank Problems."

I. Warren (With Discussion.) "Penstock

Minton M. Warren LXXIX, 238 (1915). "Pressure in Penstocks Caused by the Gradual Closing of Turbine Gates."

Gradual Closing of Tutble
Norman R. Gibson. (With Discussion.)
LXXXIII, 707 (1919-20).
"Pulsations in Pipe Lines, as Shown by
Some Recent Tests." H. C. Vensano.
LXXXII, 185 (1918). Discussion: Norman R. Gibson, Rudolph Hering. R. D.
Tohnson. and Minton M. Warren. Johnson, an LXXXII, 236.

WATER-JETS.

and other devices for deepening rivers.
 XL, 236 (1898).

WATER LAWS.

"Some Principles Relating to the Administration of Streams." Clarence T. Johnston. (With Discussion.) LXXVIII, 630 (1915).

"State and State and National—, with Denaired Statement of the Oregon System of Wa-ter Titles." John H. Lewis. LXXVI, 627 (1913). Discussion: Clarence T. National -. with Detailed Grant Grant, E. G. Hopson, H. T. Cory, O. C. Merrill, William G. Davies, and W. B. Freeman, L. XXVI, 150n, C. C. Merrill, William G. Davies, and W. B. Freeman, L.XXVI, 677.

Johnston, L. J. Le Conte, George L. Dillman, W. E. Moore, Morris Bien, Horace W. Sheley, Morris Knowles, Kenneth C. Grant, E. G. Hopson, H. T. Cory, O. C. Merrill, William G. Davies, and W. B. Freeman, LXXVI, 677.

Juperial Valley, California, LXXVI, 1507 (1913).

WATER-LEVEL RECORDERS.

"The Accuracy of - and Indicators of the

WATER-LEVEL RECORDERS—(Con'd). Float Type." J. C. Stevens. LXXXIII, 894 (1919-20).

WATER MAINS. See PIPE.

WATER METERS. See METERS.

WATER PIPE. See PIPE.

WATER POWER.

"A High-Voltage Power Transmission." M. H. Gerry, Jr. (With Discussion.) L. 212 (1903).

"A Solution of the Problem of Determining the Economic Size of Pipe for High-Pressure — Installation." Arthur L. Adams. (With Discussion.) LIX, 173 (1907).

"A—and Compressed Air Transmission
Plant for the North Star Mining Company, Grass Valley, Cal." Arthur De
Wint Foote. (With Discussion.) XXXVI, 171 (1896).

XXXVI, 171 (1896).

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913).

"Black Eagle Falls Dam, Great Falls, Montana." Maurice S. Parker. (With Discussion.) XXVII, 56 (1892).

"Calculations of the Mean Horse-Power of a Variable Stream and the Cost of Replacing the Power Lost by a Partial Viscolary of the Mean." placing the Power Lost by a Par Diversion of the Flow." William (With Discussion.) XXII, 389 Grant. (1890).

(1890).

"Construction of the Power-House of the Rochester Power Company, Adjacent to Genesee Falls, Rochester, N. Y." Robert Cartwright. XXVIII. 19 (1893).

"Electrical Transmission from Niagara."
Benjamin Rhodes. XIV, 205 (1885).

"Excavation and Embankment by —." Edward Rates Darred. (Valla Discussion.)

ward Bates Dorsey. (With Discussion.) XV, 348 (1886).

"Experiments on the Humphrey Turbine "Experiments on the Humphrey Turbine Water-Wheel, at the Tremont and Suffolk Mills, in Lowell, Mass." James B. Francis. XIII. 295 (1884).
"Governing of—Under Variable Loads."
M. S. Parker. (With Discussion.) XXVII, 17 (1897).

"Hydro-Electric Power in Canada." Cecil B. Smith. LXV, 154 (1909). Dis-cussion: H. Holgate, and E. J. Beugler,

LXV, 194.

LXV, 194.

"Notes upon the Construction of a Water System for Placer Mining, and Suggestions for a New Method of Dam Building." Robert Brewster Stanton. (With Discussion.) XXXV, 70 (1896).

"State and National Water Laws, with Detailed Statement of the Oregon System of Water Titles." John H. Lewis. (With Discussion.) LXXVI, 637 (1913).

"Storage and Pondage of Water." Joseph P. Frizell. XXXI, 29 (1894). Discussion, XXXI, 552.

"Surges in an Open Canal." R. D. Johnson. (With Discussion.) LXXXI, 112 (1917).

(1917).

"The Compensating Works of the Lake Superior Power Company." G. F. Stickney. (With Discussion.) LIV, 346 (1905)

"The Design of Hydro-Electric Power

WATER POWER-(Continued).

Plants." J. D. Galloway. ('cussion.) LXXIX, 1000 (1915).
"The Differential Surge Tank." (With Dis-

Raymond (With Discussion.) Johnson. LXXVIII, 760 (1915).

"The Economic Improvement of the Coosa and Alabama Rivers, in Georgia and Alabama." D. M. Andrews. (With Discussion.) L, 363 (1903).

"The Guadalajara Electric-Light Installation, Utilizing the Famous Juanacathan Water-Falls, 28 Km. Distant from Guadalajara." Rafael M. de Arozarena. XXIX, 689 (1893).

XXIX, 689 (1893).

"The Hydraulic Plant of the Puget Sound Power Company." Edwin H. Warner. LV, 228 (1905). Discussion: William S. Post, Joseph H. Cunningnam, Arthur L. Adams, and Verne L. Havens, LV, 250.

"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company." A. H. Van Cleve. (With Discussion.) LXII, 199 (1909).

(1909).

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." E. L. Sayers and A. C. Polk. LXXVIII, E. L. Sayers and A. C. Polk. LXXVIII, 1409 (1915). Discussion: James H. Harlow, R. D. Coombs, Hugh L. Cooper, Heinrich Homberger, H. Birchard Taylor, Spencer Miller, W. E. Mitchell, and Gardner S. Williams, LXXVIII, 1546. "The Necaxa Plant of the Mexican Light and Power Company." F. S. Pearson and F. O. Blackwell. (With Discussion.) LVIII, 37 (1907). "The Preservation of the Falls of St.

"The Preservation of the Falls of St. Anthony." F. U. Farquhar. (With Discussion.) XII, 393 (1883).
"The Pulp Mill of the Cliff Paper Company of Niagara Falls, N. Y." Wallace C. Johnson. (With Discussion.) XXXII,

Johnson. 214 (1894). "The Relative Merits of Working Hoisting Machinery by Steam, Water and Elec-tricity." George A. Goodwin. XXIX. 695 (1893).

"The—of the Falls of St. Anthony."
Joseph P. Frizell. (With Discussion.)
XII, 412 (1883).
—in the United States. X, 188 (1881).
—of the Falls of the Ohio River." Mor-

ris S. Belknap. (With Discussion.) II, 261 (1873).

-with High Pressures and Wrought-Iron Water Pipe." Hamilton Smith, Jr. (With Discussion.) XIII, 15 (1884).

WATER PRESSURES.

"Pressures in Penstocks Caused by the Gradual Closing of Turbine Gates." Norman R. Gibson. (With Discussion.) LXXXIII, 707 (1919-20).

"Pressures Resulting from Changes of Velocity of Water in Pipes." J. P. Frizell. (With Discussion.) XXXIX, 1 (1898).

- in pipe lines. LXXXII, 185 (1918).

WATER-PROOFING.

"Experiments for Making Brick Masonry Impervious to Water, Tried on the Walls of the Back Bays of the Gate Houses of the New Croton Reservoir in New York, and on the Brick Arch of High Bridge, in 1863." William L. Dearborn. I, 203 (1872).
"Impervious Concrete." An Informal Dis-

WATER-PROOFING—(Continued).

cussion. R. W. Lesley and others. Ll, 114 (1903).

Permeability of concrete and methods of

—. LIX, 159 (1907).

Permeability tests of concrete. LIX, 127

Progress report of Special Committee on Concrete and Reinforced Concrete. LXXVII, 413 (1914).

LXXVII, 413 (1914).

"Some Experiments with Mortars and Concretes Mixed with Asphaltic Oils," Arthur Taylor and Thomas Sanborn. (With Discussion.) LXXVI, 1004 (1913).

"Some of the Properties of Oil-Mixed Portland Cement Mortar and Concrete." Logan Waller Page. (With Discussion.) LXXIV, 255 (1911).

Specifications for—, Pennsylvania Railroad Terminal, New York. LXIX, 211 (1910).

(1910).

Tests of felts and fabrics. LXXIX, 322

(1915).

(1915).

"The Canse and Prevention of the Decay of Building Stone." Thomas Egleston. (With Discussion.) XV, 647 (1886).

"The Use of Canvas in Water-Tight Bulkheads." M. Meigs. (With Discussion.) XXXI, 524 (1894).

"The—of Solid Steel-Floor Railroad Bridges." Samuel Tobias Wagner. LXXIX, 306 (1915). Discussion: Albert J. Himes, William S. Babcock, Jonathan Jones, J. Lee Allen, Glenn B. Woodruff, G. J. Ray. J. B. W. Gardiner. Henry H. Quimby, Ralph J. Lawrence, A. T. Goldbeck, F. Auryansen, J. H. Fichthorn, Edward W. De Knight, Albert H. Rhett, A. W. Carpenter, C. T. DeLamere, John Jervis Vail, Philip B. Walker, and Charles Rufus Harte, LXXIX, 336. (Water-Proof Coverings." F. Collingwood. IX, 348 (1880).

IX, 348 (1880).

-at South Boston Terminal. XLIII, 114,

172 (1900). - bridges and viaducts, track elevation. Philadelphia. LXXVI, 1853, 1900, 1906

- concrete specimens in sea water. LXXXI,

675, 689, 695, 707 (1917).

- Cross-Town Tunnels, Pennsylvania Rail-road. LXVIII, 416 (1910). LXXIV, 317

- for Detroit River Tunnel.

(1911). Long Island approaches, East - Long River Tunnels, Pennsylvania Railroad. LXIX, 107, 114 (1910).

concrete. LXXXI, 1122, 1153, et seq.

(1917).

- (1917).

 of the Bergen Hill Tunnels, the New York Tunnel Extension of the Pennsylvania Railroad. LXVIII, 140 (1910).

 of the North River Tunnels of the New York Tunnel Extension of the Pennsylvania Railroad. LXVIII. 197 (1910).

 of Twelfth Street Viaduct, Kansas City, Mo. LXXX, 503 (1916).

 permanent shafts, East River Tunnels,
 Pennsylvania Railroad, LXIX, 80 (1910). - reservoir lining, Portland, Ore. LXXXII,

781 (1918).

- the Cherry Street Bridge, Toledo, Ohio.
LXXX, 750 (1916).

the Queensborough Station arch, etc. LXXXII, 286, 325, 330 (1918). - underground structures. LXXVI, 47, 68

et seq. (1913). — viaduct maso viaduct masonry, terminal structures. Pennsylvania Railroad, New York. structures. LXIX, 158 (1910).

WATER PURIFICATION.

See WATER.

WATER RAM.

"Description of Some Experiments Made on the Providence, R. I., Water-Works, to Ascertain the Force of—in Pipes." Edmund B. Weston. XIV, 238 (1885).

WATER SOFTENING.

See WATER.

WATER STORAGE.

"Hydraulic Phenomena and the Effect of Spreading of Flood Water in the San Bernardino Basin, Southern California." A. L. Sonderegger. LXXXII, 802 (1918). Discussion: Charles H. Lee and James Hyde Forbes, LXXXII, 826. "Rainfall, Flow of Streams, and Storage." Desmond FitzGerald. (With Discussion.) XXVII, 252 (1802).

Desmond FitzGerald. (With Discussion.) XXVII, 253 (1892)
"Storage and Pondage of Water." Joseph P. Frizell. XXXI, 29 (1894). Discussion, XXXI, 552.
"Storage to be Provided in Impounding Reservoirs for Municipal Water Supply." Allen Hazen. LXXVII, 1539 (1914). Discussion: Hiram F. Mills, T. U. Taylor, F. B. Marsh, L. J. Le Conte. E. P. Goodrich. James L. Tighe, and H. T. Cory, LXXVII, 1641.

Corv. LXXVII, 1641.
"The Storage of Flood-Waters for Irigation: A Study of the Supply Available from Southern California Streams." A. M. Strong. (With Discussion.) LXXVII. 67 (1914).

WATER, WASTE OF.

"A Memoir on Water Meters." John Thomson XXV, 40 (1891). Discussion, XXV.

66, 563,

on, 505.

An Example of the Legitimate Use of Water for Domestic Purposes." K. F. Cooper, L.V. 430 (1905). Discussion: F. W. Dalrymple, Alexander Potter, V. H. Hewes, M. R. Sherrerd, G. L. Christian, Edwin Durvea, Jr. Theodore Belzner, and James Owen L.V. 434.

Dusumption and waste of water.

Consumption and waste of water. XXXVIII, 1 (1897).

"Consumption and Waste of Water." Dex-(With Brackett. Discussion.)

ter Brackett. (With Discussion.) XXXIV, 185 (1895). Consumption of water in some German cities. XXXIV, 219 (1895). Consumption of water per capita in vari-ous United States cities. XXXIV, 186

(1895).
"On the Measures for Restricting the Use and Waste of Water, in Force in the City of Rochester, N. Y." George W. Rafter. (With Discussion.) XXVI, 23

"Some Facts in Relation to Friction, Waste and Loss of Water in Mains." Charles B. Brush. (With Discussion.) XIX, 89 XIX, 89

(1888)

"The Consumption and Waste of Water Delivered by Public Works." James H. Harlow, VI. 107 (1877).

Harlow, VI. 107 (1877).

"The Consumption of Water in Municipal Supplies and the Restriction of Waste." An Informal Discussion. Emil Kutchling, Gardner S. Williams, John C. Trautwine, Jr., Rudolph Hering, Desmond FitzGerald, James Owen, D. C. Humphreys, J. P. A. Malgnen, J. N. Chester, Oberlin Smith, J. H. Harlow,

WATER, WASTE OF-(Continued).

Clemens Herschel, Fred. Brooks, Dexter Brackett, G. L. Christian, Foster Cro-well, and Charles W. Sherman, XLVI, 407 (1901).

Waste and its prevention. V, 111 (1876).

WATER WHEELS.

"The Burden Water-Wheel" F. R. I. Sweeny. LXXIX, 708 (1915). The hurdy-gurdy wheel. X111, 16 (1884). "The Old-Time—of America." Joseph P. Whitell (Will Principle). Frizell. (With Discussion.) XXVIII 237 (1893). XXVIII, 237 (1893).

See also TURBINES (WATER).

WATER-WORKS.

"A Method of Determining a Reasonable Method of Determining a Reasonable Service Rate for Municipally Owned Public Utilities." J. B. Lippincott. (With Discussion.) LXXXI, 413 (1917).

"A Reinforced Concrete Infiltration Well and Pumping Plant" Frederick N. Hatch. LXXV, 697 (1912). Discussion: William R. Copeland, and H. F. Dunham, LXXV, 706.

nam, LANY, 706.

"A Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing." Joseph W. Ellins and J. S. Gettrust. (With Discussion.) LXXX, 1342 (1916).

"An Example of the Legitimate Use of Water for Domestic Purposes." K. F. Cooper (With Discussion) L.V. 450.

LV, (With Discussion.) -430Cooper. (1905)

"Bibliography on Valuation of Public Utilities." LXXVI, 2133 (1913). "Comparison of Water Supply Systems from a Financial Point of View." J. Leand FitzGerald. (With Discussion.) 247 (1891).

"Construction of the Morena Rock Fill Dam, San Diego County, California," M. M. O'Shanghnessy, (With Discus-sion.) LXXV, 27 (1912).

sion.) LXXV. 27 (1912).
"Description of Some Experiments Made on the Providence, R. I., —, to Ascertain the Force of Water Ram in Pipes." Edmund B. Weston. XIV. 238 (1885).
"Description of Some Experiments on the Flow of Water through 2½-Inch Rubber Hose, and Nozzles of Various Forms and Sizes, made on the Providence R. I.— Sizes, made on the Providence, R. I., —. Also Results of Investigations Relating to the Height of Jets of Water Ed-mund B. Weston. XIII, 376 (1884). Description of -at Washington, D. C. LVII, 307 (1906).

"Experiences had during the Last Twentyfive Years with—Having an Under-ground Sourse of Supply." B. Salbach. (Trans'ated from the German by Clemens Herschel.) XXX. 293 (1893). Dis-

cussion, XXX, 690.

"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Property and other Public Utilities." (With Discusother Public Utilities."

other Fubic Clinics.
sion.) LXXXI. 1311 (1917).
"Grouting Operations, Catskill Water Supply." James F. Sanborn and M. E. Zipser. (With Discussion.) LXXXIII, 980 (1919-20).

980 (1919-20).

"Investigations for Ground-Water Supplies" J. M. K. Penniuk, (Inter Eng. Cong. 1904.) LIV, Part D, 169 (1905).

New York City —, Brief description of. LXXVI. 1787 (1913).

"Notes and Suggestions on the Croton -

WATER-WORKS-(Continued).

and Supply, for the Future." Benjamin S. Church. V, 107 (1876). Discussion, V, 254: VI, 68 (1877).
"On the Distribution of Water in the City of Mexico." L. Salazar. XXX, 336 (1893).
"On the Fresh Water Algæ and their Relation to the Purity of Public Water Supplies." George W. Rafter. (With Discussion.) XXI, 483 (1889).
"Some Details of Valves and other Appear.

"Some Details of Valves and other Apparatus in Use by the National — Company at Kansas City, Mo." Frederick E. Sickels. XXIV, 385 (1891).

"Storage and Pondage of Water." Joseph P. Frizell. XXXI, 29 (1894). Discussion. XXXI, 552.

"Syphons of the Kansas City -." (With Discussion.) XVIII, Pearsons. 130 (1888).

"The Astoria City (Oregon) —." Arthur L. Adams. (With Discussion). XXXVI,

1 (1896).

"The Development of Water Supplies and Water-Supply Engineering." Presidential Address at the Annual Convention at Frontenac, Thomand Islands, N. Y., June 26th, 1906. Frederic P. Stearns, LVI, 451 (1906)

"The Effects of the San Francisco Earthquake of April 18th, 1906, on Engineering Constructions." Reports of a General Committee and of Six Special Committees of the San Francisco Association of Members of the American Society of Civil Engineers. (With Discussion.) 208 (1907).
"The Financial Management of —."

(With Discussion.) Kuichling. (With XXXVIII, 1 (1897).

"The Going Value of --." Leonard Met-calf and John W. Alvord. LXXIII, 326 (1911). Discussion: Clinton S. Burns, Albert I. Frye, Frederick P. Stearns, E. Kuichling. H. F. Dunham, Charles B. Buerger, Halbert P. Gillette, and George W. Fuller, LXXIII, 356.

"The Improved Water and Sewage Works of Columbus, Ohio." John H. Gregory. (With Discussion.) LXVII, 206 (1910). "The New—of Havana, Cuba." E. Sherman Gould. (With Discussion.) XXXVI,

217 (1896).

"The Pumping Plant of the Molence Company." W. L. Du Moulin. (With Discussion.) LXXIX, 1268 (1915).
"The Purification of the Water Supply of Steelton, Pennsylvania." James H. 135 (1910).

"The Quality of Water Supplies." John W. Hill. (With Discussion.) XXXII, 130 (1894).

"The Valuation of Public Service Corpora-tion Property." Henry Earle Riggs. (With Discussion.) LXXII, 1 (1911). "The Water Supply, Drainage and Sewer-age of the Lawrenceville School." Fred-

crick S. Odell. XVI, 66 (1887).

The Water Supply of Parkersburg, W. Va." William M. Hall. LXXXI, 749 (1917). Discussion: John W. Hill, Alex-"The (1917). Discussion: John W. Hill, Alexander Potter, George W. Fuller, Nicholas S. Hill, Jr., Walter E. Spear, T. Kennard Thomson, H. F. Dunham, Theodore S. Johnson, Philip Burgess, James H. Fuertes, Morris Knowles, J. D. Stevenson, and Edward Mayo Tolman, LXXXI, 788. WATER-WORKS—(Continued).

"The Water Supply of the El Paso and Southwestern Railway from Carrizozo to Santa Rosa, N. Mex." J. L. Camp-bell, LXX, 164 (1910). Discussion: G. E. P. Smith, and Kenneth Allen, LXX,

"The - and Sewerage of Monterrey, N. Mexico." George Robert Graham Con-way. LXXII, 475 (1911). Discussion: James D. Schuyler, David T. Pitketh v. George S. Binckley, Vicente Saucedo, George T. Hammond, and Rudolf

Meyer. LXXII, 557.
"The—of Denver. Colorado." James D. Schuyler. (With Discussion.) XXXI.

Schuyler. (With Discussion.) XXXI, 135 (1894).

"The—of Guantanamo, Cuba." S. D. Rockenbach. XLVII, 426 (1902).

"The—of Porterville, California." Philip E. Harroun. LIV, 235 (1905). Discussion: D. C. Henny, H. F. Dunham, G. W. Tillson, William Mayo Venable, Horace J. Howe, and G. L. Christian, LIV, 270.

"The—of Southington, Connecticut."
Theodore H. McKenzie, XV, 885 (1886).
"The—of Syracuse, N. Y." William R. Hill, (With Discussion.) XXXIV, 23 (1895).

Underground water supply. XXXI, 135 (1894).

"Valuation of — Property." Wynkoop Kier-sted. (With Discussion.) XXXVIII, 115

(1897).

(1897).

"Water Supply." An Informal Discussion. George W. Fuller, F. Herbert Snow, D. D. Clarke, George A. Soper, William J. Baldwin, Gardner S. Williams, J. T. Noble Anderson, William B. Fuller, J. Waldo Smith. Pablo Solfs and Octavio Guzmán, S. Bent Russell, M. R. Sherrerd, F. W. Blackford, and George A. Johnson. LIX. 367 (1907).

Water supply at Narragansett Bay Coaling Station. LVII, 222 (1906).

"Water Supply for the Camps, Cantonments, and Other Projects Built by the Construction Division of the United

States Army." Dabney H. Maury. LXXXIII. 481 (1919-20). Discussion: George W. Fuller, P. H. Norcross, Clarence Goldsmith. T. Kennard Thomson. W. P. Mason, J. Waldo Smith. E. T. Thurston. K. M. Boorman, William J. Boucher, Morris Knowles, H. F. Dunham, George A. Johnson, F. R. Harris, Maurlee R. Scharff, Samuel A. Greeley, Lynn E. Perry, and Asa E. Phillips. LXXXIII, 517. Construction Division of the United States Army." Dabney H. Maury.

LYXXIII, 517.

Water supply for wharf, etc., at Bocas del Toro, Panama. LXVI, 300 (1910).

"Water Supply of the San Francisco-Oakland Mctropolitan District." H. T. Cory. LXXX, 1 (1916). Discussion: F. T. Robson, L. J. Le Conte, C. E. Grunsky, William Schuyler Post. M. M. O'Shaughnessy, Allen Hazen, J. D. Galloway, F. G. Baum, E. G. Hopson, O. W. Peterson, Carl J. Rhodin, Clement H. Miller, Rudolph W. Van Norden, Burton Smith. C. E. Sloan, Edwin Duryea, Jr., H. H. Wadsworth, W. C. Hammatt, A. Griffin, J. Horace McFarland, F. C. Herrmann, and Walter Henry Brown, LXXX, 88.

"— Valuation and Fair Rates, in the Light of the Maine Supreme Court Decisions."

of the Maine Supreme Court Decisions in the Waterville and Brunswick Cases." Leonard Metcalf. LXIV, 1 (1909). Discussion: C. S. Burns, James Nisbet

WATER-WORKS-(Continued).

Hazlehurst, Allen Hazen, T. H. McKenzie, L. L. Tribus, and Gardner S. Wilzie, L. L. Tribus liams, LXIV, 75.

See also DAMS: ENGINES: FILTRATION: METERS: PIPE: PIPE LINES: RE-SERVOIRS: SEDIMENTATION: STAND PIPES: TUNNELS: WATER: WATER STORAGE: WATER, WASTE OF: WELLS.

WATERWAYS.

ATERWAYS.

Artificial — Discussion on Inter. Eng. Cong. Papers, 1904. E. L. Corthell. L. A. Huergo, D. and C. Stevenson, and B. F. Thomas. LIV, Part F, 285 (1905). "Artificial — in Great Britain." W. Henry Hunter. (Inter. Eng. Cong. 1904.) LIV, Part F, 183 (1905). "Artificial — in the United States." William L. Sibert. (Inter. Eng Cong. 1904.) LIV, Part F, 255 (1905). "Canals between the Lakes and New York."

"Canals between the Lakes and New York." Joseph Mayer, X cussion, XLV, 240 XLV, 207 (1901). Dis-

"Cheap Transportation vs. Rapid Transit and Delivery." Martin Coryell. IX,

and Delivery." Martin Coryell, 1X, 401 (1880).
"Effect of Depth upon Artificial—."
Thomas C. Clarke. (With Discussion.)
XXXV, 1 (1896).
"History of the Conversion of the River
Clyde into a Navigable Waterway and the Progress of Glasgow Harbour from its Commencement to the Present Day." James Deas. XXIX, 128 (1893). Discussion. XXX, 478 (1893). "Inland Navigation in France." A. Char-

miand Navigation in France." A. Charguéraud. (Translated from the French by Foster Crowell.) (Inter. Eng. Cong. 1904.) LIV, Part F, 235 (1905).
"Natural—: A Review of their Development in the Netherlands." A. B. Marinkelle. (Inter. Eng. Cong. 1904.) LIV, Part D. 401 (1905).

"On the Straits of Juan de Fuca, Puget Sound; and Government Improvements on the Pacific Coast." Folton W. De-Courcy. (With Discussion.) XXV, 420 (1891).

"Reservoir System of the Great Lakes of the St. Lawrence Basin: Its Relation to the Problem of Improving the Naviga-tion of These Bodies of Water and of Their Connecting Channels." Hiram M. Chittenden. (With Discussion.) XL, 355 (1898).

"Rolling Dams." K. E. Hilgard. (Inter. Eng. Cong. 1904.) LIV, Part D, 439

Eng. (1905).

"The Concurrent Development of Traffic on Improved—and on Railroads." Edward P. North. (With Discussion.) (Inter. Eng. Cong. 1904.) LIV, Part B, 475 (1905).

"The Economic Dimensions for a Water-

"The Economic Dimensions for a Waterway from the Great Lakes to the Atlantic." George Y. Wisner. (With Discussion.) XLV, 224 (1901).
"The Improvement of Three Holland Ship Canals." L. F. E. van Hoogenhuyze and J. A. de Lint. (Inter. Eng. Cong. 1904) LIV, Part F, 209 (1905).
"The Radical Enlargement of the Artificial Waterway between the Lakes and the Hudson River." E. Sweet. XIV, 37 (1885). Discussion, XIV, 43, 93.

See also CANALS; HARBORS: LAKES: RIVERS.

WAVES.

"A Theory of the Water Wave." Morton F. Sanborn. LXXI, 284 (1911).
"Littoral Movements of the New Jersey Coast, with Remarks on Beach Protection and Jetty Reaction." Lewis M. Haupt. (With Discussion). XXIII, 123 (1890).

"On - of Translation that Emanate "On—of Translation that Emanate from a Submerged Orifice, together with an Examination of the Feasibility of the Proposed Baie Verte Canal." Clemens Herschel. IV, 185 (1875).
"Some General Notes on Ocean—and Wave Force." Theodore Cooper. (With Discussion.) XXXVI, 139 (1896).
"The Preservation of Sandy Beaches in the Vicinity of New York City." Elliott J. Dent. (With Discussion.) LXXX, 1786 (1916).
"The Proper Profile for Resisting Wave Action." (Abstract.) Robert Fletcher. XXXVI, 514 (1896).

XXXVI, 514 (1896).

of Translation in Fresh Water." Wm.

J. McAlpire. I, 333 (1872).

See also SHORE PROTECTION.

WEIGHTS.

"On the Metric System of - and Measures." A Discussion. Clemens Herschel, Joseph B. Davis, Coleman Sellers, Julius E Hilgard, Theodore G Ellis, and Robert Briggs. V, 355 (1876).—and Measures." Fred. Brooks. (With Discussion.) XI, 408 (1882).

WEIRS.

See IRRIGATION: WATER, FLOW OF, IN PIPES: WATER, FLOW OF, OVER DAMS AND WEIRS.

WELLS.

"A Reinforced Concrete Infiltration Well and Pumping Plant." Frederick N. Hatch. (With Discussion.) LXXV, 697

Artesian — and Artesian flow in San Bernardino Basin, California. LXXXII, 802 (1918).

"Driven - of the Plainfield Water Supply

"The Use of Cement for Excluding Water from Oil Sands in Drilling —." Paul M. Paine. LXXVI, 1644 (1913).
"The Water Supply of Parkersburg, W. Va." William M. Hall. (With Discussion.) LXXXI, 749 (1917).

WHALEBACK STEAMERS. See STEAMSHIPS.

WHARVES.

"Coal Piers on the Atlantic Seaboard."
J. E. Greiner. LXXVII, 454 (1914).
Costs of various types of — at New York.

III, 189 (1874).

"Description of the Iron Coal Pier, Nor-folk and Western Railroad Company, at folk and Western Railroad Company, at Lambert's Point, Norfolk, Va., and Some of the Methods Used in its Construction." W. W. Coe. XXVII, 125 (1802). Discussion, XXVII, 129.
"Modern Pier Construction in New York Harbor." Charles W. Staniford. LXXVII, 503 (1914). Discussion: E. G. Walker, Edwin J. Beugler, Harrison S. Taft, F. R. Harris, J. P. Snow, Tyr-

WHARVES—(Continued).

rell B. Shertzer, C. H. Stengel, L. D. Cornish, L. J. Le Conte, Chandler Davis. and R. T. Betts, LXXVII, 522.
"Observations on Dock Work in New Yorl. Harbor." J. A. Bensel, (Inter. Eng. Cong. 1904.) LIV, Part. F, 3 (1905). Discussion: E. P. Goodrich, LIV, Part. F, 13. F, 13.

"Reinforced Concrete Docks: Foreign and American Structures. Failures, Costs, and General Considerations." Harrison (With Discussion.) LXXVIII, Taft.

1058 (1915).
"Reinforced Concrete Pier Construction."
Eugene Klapp. LXX, 448 (1910). Discussion: William Arthur Payne, LXX, 455.

"The Improvement of the Water Front of the City of New York." John D. Van Buren, Jr. (With Discussion.) III, 172 (1874).

(1874).

"The Iron Wharf at Fort Monroe, Va."
John B. Duncklee. XXVII, 115 (1892).
Discussion, XXVII, 129.

"The Ocean Pier at Coney Island." Charles
Macdonald. VIII, 227 (1879).

"The Problem of the Lower West Side
Manhattan Water-Front of the Port of
New York." B. F. Cresson, Jr. (With
Discussion.) LXXV, 226 (1912).

"The Reinforced Concrete Wharf of the
United Fruit Company at Bocas del
Toro, Panama." T. Howard Barnes,
LXVI, 289 (1910). Discussion: John
Hawkesworth, and John B. Cameron.
LXVI, 303. LXVI, 303.

Timber versus concrete for —. LXXVII, 503 (1914).

"Unusual Coffer-Dam for 1,000-Foot Pier, New York City." Charles W. Staniford. (With Discussion.) LXXXI, 498 (1917).

See also DOCKS.

WHEEL CONCENTRATIONS. See WHEEL LOADS.

WHEEL LOADS.

'A New Graphical Solution of the Problem. What Position a Train of Concentrated What Position a Train of Concentrated Loads Must Have in Order to Cause the Greatest Stress in any Given Part of a Bridge Truss or Girder." Henry T. Eddy. XXII, 259 (1890).
"Live Loads for Railroad Bridges." Henry W. Hodge. (With Discussion.) (Inter. Eng. Cong. 1904.) LIV, Part A, 79 (1905)

(1905).

"Progress Report of the Special Committee to Report on Stresses in Track." LXXXII, 1191 (1918).

"Wheel Concentrations and Fatigue Formulas in Bridge Design," An Informal Discussion. Gustav Lindenthal and others. XLII, 189 (1899).

WHEELS.

"Cylindrical — and Flat-Topped Rails for Railways." D. J. Whittemore. XXI, 133 (1889). Discussion, XXI, 153.

153 (1889). Discussion, XXI, 153.

"Proper Relation to Each Other of the Sections of Railway—and Rails." Report of the Committee, Preliminary Report, XIX, 1 (1888); Final Report, XXI, 223 (1880).

"Sections and Mechanical Conditions of Car—." P. H. Griffin. (With Discussion.) XXV, 23 (1891).

WHEELS-(Continued).

'The Relation of — to Frog Points and to Guard Rails." Archibaid A. Schenck. (With Discussion.) XXXI, 500 (1894).

WIND.

Effect of—on currents. XL, 86 (1898).
Effect of—on tides, etc., Cape Cod Canal.
LXXXII, 80 (1918).
"On the Cause of Trade Winds." Franz
A. Velschow. (With Discussion.) XXIII,

101 (1890).

WIND BRACING.

Necessity for - in high buildings, XXXVII,

2/2 (1897).
"—in High Buildings." Guy B. Waite.
(With Discussion.) XXX111, 190 (1890).
"—in High Buildings." Henry H. Quimby.
(With Discussion.) XXVII, 221 (1892).

WIND PRESSURE.

"An Examination into the Method of Determining mining Wind Pressures. r. comingwood. (With Discussion.) X, 172 (1881).

wood. (With Discussion.) X, 172 (1881).

"Probable — Involved in the wheck of the High Bridge over the Mississippi River, on Smith Avenue, St. Paul, Minn., August 20th, 1904." C. A. P. Turner. (With Discussion.) LIV, 31 (1905).

"— against Bridges." Ashbel Welch. (With Discussion.) 1X, 391 (1880).

— in bridge design. XXVI, 90 (1892).

"— upon Bridges." C. Shaler Smith. (With Discussion.) X, 139 (1881).

"Wind Pressures in the St. Louis Tornado, with Special Reference to the Necession.

do, with Special Reference to the Necessity of Wind Bracing for High Bundings." Julius Baier, (With Discussion.) XXXVII, 221 (1897).

WINDMILLS.

Windmill pumps of Holland, XXVI, 622 (1892).

WIRE ROPE.

Tests of -, May, 1895. XXXVI, 414 (1896).

WOOD.

See TIMBER.

WOOD BLOCKS.

Preservatives for -. LXXXII, 1417, 1462 (1918).Wood block pavements. LXXXII, 1391,

1416 (1918).

WOOD-BORERS.

"Marine —." Charles H. Snow. Discussion.) XL, 178 (1898). (With

See also TEREDO.

WOOD PIPE.

"Additional Information on the Durability of Wooden Stave Pipe." Arthur L.

WOOD PIPE-(Continued).

Adams. (With Discussion.) LVIII, 65 (1907).

Data concerning some existing stave pine

lines. XLI, 43 (1899).

"Experiments on the Flow of Water in Wood Stave Pipes." E. A. Moritz. (With Discussion.) LXXIV, 411 (1911).

"Modern Practice in Wood Stave Pipe De-

"Modern Practice in Wood Stave Pipe Design and Suggestions for Standard Specifications." J. F. Partridge. LXXXII, 433 (1918). Discussion: Hermann von Schrenk, Frank F. Bell, D. C. Henny, Henry P. Rust, F. M. Robbins, William J. Boucher, J. C. Ralston, O. P. M. Goss, W. H. R. Nimmo, E. A. Moritz, and A. N. Miller, LXXXII, 469. Old—in large cities. LXX, 186 (1910). Old—in New York City. XLI, 62 (1899). 6-ft. wood stave pipe. VI, 69 (1877). "Stave Pipe: Its Economic Design and the Economy of its Use." Arthur L. Adams.

"Stave Pipe: Its Economic Design and the Economy of its Use." Arthur L. Adams. (With Discussion.) XLI, 27 (1899).
"The Flow of Water in Wood Pipes." Theron A. Noble. (With Discussion.) XLIX, 112 (1902).
"The Water Supply of the El Paso and Southwestern Railway from Carrizozo to Santa Rosa, N. Mex." J. L. Campbell. (With Discussion.) LXX, 164 (1910) (1910).

--- at

at Astoria, Oregon, Water - Works. XXXVI, 15 (1896).

at Denver, Colo. XXXI, 135 (1894).

at Ogden, Utah. XXXVIII, 267 (1897).

of Bear Valley Irrigation Company, California. XXXIII, 112 (1890). --- at

See also PIPE: PIPE LINES.

WORLD WAR.

"The 'Light Railways' of the Battle Front in France." Frank G. Jonah. (With Discussion.) LXXXIII, 1220 (1919-20).

WRECKS.

- on railroads. XXVII, 39 (1892).

WROUGHT IRON.

"Experiments on the Strength of - Struts." James Christie. XIII, 85 (1884). Dis-

James Christie. XIII, 80 (1994). Plast cussion, XIII, 267.
Relation between tenacity and resistance to torsion. VII, 169 (1878).
"Tests of Built-Up Steel and — Compression Pieces." Arthur N. Talbot and Herbert F. Moore. (With Discussion.)

Herbert F. Moore. (With Discussion.) LXV, 202 (1909).
Tests of —. II, 349 (1873); III, 1 (1874).
"The Crippling Strength of — Columns."
C. L. Gates. IX, 407 (1880).
"The Effects of Straining Structural Steel and —." Henry S. Prichard. (With Discussion). and —." Henry S. Prichard. (With Discussion.) LXXX, 1429 (1916).
"The Strength of — Columns." G. Bous-

caren. IX, 447 (1880). Discussion, XI, 61 (1882).

See also IRON.



AUTHOR INDEX

AUBOT, FREDERIC V.

Grouted cut-off for the Estacada Dam. LXXVIII, 511.

How to build a stone jetty. LXXV, 1050, improvement. harbor ingle jetty XXXVI, 132.

Substructure, Lonesome Valley Viaduct.

XXXIV, 253.

Topography on the survey of the Mexico - United States boundary, XXXIV,

ABBOT, FREDERICK WILLIAM.

"Tequixquiac Tunnel, Valley of Mexico." XXXII, 171.

ABBOT, HENRY L.

Hydrology of the Panama Canal, LXXVI, 986.

ABBOTT, ARTHUR V.

A new type of masonry dam. XLIX,

"Report of Progress of the Committee on the Compressive Strength of Cements and the Compression of Mor-tars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).

"The Load Line in changes." XXXII, 74. Telephone

ABBOTT, E. L.

Freezing as an aid to excavation. LII, 442.

ABBOTT, HUNLEY.

Concrete piles. LXV, 507.

ABBOTT, JOB.

Memoir of. XXXVI, 538.

ABERT, SYLVANUS THAYER.

Memoir of. L1X, 521.

ADAMS, ARTHUR.

Flow of water in pipes. XLVII, 323.

ADAMS, ARTHUR LINCOLN.

"A Solution of the Problem of Determining the Economic Size of Pipe for High-Pressure Water-Power Installations." LIX, 173.

"Additional Information on the Durability of Wooden Stave Pipe." LVIII, 65.

65. Effects of San Francisco earthquake on engineering constructions. LIX,

245, 285, Efficiency of centrifugal pumps, LVI,

Flow of water in Ogden, Utah, pipe line.

XL, 542.
Flow of water in 28 to 42-in, pipes.
XXVI, 212.
Hydraulic power plants. LV, 254.
Memoir of, LXXVII, 1831.
Memoir of, LXXVIII, 1831.

Power plant at Ogden, Utah. XXXVIII,

"Stave Pipe — Its Economic Design and the Economy of its Use." XLI, 27. "The Astoria (Oregon) City Water-The Astoria (Oregon) Works." XXXVI, 1.

The valuation of public service property. LXXII, 281.

Water-works valuation. XXXVIII, 165.

ADAMS. E. T.

Centrifugal pumps and fans. LI, 231.

ADAMS, HENRY C.

The valuation of public service property. LXXII, 196.

ADAMS, JULIUS W.

Inter-oceanic canal projects. IX, 59. Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122 (1875).

Teredo Navalis, or ship-worm. III, 170.

ADENEY, W. E.

Absorption of oxygen. LXXVI, 1637.

ADGATE, GEORGE.

Memoir of. LXV, 514.

AFRICA, JAMES MURRAY, Memoir of, LXXXIII, 2139.

AGNEW, AUGUSTUS WATEROUS.

Memoir of, LXXXI, 1792.

AGRAMONTE, A. A. "The Picaza Bridge." LXXX, 200.

AIKEN, W. A.

"Tests of Cement." LIV, Part F, 37, 53.

The the engineer and the inspection of work. LVI, 134.

AIMS, WALTON I.

Caisson disease and its prevention. LXV,

AINSWORTH, DANFORTH HURLBUT,

Memoir of. LIV, 522 Railroad location. XXXI, 95.

ALBERTSON, CHARLES.

Nagasaki graving dock. LVI, 87.

ALDEN, CHARLES A.

Transition curves. XLVI, 398.

ALDEN, JOHN FERRIS.

Memoir of. LXXXI, 1674.

ALDRICH, J. FRANK.

Physical valuation of railroads, LXXVII,

ALDRICH, JAMES COLWELL,

Memoir of, XLV, 617.

ALDRICH, WILLIAM S.

Flow of water in irrigation channels. LXXX, 1683.

ALEXANDER, B. S.

"Minot's Ledge Lighthouse." VIII, 83.

ALEXANDER, EDWARD PORTER. Memoir of. LXXXIII, 2414.

ALLAIRE, ALEXANDER.

"The Failure and Righting of a Million-Bushel Grain Elevator." LXXX, 799.

ALLAN, A. G.

"Some Railway Construction in Oklaho-ma." LI, 424.

ALLANSON-WINN, R. G.

"The Protection and Improvement of Foreshores by the Utilization of Tidal and Wave Action." L, 66.

ALLARDT, G. F.

Single jetty harbor improvement. XXXVI, 125.

ALLEN, ANDREWS.

Precarious engineering expedients. LXVII, 52.

ALLEN, C. FRANK.

Cylindrical wheels and flat topped rails for railways. XXI, 189. Inspection and maintenance of railway structures. XVII, 307.

ALLEN, C. M.

Modern hydraulic turbines. LXVI. 354. Use and care of the current meter. LXVI,

ALLEN, CHARES A.

"Sewage Disposal." XVIII, 8.

ALLEN, CHARLES T.

Preservation of the Falls of St. Anthony. XII, 407.

ALLEN, HERMON CHARLES. Memoir of. LXXXIII, 2141.

ALLEN, HORATIO.

Inter-oceanic canal projects. IX, 97, Rails. III, 109.

ALLEN, J. LEE

Water-proofing railroad bridge floors. LXXIX, 342.

ALLEN, JAMES P.

Rapid methods in topographical surveying. XI, 405.

ALLEN, KENNETH

Concrete tunnel lining. XXXI, 315, Determination of storm-water run-off. LXXVIII, 1165. unning's Dam, Dunning's Dam, near Scranton, Pa. XXXII, 411.

External corrosion of cast-iron pipe.

LXXVIII, 863.

Ground-water in sewers. LXXVI, 1919. High masonry dams. XXXIV, 512. Investigations of fuels. LXX, 300.

Maximum rates of rainfall. LIV, 181.

Prevention LXXVI, 776. breeding. of mosquito

Railroad location. XXXI. 107.
Railroad water supply. LXX, 186.
Sewage and wastes disposal for the U. S. Army. LXXXIII, 359.
Stadia topographic surveys. XLIV, 113.

Stream contamination and sewage purifi-

Stream contamination and sewage purifi-cation. XLII, 169.
Submerged pipe work, Portland, Ore. LXXVIII, 1330.
"The Clarification of Sewage by Fine Screens." LXXVIII, 880.
The separate sewer system without auto-matic flush tanks. XXXIV, 228.
The sewer system of San Francisco. LXV 400

LXV, 400. Theory and

Theory and practice of special assesments. XXXVIII, 407.

Tidal phenomena in New York Harbor.
LXXVI, 2099.

Topographic surveys. XXX, 612.

Topography on the survey of the Mexter Harbor.

ico - United States boundary. XXXIV,

ranslation of paper by H. Engels. Translation

Translation of paper by J. Fülscher. XXX, 421.

Water-works pumping engines. LXXIV. 36.

Water-works valuation. XXXVIII, 150. Yield of underground reservoirs. LXXVIII, 239.

ALLEN, LESLIE H.

Agreements for building contracts. LXVII, 520.

ALLEN, THEODORE.

"Apparatus for Obtaining Borings by Direct Pressure." II, 33. Early history of railways. II, 60.
"Iron Hulls for Western River Steamboats." II, 271.

ATTEN. WALTER HINDS. Engineering education. LXXV, 1118.

ALLEN, WILLIAM ALBERT. Memoir of. XXXVI, 539.

ALLEN, WILLIAM FREDERICK. Memoir of. LXXX, 2244.

ALLISON, J. C.

"Control of the Colorado River as Re-lated to the Protection of Imperial Valley." LXXXI, 297..

ALVORD, JOHN W.

"Fundamental Principles of Public Util-ity Valuation." LXXIX, 117. Sewerage disposal, LIV, Part E, 242:

also, LVII, 126,
"The Depreciation of Public Utility Properties as Affecting Their Valuation and Fair Return." LXXVII, 788.
"The Going Value of Water-Works." LXXIII. 326.

AMBROSE, W. C.

"The Use of Asphaltum in Building Sea Walls." XXIV, 223.

AMES, THALES L.

"Ammunition for Cannon." LIV, Part B, 283.

AMMANN, O. H.

Revision of Niagara Railway
Bridge, LXXXIII, 2000. Arch

Stress measurements, Hell Gate Arch.
LXXXII, 1106.
"The Hell Gate Arch Bridge and Approaches of the New York Connecting Railroad Over the East River in New York City." LXXXII, 852.

ANDERSON, GEORGE GRAY.

Irrigation, XVI, 108; also, LXII, 1, 53.
"The Effect of Alkali on Concrete."
LXVII, 572.

ANDERSON, J. T. NOBLE.

Electric railways. LIX, 334. Peustock and surge-tank problem LXXIX, 288. Pressures in penstocks. LXXXIII, 764. Water supplies. LIX, 389. problems.

ANDERSON, LATHAM.

Availability of the cañons of the Colorado for railway purposes. XXVI, 349. Controverted questions in road construc-

Controverted dustrious in road construc-tion. XXVIII, 91.

Designing and erection of the Oakley Arch. XXIII, 179.

"The Single Trap System of House Drainage." XXV, 394.

ANDREWS, CARL B.

Nomographic solutions for formulas. LXXVIII, 1382.
The hydraulic jump. LXXX, 374.

ANDREWS, DANIEL MARSHALL.

Improvement of rivers. XLIX, 323 Memoir of. LXXXII, 1669. "The Economic Improvement of the Coosa and Alabama Rivers, in Geor-gia and Alabama." L, 363.

DREWS, EDWARD R.

onstruction and maintenance of roads. VIII, 348.

"Report of the Committee on the I'reservation of Timber." Preliminary Report, XI, 325, 360 (1882); Final Report, XIV, 247 (1885).

ANDREWS, HORACE.

A concrete sewer. XXIV, 396. Influence of rails on street pavements. XXXVII, 113.

Invar (nickel-steel) tapes. LX, 245. Pavements. LIX, 346.

Review of mathematical tables. LXXXII, 759.

Separate versus general contracts. XLIX,

Spirit leveling. XXXIX, 407. Street grades and cross-sections. XLII,

Surveying instruments. XLVIII,

The marking of street lines. XXXII, 69.

ANGERER, VICTOR.

Influence of rails on street pavements. XXXVII, 102.

ANNAN, C. L.

"Street Sprinkling in St. Paul, Minn." LXXVI, 77.

ANNEAR, EDGAR HAROLD.

Memoir of. LXXXIII, 2353.

ANSLEY, GEORGE D.

Construction and maintenance of roads. VIII, 339.

ANSON, WILLIAM FREDERICK ALFRED.

Memoir of. LXXXI, 1794.

ANTHONY, CHARLES Jr.

"Automatic Modules for Regulating the Speed of Filtration." LI, 136. "Liberation of Air in Siphons." LIX,

APPLEBY, C. J.

"On Cranes as Labor-Saving Machines." XV, 369.

APPLETON, NATHAN.

Inter-oceanic canal projects. IX, 36.

APPLETON, THOMAS.

Memoir of, LXXXI, 1676.

ARANGO, RICARDO MANUEL. Memoir of. LXXVII, 1841.

ARCHBALD, JAMES.

Memoir of. LXXII, 586.
"Report of the Committee on the Proper
Relation to Each Other of the Sections of Railway Wheels and Rails."
Preliminary Report, XIX, 1 (1888);
Final Report, XXI, 223 (1889).

ARCHBOLD, W. K.

Catenary trolley construction. LXII, 185. Overhead construction for electric traction or transmission. LX, 547.

ARCHER, A. R.

Dam for Fremantle Graving Dock. LXXVI, 1971.

ARCHER, STEVENSON, Jr.

Standard levee sections. XXXIX, 215.

ARCHER, W. H.

"Experimental Determination of Loss of Head Due to Sudden Enlargement in Circular Pipes." LXXVI, 999.

ARCHER, WILLIAM.

Memoir of. LXXXIII, 2143.

ARCHIBALD, PETER SUTHER.

Bridge substructure and foundations in Nova Scotia. XXX, 574. Memoir of. LXXVI, 2199.

ARMSTRONG, ALEXANDER F.

Road construction and maintenance: Preliminary Investigations. LXXIII, 10. Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 89.

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 577.

ARMSTRONG, JAMES W.

Washing rapid sand filters. LXXX, 1423.

ARNODIN, F.

Nickel steel for bridges. LXIII, 366.

ARNOLD, WILLIAM HARRY.

Memoir of. LXXXI, 1679.

AROZARENA, RAFAEL M. DE

"The Guadalajara Electric-Light Installation, Utilizing the Famous Juanacat-lán Water-Falls, 28 Km. Distant from Guadalajara." XXIX, 689.

ARTHUR, HOWARD ELMER.

Mempir of. LXXVII, 1843.

ARTHUR, WILLIAM.

"An Automatic or Governor Cut-off for Steam Engines." 11, 81.

ARTINGSTALL, SAMUEL G.

Painting of iron structures. XXXIII, 537.

ASH, L. R.

Trafficway viaduct, Kansas City, Mo. LXXX, 563.

ASHTON, H. T.

Ordnance, LIV, Part B, 391.

ASPINWALL, THOMAS.

Memoir of, LXXXIII, 2144.

ASPINWALL, WILLIAM HOWLAND. Memoir of. XXXVI, 598.

ASSERSON, P. C.

Dry docks - stone vs. wood, XLI, 581.

ATKINSON, JOHN BOND.

Memoir of. LXXIV, 492.

ATTERBURY, CHARLES DE LA PLANE. Memoir of. LXXVI, 2252.

ATWOOD, JOHN ABIEL.

Memoir of. LXXXIII, 2145.

ATWOOD, THOMAS C.
Movable weir dams. LXXVI, 130. The Yuba River debris barrier. LXXI, 231. Yale Bowl. LXXXI, 280.

AUCHINCLOSS, W. S.

"Averaging Machine." XI, 121. "Exponent of the Principle of Moments." X, 135. Journal friction. XIII, 447.

AURYANSEN, F.

Water-proofing LXXIX, 356. railroad bridge floors.

AUS, GUNVALD.

Structural design of buildings. LIV, 435.

AUSTIN, F. W.

Sanitation of construction camps. LXXVI, 514.

AVERILL, F. L.

Ninety-sixth Street Power Station. XLIV, 143.

AYCRIGG, WM. A.

Combination bridges. XXVIII, 44.

AYLETT, PHILIP.

Design of concrete bridges. LXXVII, 721.Reilroad bridges. LXI, 275.

Notes on tunnel lining. LXXXIII, 1875.

Railroad bridge accidents. XLV, 451.

BABB, CYRUS C.

Black Eagle Falls Dam, Great Falls, Montana. XXVII, 67. Floods and flood prevention. LXXXI,

"Rainfall and River-Flow."

323. "The Hydrography of the Potomac Basin." XXVII, 21.

BABCOCK, W. J.

Effect of depth upon artificial waterways, XXXV, 36,

BABCOCK, WILLIAM S.

Water-proofing railroad bridge floors, LXXIX, 339.

BACHE, ALEXANDER DALLAS.

Memoir of. XXXVI, 522.

BACLE, L.

"Tests of Steel." (Translated from the French by Paul A. Seurot.) LIV, Part F, 55.

BACON, GEORGE M.

Designing an earth dam. LXXXI, 47.

BACOT, WILLIAM SINCLAIR.

Controverted questions in road construc-tion. XXVIII, 116. Memoir of. LXXXII, 1671.

BAIER, JULIUS.

"Wind Pressures in the St. Louis Torwind Pressures in the St. Louis formado, with Special Reference to the Necessity of Wind Bracing for High Buildings." XXXVII, 221.

BAILEY, E. H. S.

Strength and weathering qualities of roofing slates. XXXII, 542.

BAILEY, GEORGE IRVING.

Albany Filtration Plant. XLIII, 296. Lawrence, Mass., Filter. XLVI, 320. Memoir of. LXI, 556.

BAILY, THOMAS CHALKLEY JAMES, Jr. Memoir of. LXXVI, 2201.

BAIRD, HOWARD C.

Tornadoes and wind bracing for high buildings. XXXVII, 296.

BAKENHUS, R. E.

"Tests of Concrete Specimens in Sea Water, at Boston Navy Yard." LXXXI, 645.

BAKER, Sir BENJAMIN.

Continuous superstructure of the Memphis Bridge. XXX, 561.
Manufacture and testing of Portland cement. XXX, 603.
Niagara Cantilever Bridge. XIV, 571.

BAKER, HOLLAND WILLIAMS. Memoir of. LXXXIII, 2147.

BAKER, IRA O.

Counterstresses in bridges. XL11, 555. Maintenance of macadam and other roads. LXI, 472.

The manufacture of brick, XVIII, 308, Theory of concrete, XLII, 132.

BAKER, J. T.

"The Merrimack Manufacturing Com-pany's Chimney, at Lowell, Mass."

BAKER, M. N.

Disposal of municipal refuse. LIV, Part

E, 326. Sanitary disposal of refuse. L, 141. Sewage disposal. LIV, Part E, 208.

BAKER, MARCUS.

Topographic surveys. XXX, 619.

BAKER, SHIRLEY.

Durability of wooden stave pipe. LVIII,

BAKER, W. S. G.

Cylindrical wheels and flat topped rails

for railways. XXI, 162. Proper relation to each other of the sections of railway wheels and rails. XXI, 249.

BALDWIN, A. S.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track," LXXXIII, 1409.

DALDWIN, HENRY FURLONG.

Memoir of, LXVII, 621.

BALDWIN, W. II.

Dunning's Dam, near Scranton, Pa. XXXII, 410.

BALDWIN, WARD.

Loadings for railway bridges, XXX,

Preservation of railway ties, XLV, 541, Railway bridge designing, XXVI, 256, "Stresses in Railway Bridges on Cur-ves." XXV, 459. Train loadings for bridges, XXX1, 193,

BALDWIN, WILLIAM J.

Electricity vs. steam for branch rail-roads. XLH, 382. Sanitary disposal of refuse. L, 131. steam heating. XXIV, 218.

"Tests of Condensation in Cast-Iron Radiators." XXXII, 34. Water supplies. LIX, 388.

BALDWIN-WISEMAN, W. R.

Action of water under dams, LXXX, 465.

BALL, CHARLES B.

Sanitary disposal of refuse. L, 133.

CALL, ERNEST STEARNS. Memoir of, LXVI, 510,

BAMFORD, WILLIAM BROKAW.

"Agreements for Building Contracts." LXVII, 438.

Appraisal of public service properties. LXXV, 844.

BARBER, CLARENCE M.

"Carbon and its Uses in Electrical Engineering." XXIX, 680.

BARBER, F. M.

Properties of steel: Its use in structures and heavy guns. XVI, 328,

BARBOUR, F. A.

Sewage disposal. LIV, Part E, 253. Washing rapid sand filters. LXXX, 1411.

BARKER, LOUIS II.

"The New York Tunnel Extension of the Pennsylvania Railroad. side Yard." LXIX, 132. Railroad. The Sunny-

BARLOW, J. Q.

Availability of the cañons of the Colorado for railway purposes. XXVI, 349. Railroad location. XXXI, 103.

BARNARD, EDWARD C.

"Surveying." LIV, Part B, 419.

BARNARD, JOHN F.

Excessive rainfalls, XXV, 111.

BARNARD, JOHN G.

"Experiments on the Front or Shield of the Experimental Casemate at Fort Mourge" 1 172 Monroe." I, 173. Flexure of beams, III, 53.

Improvement of the mouth of the Mississippi River. V. 286.

"Lighthouse Engineering as Displayed at the Centennial Exhibition." VIII, 55. "Remarks on the Causes of Fall of the Western Arched Approach to the South Street Bridge, Philadelphia." IX, 319. "Resistance of Beams to Flexure." 111,

123; IV, 283. "The Delta of the Mississippi, Considered in Relation to an 'Open River Mouth.' IV, 104.

BARNES, DAVID L.

"Distinctive Features and Advantages of American Locomotive Practice," XX1X,

Memoir of, XLL 618. Train loadings for bridges, XXXI, 211,

BARNES, JAMES,

Memoir of, XXXVI, 540.

BARNES, M. G.

Design of masonry dams, LXXV, 157.

BARNES, OLIVER W.

Proper relation to each other of the sections of railway wheels and rails. XXI, 249.

BARNES, T. HOWARD.

"The Reinforced Concrete Wharf of the United Fruit Company at Bocas del Toro, Panama." LXVI, 287.

BARNEY, W. J.

Reinforced concrete docks. LXXVIII, 1113.

BARRETT, J. P.

Electric lighting. XXVI, 438.

BARRIGER, JOHN WALKER, Jr. Memoir of. LVI, 477.

BARRINGTON, EDWARD.

Electric motive power for suburban traffic. XXXVII, 183,

BARROWS, H. K.

Floods and flood prevention. LXXXI. 1282.

Highway construction. LIV, Part F, 176.

Rainfall and stream flow. LIX, 499. Surveying. LIV, Part B, 459. Use and care of the current meter. LXVI, 108.

BARTOCCINI, A.

Design of tunnel approaches. LXIX, 396. Investigations of mine accidents. LXX, 312.

BARTON, GEORGE F.

"A Graphical Method for the Solution of Stresses in the Continuous Girder, as Applied to Draw-Bridges." XLVIII,

BASAVE, E. PRIETO.

"Railroads in the Republic of Mexico in 1893." (Translated from the Span-ish by Foster Crowell.) XXIX, 357.

BASSELL, BURR.

Lake Cheesman Dam and Reservoir. LII, 137.

BASSETT, CARROL PH.

"Inland Sewage Disposal, with Special Reference to the East Orange, N. J., Works." XXV, 125.

BATERDEN, J. R.

Floating dry docks. LVIII, 152. Pearl Harbor Dry Dock. LXXX, 326.

BATES, C. J.

Electric motive power for suburban traf-fic. XXXVII, 180. Right of way for railroads. XXV, 324.

BATES, ONWARD.

Cylindrical wheels and flat topped rails for railways. XXI, 193. Grand River Bridge reconstruction.

XXXVI, 356.

Life of iron railroad bridges. XXXIV, 312.

"Pine Stringers and Floor-Beams for Bridges." XXIII, 261. Presidential Address at the 41st Annual

Convention, Brotton Woods, New Hampshire, July 6th, 1909. LXIV, 567. Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 267.

BATES, PHILO H.

Effect of alkali on concrete. LXVII, 608.

BAUER, L. A. "Surveying." LIV, Part B, 399.

BAUM, F. G.

Contracts: "Cost plus" and other forms. LXXXIII, 821.

Necaxa light and power plant. LVIII,

Size of high-pressure water-power pipe.

LIX, 193.
Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 142.

BAYLEY, G. W. R.

"Levees, as a System for Reclaiming Lowlands." V, 115, 311. "Teredo Navalis, or Ship-Worm." III,

BAZIN, HENRY.

Flow of water in pipes. XLVII, 244.

BEACH, LANSING H.

Pavements. LIX, 349.

BEAHAN, WILLIARD. The engineer and the inspection of work.

LVI, 131.

"The Main Relief Sewer of Brooklyn."

XXVI, 484, 509; XXVII, 97.

BEARD, E. J.

Railroad Iocation. LII, 505.

BEARDSLEY, R. C.
Dams on sand foundations. LXXIII, 203.

BEATTY, P. A.

"Construction of a High-Service Reservoir at Baltimore, Md." LXXVI, 92.

BEATY, R. E.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1144.

BECHMANN, M.

"Purification of Water for Domestic Use: French Practice." (Translated from the French by Allen Hazen.) LIV,

French Practice." (Translated from the French by Allen Hazen.) LIV, Part D, 183, 255. "Sewage Disposal in France." (Trans-lated from the French by George W. Fuller.) LIV, Part E, 195.

BECKER, M. J.

Cause and prevention of decay of building stone. XV, 705.
Cylindrical wheels and flat topped rails for railways. XXI, 154.
Designing and erection of the Oakley Arch. XXIII, 188.

Destruction of rails by excessive weights.

Destruction of rails by excessive weights. XX, 128.

English and American railroads compared. XV. 745.

Memoir of. XXXVII, 555.

Presidential Address at the Annual Convention at Seabright, N. J., June 21st, 1889. XX, 233.

Proper relation to each other of the sections of railway wheels and rails. XXI 247

XXI, 247.

Properties of steel: Its use in structures and heavy guns. XVI, 361.
"Reconstruction and Enlargement of

Cork Run Tunnel on the Pittsburgh, Cincinnati & St. Louis Railway, 1870-73." VI, 1,

BECKER, M. J .- (Continued).

Relation of wheels to frog points and to guard rails. XXXI, 518. "Report of the Committee on the Cause

of the Failure of the South Fork Dam. XXIV, 431 (1891).

"The Incline Plane Railroad at Madison, Ind. Its History and Operation." VII, 68.

BECKLER, E. H.

Grading contracts. LVIII, 373. Railroad location. XXXI, 100.

BECKWITH, ARTHUR.

"On the Composition of Ancient Cements and Rosendale Cements." II, 171.

BECKWITH, FRANK.

Concrete and concrete-steel. LIV, Part E, 583

BECKWITH, LEONARD F.

"Béton-Coignet, Its Fabrication and Uses." I, 93.
"Report of the Committee on a Uniform
System for Tests of Cement." XIV, 475 (1885).

BEGG, R. B. H.

Rainfall and run-off. LXXVII, 364.

BELCHER, W. E.

Painting structural steel. LXXVII, 979.

BELKNAP, MORRIS S.

"Water-Power of the Falls of the Ohio River." II, 261.

BELKNAP, W. E.

Brooklyn Elevated R. R. improvement.
XXXII, 386. Effect of alkali on concrete. LXVII, 612. Elevated railroads. XXXVII, 402. Portland cement concrete. XXXVII, 524. Transverse strength of beams as a direct LXVII, 612. function of the tensile and crushing stresses of material. XXXV, 499.

BELKNAP, WILLIAM RICHARDSON, Memoir of, LXXIX, 1494.

BELL, ALONZO CLARENCE. Memoir of. LXXXIII, 2149.

BELL, ANDREW. Memoir of. LXXVI, 2203.

BELL, FRANK F.

Wood stave pipe design. LXXXII, 470.

BELL, GEORGE JOSEPH. Memoir of. LXXIV, 495.

BELL, HENRY PURDON. Memoir of, LXXIV, 496. Nickel steel for bridges. LXIII, 302.

BELL, Sir LOWTHIAN.

Recent practice in rails. XLIV, 499.

BELL, VICTOR HUGO. Memoir of, LXXXIII, 2415.

BELLAMY, HERBERT E.

Dam for Fremantle Graving Dock. LXXVI, 1972.

East Canyon Creek Dam. LXXXIII,

Pland flows. LXXVII, 638.
Pearl Harbor Dry Dock. LXXX, 328.
Stream administration. LXXVIII, 649.

BELLINGER, L. F.

Fatigue of cement products, LI, 447. Nagasaki graving dock, LVI, 89. The naval floating dock; its advantages, design, and construction. LX, 110.

BELZNER, THEODORE.

Action of frost on cement and cement mortar. LX1V, 350. Dumbarton Bridge construction. LXXVI,

Faults in the theory of flexure. LXXV, 932.
Grouting operations. LXXXIII, 1078.
Harlem Ship Canal Bridge. LXVII, 27.
Impervious concrete. LI, 130.
Improvement of rivers. XLIX, 312.
Legitimate use of water. LV, 442.
Overloaded bridges. LVII, 262.
Preservation of materials of construction. L, 317.
Repairing bridge piers. LXXIX, 111.
Revision of Niagara Railway Arch
Bridge. LXXXIII, 2004.
Sand-blast cleaning of steel. L, 281.
The bonding of new to old concrete.
LXIV, 270. 932.

LXIV, 270.

BENDER, CHARLES.

"Application of the Theory of Contin-uous Girders to Economy in Bridge Building." V, 147. 224. "Historical Sketch of the Successive Im-provements in Suspension Bridges to the Present Time." I, 27.

BENNETT, CHARLES J.

Road construction and maintenance: Engineering organizations for highway work. LXXVII, 1092. Road construction and maintenance: maintenance: Bituminous surfaces. LXXV, 566.

BENSEL, JOHN A.

"Address at the 42d Annual Convention, Chicago, Illinois, June 21st, 1910."

"Address at the 42d Annual Convention, Chicago, Illinois, June 21st, 1910." LXX, 464.
"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.
"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." LXXXI, 1207.
"New Transfer Bridge, Harsimus Cove, Jersey City, N. J." XIX, 309.
"Observations on Dock Work in New York Harbor." LIV, Part F, 3.
"Removal of Rock 40 Ft. below Surface of Water, North River, N. Y." XXXII, 231.

BENTHAM, C.

Revision of Niagara Bridge. LXXXIII, 2002. Railway Arch

BENZENBERG, GEORGE H.

Friction, waste and loss of water in mains. XIX, 106. Purification of sewage and water by fil-tration. XXX, 706.

BENZENBERG, GEORGE IL.—(Continued).

"The Engineer as a Professional Man."
Presidential Address at the Annual
Convention in the City of Mexico, July
Sth, 1907. LVIII, 515.
The manufacture of brick. XVIII, 305.

"The Sewerage System of Milwaukee and the Milwaukee River Flushing Works." XXX, 367, 711.

BERDEAU, RAY W.

Three 15-Cubic Yard Dipper-Dredges, Gamboa, Paraiso, and Casadas, as Supplied and Used on the Panama Canal." LXXXII, 515. "The Three 15-Cubic Yard

BERESFORD, FRANK. Memoir of, XXXVI, 594.

BERG, L. DeCOPPET.

Cast iron - strength, resilience, tests and

specifications. XXII, 128.

The relative effects of frost and the sulphate of soda tests on building stones. XXXIII, 247.

BERG, WALTER G.

Foundations for heavy buildings, XXXV,

Marine wood-borers. XL, 210. Railroad freight differentials.

XLVI, 201. The strength of pillars. XXXV, 411. Three-hinged masonry arches. XL, 77.

BERGEN, VAN BRUNT. Memoir of. LXXXII, 1672.

BERGENDAHL, G. S.

Concrete and reinforced concrete. LXXXII, 1551.

BERGER, BERNT.

Bridge experiments with moving trainloads. XLI, 454. Concrete-iron highway bridges. XXXI, 469

Elevated railroads. XXXVII, 421. Memoir of. LXXXIII, 2355. Rivet spacing, etc., in plate girders. XLV, 569.

BERGER, C. L.

Spirit leveling. XXXIX, 391.

BERNHARD, J. H.

National railroad question of to-day. LXXXIII, 958.
Rivers and railroads in the United States. LXXIX, 945.

BERRIAN, RICHARD MILFORD. Memoir of. LXII, 550.

BERTIN, L. E.

Naval architecture. LIV, Part D, 117.

BESSELIEVRE, EDMUND B.

Sewage and wastes disposal for the U. S. Army. LXXXIII, 364.

BETTS, R. T.

Pier construction in New York Harbor. LXXVII, 549.

BEUGLER, EDWIN J.

Hydro-electric power in Canada, LXV, 199.

Pier construction in New York Harbor. LXXVII, 524. BEYER, ALBERT.

Translation of paper by L. Franzius. XX1X, 173.

BEYER, ALBIN H.

Questions in reinforced concrete design. LXX, 102.

BIDDLE, WILLIAM FOSTER.

Memoir of. LXXI, 401,

BIEN. MORRIS.

State and national water laws. LXXVI, 694

BIENENFELD, A. M.

Effects of San Francisco earthquake on engineering constructions. LIX, 284.

BIENENFELD, BERNARD.

Effects of San Francisco earthquake on engineering constructions. L1X, 285. Pavements. LIX, 361.

BIETTE, L.

"Underground Railways: The Metropolitan System of Paris." Translated from the French.) LIV, Part F, 299.

BIGELOW, EDWARD MANNING. Memoir of. LXXXI, 1681.

BILYEU, CHARLES S.

Tests of concrete in sea water. LXXXI, 684

BINCKLEY, GEORGE SYDNEY.

Hydraulic-fill dams. LXXXIII, 1786. Long-time tests of Portland cement. LXXVI, 1039

Monterrey W: LXXII, 561. water-works and sewerage.

Steel stresses in flat slabs. LXXVII, 1411.

"Suggested Changes and Extension of the United States Weather Bureau Service in California: Report of a Committee of the Southern California A sociation of Members." LXXXI, 161.

BINNIE, W. J. E.

External corrosion of cast-iron pipe. LXXVIII, 869.

BIRCH-NORD, C. W.

Earth pressures and bracing. LX, 25. Memoir of. LXVI, 509. "The Design of Elevated Tanks and Stand-Pipes." LXIV, 526.

BIRRELL, THOMAS FLETCHER.

"The Railway System of New South Wales." XXIX, 326.

BISHOP, HUBERT K.

"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use. LXXXII, 1384.

"Progress Report of Special Committee on Bituminous Materials Construction." LXV1, 429. for Road

Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 70.

BISHOP, HUBERT K .- (Continued).

Road construction and maintenance: Systems of maintenance. LXXIII, 25. Road construction and maintenance: The use of water, calcium chloride, light use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIIL

BISHOP, LYMAN E.

"Economic Canal Location in Uniform Countries." LXXIV, 179.

BISHOP, THOMAS SPARKS. Memoir of. XLI, 621.

BISSELL, CLINTON S.

Concrete and reinforced concrete. LXXXII, 1564. Railroad surveys. LXV, 131.

"The Maximum Weights of Slow Freight Trains." LXIV, 303.
"The Traction of Freight Trains at Different Speeds." LXVI, 58.

BISSELL, H.

Efficiency of railroads for the transportation of freight. XII, 140.

BIXBY, G. S.

The engineer and the inspection of work. LVI, 139.

BIXBY, WILLIAM H.

Cause and prevention of decay of building stone. XV, 709.
English and American railroads compared. XV, 746.
Improvement of rivers. XIX, 259.
South Pass Jettles. XV, 255.

BLACK, R. P.

"Remedies for Landslides and Slips on the Kanawha and Michigan Railway. LXXI, 1.

BLACK, WILLIAM MURRAY.

Coffer-dam for 1000-foot pier. LXXXI, 569.

Coos Bay Harbor improvement, XLVI.

Cost keeping. LXIV, 430. Elevated tanks and stand-pipes. LXIV, 539

Improvement of rivers. XXX, 493. Improvement of the Lower Weser. XXX,

486

Jetty harbors XXVIII, 381. harbors of the Pacific Coast.

railways of the battle front.

LXXXIII, 1241.

Manufacture and te cement. XXX, 601. testing of Portland

"The Improvement of Harbors on the South Atlantic Coast of the United States." XXIX, 223; XXX, 500.

Uniform practice in pile-driving. XXVII, 165.

BLACKBURN, N. T.

Sixth Street Viaduct, Kansas City. LXV, 100

Topographicai surveys. LXXVII, 1037.

BLACKFORD, F. W.

Water supplies. LIX, 398.

BLACKMAR, ABEL E.
"Railroad Discrimination against New York, and the Remedy." XLVI, 182.

BLACKWELL, CHARLES.

Cylindrical wheels and flat-topped rails for railways. XXI, 189. Memoir of. LIX, 531. Proper relation to each other of the

sections of railway wheels and rails. XXI, 250.

BLACKWELL, F. O.

High-voltage power transmission.

Multiple-arch dams. LXXXI, 882.
"The Necaxa Plant of the Mexican Light and I'ower Company." LVIII, 37.

BLACKWELL, PAUL A.

conomics of LXXXIII, 42. steel arch bridges. Economics

BLAIR, WILL P.

Road construction and maintenance: Drainage and foundations. LXXV, 526. Road construction and maintenance: Filfor brick and block pavements. lers LXXV, 540.

ANTHONY HOUGH-BLAISDELL, TALING.

Memoir of. LVI, 464.

BLAKELEY, GEORGE H.

Brooklyn Elevated R. R. improvement. XXXII, 384.

Early practice XXXVII, 9. in bridge building.

AXAVII, 9. Eye-bar tests. XXXI, 424. Railway bridge designing. XXVI, 258. Structural design of buildings. LIV, 454. "The Weehawken Elevators and Viaduct." XXVII, 1. Train loadings for bridges. XXXI, 185.

BLANCHARD, ARTHUR H.

Engineering education. LXXV, 1122. "Final Report of the Special Committee on Materials for Road Construction and Standards for Their Test and Use.

"Progress

on Standards for Their Test and Use."
LXXXII, 1384.
Maintenance of macadam and other
roads. LXI, 445, 489
Progress Report of Special Committee
on Bituminous Materials for Road
Construction." LXVI, 429.
Road construction and maintenance:
Bituminous surfaces. LXXV, 554.
Road construction and maintenance:

Cement-concrete pavements. LXXVII,

119.

oad construction and maintenance: Cost records and reports. LXXVII, Road

Road construction and maintenance: Design of highway systems. LXXVII, 170.

maintenance: construction and Drainage and foundations. LXXV, 524.
Road construction and maintenance:
Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1164.
Road construction and maintenance: Road

Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 200.
Road construction and maintenance:

Fillers for brick and block pavements. LXXV, 544.

Road Preliminary investigations, LXXIII, 7. BLANCHARD, ARTHUR H .- (Continued). Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII. 56

Road construction and maintenance:
The use of bituminous materials by mixing methods. LXXIII, 99, 134.
Road construction and maintenance:
Use of bituminous material in penetration and mixing methods. LXXV,

Sampittic surfacing. LXIV, 363.
Sand-clay mixtures for road surfacing.
LXXVII, 1484.

Street sprinkling. LXXVI, 88.

Water-bound macadam roads. LXXVI, 994.

BLAND, J. C.

Railway bridge designing. XXVI, 232. Train loadings for bridges. XXXI, 194.

BLATCH, NORA STANTON.

Water filtration at Washington, D. C. LVII, 400.

BLEICH, SAMUEL D.

Determination of storm-water run-off. LXXVIII, 1183.

BLICKENSDERFER, JACOB.

Excessive rainfalls. XXV, 113.

BLIGH, W. G.

Designing an earth dam, LXXXI, 25.

BLISS, HENRY ISAAC.

Memoir of. XXXVI, 541.

BLUNDEN, HENRY D.

Memoir of, XXXVI, 542.
"On the Care and Maintenance of Iron Bridges." XI, 418.

BOARDMAN, CHARLES S.

Coffer-dam for 1000-foot pier. LXXXI,

BOECKLIN, WERNER.

Freezing as an aid to excavation. LII, 443.

Ninety-Sixth Street Power Station. XLIV, 146.

BOES, FRANK C.

Depreciation of public utility properties. LXXVII, 807.

BOGART, JAMES PETER.

Memoir of, LII, 545.

BOGART, JOHN.

"American Engineering at the Paris Exposition of 1878." (Report of the Committee on the Exhibition made by this Society.) VII, 317.
Commercial cities: The law of their birth and growth. XIV, 28.
Concrete-iron highway bridges. XXXI, 478.

Concrete tunnel lining. XXXI, 317.

Construction and maintenance of roads. VIII, 368.

Effect of freezing on cement-mortar. XVI,

English and American railroads compared. XV, 749.
Improvement of James River, Va.

XXVIII, 448.

Inter-oceanic canal projects. IX, 157. Rainfall and river-flow. XXVII, 339. Report of the Committee on "Cost and Work of Pumping Engines." IV, 142 IV, 142 (1875).

Sewerage of Memphis. X, 43. Subaqueous foundations. XXIV, 240.

Tests of cement. IX. 346.
The Holland dikes. XXVI, 690
The manufacture of brick. XV The Holland dikes. XXVI, 630.
The manufacture of brick. XVIII, 305.
"The Permanent Way of Railways in
Great Britain and Ireland, with Especial Reference to the Use of Timber
Preserved and Unpreserved." VIII, 17.

he water-works of Syracuse, N. XXXIV, 58.

Tuberculation in water pipes. XXVIII, 259

Underpinning XXXVII, 46. of heavy buildings. Wind bracing in high buildings. XXVII, 242.

BOGGS, E. M.

Effects of San Francisco earthquake engineering constructions. LIX, 258.

BOGGS, J. I.

"Heavy Railway Construction in Wyo-ming." XLVI, 1.

Preservation of railroad ties. XLII, 348, "Some Peculiar Railroad Bridge Accidents." XLV, 446.

Timber preservation. XLIV, 203. Transition curves. XLVI, 396.

BOGUE, V. G.

Brooklyn Elevated R. R. improvement. XXXII, 383. Erection of the Verrugas Bridge. V,

Proper relation to each other of the sections of railway wheels and rails. XXI, 250.

"Report of Rail S the Committee on Standard Rail Sections." Progress Report, XXIV. 1 (1891); Final Report, XXVIII, 425 (1893).

Timber preservation. XLIV, 198.

BOHM. ---.

Disposal of municipal refuse. LIV, Part E, 335.

BOLLER, ALFRED P.

Cements, mortars and concretes. XXV, 290.

"Central Avenue Bridge, at Newark,

New Jersey." II, 379.
"Description of the New Wrought-Iron Bridge at Bridgeport, Ct." I, 317.
Dry docks—stone rs. wood. XLI, 592.
Elevated railroads. XXXVII, 388.

Enlargement of the Erie Canal. XIV.

Failure of the Ashtabula Bridge. VI, 199.

Failure of the Ashtabula Bridge. VI, 199. Flexure of beams. III, 48 Inland sewage disposal. XXV, 148. "On the Mode of Underpinning Adopted for the Croton Lake Bridge, N. Y. C. & N. R. R., during the Repairs to the Masonry Piers." XI, 150. Painting of iron structures. XXXIII, 531

"Progress Report of Special Committee on Steel Columns and Struts." LXVI, 401

Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122 (1875).

BOLLER, ALFRED P .- (Continued).

"Some Notes on Foundation Experiences." XXVII, 471.
South Pass Jetties. XV, 232.

South Pass Jetties. XV, 232.
Specifications for strength of iron bridges. XV, 453.
Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 268.
"Test of a Wrought-Iron Double Track Floor Beam." XVIII, 119.
Tests of bridge irons. II, 225.
The American railroad viaduct. XXV, 362.

BOLLER, ALFRED P. Jr.

"Experimental Determination of Rolling Friction in Operating the Draw of the Thames River Bridge, together with Method for Determining Power to Operate Draw-Bridges." XXV,

BOLTON, CHANNING M.

"Emergencies on Railroads." XXVII.

BOLTON, REGINALD PELHAM.

Height of buildings. XLIV, 454. Modern office buildings. XLVIII, 29. Passenger elevators. LIV, Part B, 187. "The Operation of Passenger Elevators." LXIV, 231.

Ventilation of tunnels. LVII, 243.

West est Side LXXV, 284. Manhattan water-front.

BOND, EDWARD A.

Shall civil engineering practice be regulated by law? XLVI, 139.

BOND, FREDERICK WINN.

Memoir of. LI, 452.

BONNETT, LOUIS B.

"Test of Power Required to Drive Electric Street Cars, and Total Efficiency of Motor." XXVII, 307, 675.

BONTECOU, DANIEL.

"Notes on Cost of Operating Cable Railways." XXVIII, 250, 461.
Painting of iron structures. XXXIII, 550.
Sixth Street Viaduct, Kansas City.
LXV, 95.

Transmission of power in cable railways. XXX, 550. operating

BONZANO, ADOLPHUS.

"Experiments upon Phænix Columns." XI, 1. Memoir of. LXXVII, 1845.

BONZANO, M. F.

Lateral earth pressures, LIII, 305.

BOORMAN, K. M.

Cinder concrete LXX1X, 622. floor construction.

Water supply for camps, cantonments, etc. LXXXIII, 524.

BOORMAN, T. HUGH.

Cinder concrete LXXIX, 622. floor construction.

Road construction and maintenance: Equipment and methods for maintaining bituminous surfaces and bitumin-

ous pavements. LXXVII, 1177. Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 647.

BOOTH, GEORGE W.

The automatic volumeter. LXXX, 590.

BOOTH, L. M.

Purification of water for the production of steam. LIV, Part A, 35.

BOOTH, WILLIAM H.

Hot-bath tests for cements. XXXII, 339. Sanitary disposal of refuse. L, 151. "Stresses in Bridges." XX, 137.

BORING, WILLIAM A.

Agreements for building contracts. LXVII, 486.

BOSLEY, WILLIAM B.

Depreciation as an element in appraisal. LXXIX, 827.

BOUCHER, WILLIAM J.

Appraisal of public service properties. LXXV, 854. Canadian Niagara power plant. LXII,

241.

Electric railways in the Ohio Valley. LXIII, 98.

Engineering education. LXXV, 1113. External corrosion of cast-iron plpe. LXXVIII, 868.

Oil-mixed mortars and concretes. LXXVI, 1107

Operation of passenger elevators. LXIV, 243.

Railway development in the United

States. LXXIV, 140.
Sixth Avenue Subway, Huds hattan R. R. LXXVI, 68.
Street railway track co.
LXXVI, 475. Hudson & Manconstruction.

Valuation of land. LXXXI, 631.
Water supply for camps, cantonments, etc. LXXXIII, 526.
Wood stave pipe design. LXXXII, 481.

BOURDRER, J. J. L.

"Concrete and Concrete-Steel in Holland." LIV, Part E, 507.

BOUSCAREN, L. G. F.

Cylindrical wheels and flat-topped rails for railways. XXI, 170.
Elevated railroads. XXXVII, 372.

Energish and American railroads compared. XV, 753, High masonry dams. XIX, 181. Inspection and maintenance of railway structures. XVII, 271. Memoir of. LIX, 533. Painting of iron structures. XXXIII,

Proper relation to each other of the

reper relation to each other of the sections of railway wheels and rails. XXI, 251.
Railway bridge designing. XXVI, 174.
"Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1892).

425 (1893).
"Report of the Committee on the Preservation of Timber." Preliminary Report, XI, 325 (1882); Final Report, XIV, 247 (1885).

BOUSCAREN, L. G. F .- (Continued).

'Restoration of the Cable Ends of the

"Restoration of the Cable Ends of the Covington and Cincinnati Suspension Bridge." XXVIII, 47, 369.

Specifications for strength of iron bridges. XV, 427.

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 274.

Suspension bridges. XXXVI, 462.
Testing machines. XVI, 12.
The American railroad viaduct. XXV, 360.
"The Strength of Wrought-Iron Columns." IX, 447; XI, 62.
Uniform practice in pile-driving. XXVII,

Uniform practice in pile-driving. XXVII,

163.

Wind pressure upon bridges. X, 154.

BOUTON, HAROLD.

Engineering education. LVII, 149. Grading contracts. LVIII, 381.

BOVYER, WILLIAM BLAIR. Memoir of. LXXXIII, 2357.

BOWDITCH, E. W.

"Report of the Committee on the Preservation of Timber." Preliminary Report, XI, 325 (1882); Final Report, port, XI, 325 XIV, 247 (1885).

BOWEN, EDWARD R.

Cement joints for cast-iron water mains. LXXXIII, 302.

BOWEN, S. W.

Bridge and subway specifications. LXXV, 353

Design of concrete bridges. LXXVII. 709.

"The Design and Construction of Four Reinforced Concrete Viadnets at Fort Worth, Texas." LXXVIII, 1206.

BOWEN, WALTER COX.

Memoir of. LXXX, 2255.

BOWIE, C. P.

Concrete-lined oil-storage reservoirs. LXXX, 715. External corrosion of cast-iron pipe.

LXXVIII, 857.

BOWLES, FRANCIS T.

Dry docks — stone vs. wood. XLI, 591. Protection of steel and aluminum ex-posed to sea water. XXXVI, 494.

BOWLUS, FRED D.

Physiography of water-sheds and chan-nels. LXXXIII, 1143.

BOWMAN, ARTHUR M. Movable dams. XXXIX, 601.

BOWMAN, AUSTIN LORD.

Bridge substructure, and concrete work.

LXI, 384.

Memoir of. LXXXIII, 2150.

"Progress Report of Special Committee on Steel Columns and Struts." LXVI,

BOWMAN, DANIEL WHEELER. Memoir of. LXXXI, 1684.

BOWMAN, W. L.

LXVII, 491. Agreements building contracts.

BOWSER, E. H.

Creosoting timber. LVI, 18.

BOX, EDWARD.

Floating dry docks. LVIII, 168. Pearl Harbor Dry Dock. LXXX, 329.

BOYD, JAMES C.

Bridge substructure, and concrete work. LXI, 385.

BOYLE, OLIN McCLINTOCK, Jr. Memoir of. LXIV, 591.

BOYNTON, ROBERT HAMMOND. Memoir of. LXXXI, 1796.

BRACE, JAMES H.

Bridge substructure, and concrete work.
LXI, 383.

"Freezing as an Aid to Excavation in Unstable Material." LII, 365.

"The New York Tunnel Extension of the Pennsylvania Railroad. The Cross-Town Tunnels." LXVIII, 391.

"The New York Tunnel Extension of the Pennsylvania Railroad. The East River Tunnels." LXVIII, 419.

BRACKETT, DEXTER.

"Consumption and Waste of Water." "Consumption XXXIV, 185. Memoir of, LXXX, 2109. two 36-in.

Moving two 36-in. water mains.

XXXIV, 538.

Tuberculation in water pipes. XXVIII,

268.

Water consumption and restriction of waste. XLVI, 440.

BRADBURY, E. G.

Ground-water in sewers. LXXVI, 1931.

BRADLEY, C. W.

Railway signaling. XXVIII, 290.

BRADLEY, W. H.

Astoria Gas Tunnel. LXXX, 681.

BRAINARD, A. S.

Road construction and maintenance: Bituminous surfaces. LXXV, 566.

BRAINARD, HENRY A. Irrigation. XVI, 119.

BRAINARD, OWEN. Memoir of. LXXXIII, 2154.

BRANNE, J. S.

"Economy in Rectangular Panels, Using Beams of Constant Cross-Section." LXXIV, 166.

Precarious engineering expedients. LXVII, 50. Strength of columns. LXXVI, 294. Tests of large steel columns. LXXIII, 457.

Underpinning **Tr**inity Vestry Building. LXXXI, 109.

BRANNER, JOHN C.

"Geology in its Relation to Topography." XXXIX, 53.

BRAUNE, G. M.

Design of masonry dams. LXXV, 146. Earth pressures. LXXXI. 216. Niagara Railway Arch. XL. 166.

BRAUNWORTH, P. L.

"Fountain Flow of Water in Vertical Pipes." LVII, 265. Pipes."

BREBNER, ALAN.

Lighthouses and other aids to navigation, LIV, Part B, 78.

BRECKINRIDGE, CABELL.

Memoir of. LXV, 529.

BREED, H. ELTINGE.

American highways. LXXXIII, 556.

BREITHAUPT, WILLIAM H.

Bridge painting. XXXIX, 38. Hell Gate Arch Bridge. LXXXII, 1005. Motive power for street railways. XXVII, 582.

Nickel steel for bridges. LXIII, 339, Railway bridge designing. XXVI, 215. Red Rock Cantilever Bridge. XXV, 722. Rolling friction of draw-bridges. XXV, 659.

Suspension bridges. XXXVI, 437. The Launhardt formula and bridge spec-ifications. XLI, 166. "The Sibley Bridge." XXI, 97, 612.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 493.
Wind bracing in high buildings. XXXIII, 220.

BREMNER, G. H.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

BRENDLINGER, P. F.

Brooklyn Elevated R. R. improvement. XXXII, 384.
Cause of failure of South Fork Dam. XXIV, 461.

Concrete tunnel lining. XXXI, 311 Construction of railway tracks. XXV,

Cost of operating cable railways. XXVIII,

456.

Design and erection of the Oakley Arch. XXIII, 182.
Failure of a masonry pier and a rock foundation. XXXI, 584.

foundation. XNXI, 584.
Notes on a mountain slide. XXIV, 562.
Railroad location. XXXI, 118.
Reconstruction of substructure of the Johnsonville Bridge. XXXI, 602.
Right of way for railroads. XXV, 324.
Stability of bench marks. XX, 76.
Ventilation of tunnels. LIV, Part 1776.

BRENEMAN, A. A.

576.

Bacteria and other organisms in water. XXXIII, 447.

BRERÉTON, CUTHBERT A. "Dry Docks." LIV, Part F. 379.

BRERETON, THOMAS J.

Proper relation to each other of the sections of railway wheels and rails. XXI, 252.

BREUCHAUD, JULES.

A new type of masonry dam. XLIX,

109.
"The Underpinning of Heavy Buildings."

BREWER, BERTRAM.

Road construction and maintenance: Design of highway systems. LXXVII, 162.

BRIDGES, LYMAN.

"Overflow of the Mississippi River." XI, 251.

BRIGGS, A. D.

Bridge accidents. IV, 217. Railroad accounts and returns. V, \$30. Rails. III, 110.

BRIGGS, R. E.

Proper relation to each other of the sections of railway wheels and rails.

BRIGGS, ROBERT.

Eiastic limit iu metals. IX, 362. Fallure of the Ashtabula Bridge. VI,

209.

Memoir of. XXXVI, 542.

Metric system of weights and measures.

V, 375.
"On the Ventilation of Halls of Audience." X, 53.
Wind pressure against bridges. IX, 397.

BRIGGS, WALDO C.

Grouting operations. LXXXIII, 1069. Tests of concrete in sea water. LXXXI,

683. he bonding of new to old concrete. The LXIV, 280.

BRIGHT, CHARLES EDWIN.

Memoir of. LXXXIII, 2358.

BRINCKERHOFF, H. M.

Electrification of suburban zone, New York Central & Hudson River R. R. in the vicinity of New York City. LXI, 113.

BRINCKERHOFF, H. W.

Brooklyn Elevated R. R. improvement. XXXI, 381.

Continuous rope driving. XXXIX, 179.
Electric light and power station, Rochester, N. Y. XXXI, 358.
Flow of water in pipes. XLVII, 272.
High masonry dams. XIX, 179.
Memoir of. LXVI, 494.
Motive power for street railways. XXVII, 575.

575. of piles from the Teredo. Protection

XXXI, 241.

Relation of wheels to frog points, and to guard rails. XXXI, 522.
Reservoir system of the Great Lakes. XL, 431.

BRINCKERHOFF, H. W .- (Continued).

Shall civil engineering practice be regulated by law? XLVI, 136.
Stability of bench marks. XX, 76.
Steam heating. XXIV, 219.
Street railway track. XXIV, 148.
Subaqueous foundations. XXIV, 245.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 493. Tuberculation in water pipes. XXVIII,

261. Wind bracing in high buildings. XXVII, 232; also, XXXIII, 212.

BRINK, LAWRENCE CALVIN.

Memoir of. LXXIX, 1466,

BRINKLEY, M. H.

Physical valuation of railroads. LXXVII,

BRINSMADE, DANIEL SEYMOUR. Memoir of. LXXVI, 2205.

BRITTON, W. E.

Prevention of mosquito breeding, LXXVI,

Sanitation of construction camps. LXXVI, 513.

BRODHEAD, CALVIN EASTON.

Memoir of. LX, 579.

BRODIE, HUGH.

"Report on a Series of Tests on Concrete Columns Reinforced with a Spiral of Steel." LXXVIII, 97.

BRODIE, ORRIN L.

Constant-angle arch dam. LXXVIII, 726. Design of masonry dams. LXXV, 174. Notes on tunnel lining. LXXXIII, 1905. Reconstruction of Stony River Dam. LXXXI, 1041.

Top width of non-overflow dams. LXXX,

BROE, V. E. de B. de.

High-alloy steels for bridges. LXXVIII,

BROOKE, MARK.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construc-tion. LXXVII, 1136.

BROOKS, FRED.

Consumption and waste of water. XLVI, 440.

Hight of way for railroads. XX "Thermometer Scales." XV, 381. "Weights and Measures." XI, 408. Memoir of. LXXXIII, 2157.

BROOKS, JOHN N.

"The Infiltration of Ground-Water into Sewers." LXXVI, 1909, Sewers."

BROOKS, T. B.

"An Analysis of the Cost and Descrip-tion of the Methods of Mining Em-ployed in the Marquette Iron Region, Lake Superior, Michigan." II, 15.

BROOMALL, C. M.

High masonry dams. XXXIV, 514. Impact tests of structural steel. XLIII, "On the Marking of Street Lines," XXXII, 65.
Tests of bridge members. XXXVIII XXXVIII, 74.

BROUGHTON, URBAN H.

"The Shone Hydro-Pneumatic System of Sewerage." XXVII, 659; XXVIII, 58.

BROWN, CHARLES O.

Test of a wrought-iron floor beam. XVIII, 125.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 498.

BROWN, Sir HANBURY.

"Irrigation under British Engineers." LIV, Part C, 3, 169.

BROWN, J. F.

Sewage and wastes disposal for the U. S. Army. LXXXIII, 381.

BROWN, JOHN MASON.

Agreements for building contracts. LXVII, 502.

BROWN, L. W.

Levees of the Mississippi River. LI, 344. Memoir of. LXX, 470.

BROWN, LOUIS L.

Pneumatic foundations for buildings. LXI, 233.

BROWN, M. F.

Nickel steel for bridges. LXIII, 301.

BROWN, MARSHALL W.

Tests of concrete in sea water. LXXXI, 692.

BROWN, PAUL G.

Proposed New York and New Jersey Vehicular Tunnel, LXXXIII, 452.

BROWN, RALPH HENRY.

Memoir of. LXXXIII, 2159.

BROWN, STEPHEN PEARSON.

Memoir of. LXXXIII, 2161.

BROWN, THOMAS E.

"Passenger Elevators." LIV, Part B, 133.
"The Weehawken Elevators and Viaduct." XXVII, 1.

BROWN, W. H.

Proper relation to each other of the sections of rallway wheels and rails. XXI, 255.

BROWN, W. N.

Topographical surveys. LXXVII, 1035.

BROWN, WALTER HENRY.

Water supply of the San Francisco-Oak-land Metropolitan District. LXXX, 183.

BROWN, WILLIAM LOWE.

Effect of temperature changes on mason-

ry. LXI, 429.
"The New York Tunnel Extension of the Pennsylvania Railroad. The North River Tunnels." LVIII, 152.

BROWNE, J. VINCENT.

"The Improvement of the Harbor of Quebec." IX, 455.

BROWNE, WILLIAM LYON.

Memoir of. LXXXIII, 2163.

BRUNNER, JOHN.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

BRUSH, CHARLES B.

Algæ and the purity of water supplies. XXI, 519.

Asphaltum for reservoir linings. XXVIII, 134

Borings in XXVIII, 16. Broadway, New York.

Cause and prevention of decay of building stone. XV, 708.
Cements, mortars and concretes. XXV,

Comparison of water supply systems from a financial point of view. XXIV,

Concrete tunnel lining. XXXI, 309.

Construction and maintenance of roads. VIII, 333.

Controverted questions in road construction. XXVII, 625.

Cost of operating cable railways. XXVIII, 457.

Driven wells at Plainfield, N. J. XXXI, 380

Improvement of James River, Va. XXVIII, 445. Main relief sewer of Brooklyn. XXVI, 512

Notes on a mountain slide. XXIV, 561.
"One Way of Obtaining Brine." XXIII,

Power required to drive electric street cars. XXVII, 675.
Recent experiments with dynamite on an ocean bar. XXV, 446.
"Remarks on the Aeration of Water."

XV, 139.

Right of way for railroads. XXV, 325.

Single trap system of house drainage.

XXV, 407.

"Some Facts in Relation to Friction,

Waste and Loss of Water in Mains."

XIX, 89.

Stoppage of flow in a water main by anchor ice. XVI, 177.
Storage and pondage of water. XXXI,

553. qualities of

Strength and weathering qualities roofing slates. XXVII, 348.
The Holland Dikes. XXVI, 689.
"The Hudson River Tunnel," IX, 259.

The nozzle as an accurate water meter.

XXIV, 514.
Topographic surveys. XXX, 611.
Tuberculation in water pipes. XXVIII, 257.

Underground water supply. XXX. Uniform practice in pile-driving. XXVII, 162.

Use of long steel tapes for measuring base lines. XXX, 639.

BRUSH, WILLIAM W.

Astoria Gas Tunnel. LXXX, 684. External corrosion of cast-iron pipe. LXXVIII, 865.

Submerged pipe work, Portland, Ore. LXXVIII, 1342.

BRYAN, WILLIAM B.

Filtration of water. LIII, 265.

BRYAN, WILLIAM H.

Passenger elevators. LIV, Part B, 195. Tests of bituminous coals. XLII, 91.

BRYNN, PER.

Memoir of. LVII, 528.

BRYSON, ANDREW.

Inspection and maintenance of railway structures. XVII, 286. Memoir of. LXXXIII, 2165. Surveys for railway location. XXX, 528.

Transmission of power in operating cable railways. XXX, 548.

BUCHANAN, J. M.

Gas engines. LIX, 428.

BUCHHOLZ, C. W.

Electricity vs. steam for branch rail-roads. XLII, 385. "Final Report of Special Committee on Rail Sections." LXX, 456.

BUCK, L. L.

"A Few Remarks about the Niagara Gorge." XXXII, 205. "A Few Remarks on Foundations." LV,

169. Bridge painting. XXXIX, 31,

Concrete-iron highway bridges. XXX1.

Cylindrical wheels and flat-topped rails for railways. XXI, 176.

Dimension stone quarrying. XXV, 514. "Erection of the Verrugas Bridge." V, 103, 242,

Eye-bar tests. XXXI, 422. Impact testing experiments. XXXIX.

Memoir of. LXXIII, 493.
Niagara Railway Arch. XL, 158.
Properties of steel: Its use in structures and heavy guns. XVI, 372.
Proposed method of testing structural steel. XXX, 667.

Protection of steel and aluminum. XLIII,

462.
Railway bridge designing. XXVI, 133.
Relation of wheels to frog points and to guard rails. XXXI, 522.
"Replacing the Stone Towers of the Niagara Railway Suspension Bridge, with Iron Towers," XVII, 204.
Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge. XXVIII, 360.
Rolling friction of draw-bridges. XXV, 657

strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 279. Suspension bridges. XLVIII, 441. Suspension of solids in rivers. XXXVI,

Sweetwater Dam. XIX 222. The Halsted Street Lift-Bridge. XXXIII,

37.

"The Re-enforcement of the Anchorage and Renewal of the Suspended Super-structure of the Niagara Rallroad Suspension Bridge." X, 195.

The water-works of Syracuse, N. Y.

XXXIV, 62.
Treatment of metals for structural purposes. XXX, 655.

BUCK, L. L .- (Continued).

Wind bracing in high buildings. XXVII, 240.

BUCK, R. S.

Irrigation and river control. LXXVI. 1515.

Reclamation of the Potomac Flats. XXXI

Stadia topographic surveys. XLIV, 105. Steel-concrete construction. XLVI, 93. Stiffened suspension bridges. LV, 24.

The arch orinciple in long-span bridges. LXXI, 259.
The Kinzua Viaduct. XLVI, 40.
"The Niagara Rallway Arch." XL, 125.

BUCK, W. E.

Size of high-pressure water-power pipe. LIX, 179.

BUCKLEY, E. R.

Fatigue of cement products. LI, 446.

BUDD, HENRY I.

Road building. XLI, 96.

BUEHLER, WALTER,

"Timber Preservation: Its Development and Present Scope." LXXI, 364.

BUEL, ALBERT W.

Cinder concrete floors. LXXVII. 1802. Concrete and concrete-steel. LIV, Part E. 547. Design of concrete bridges. LXXVII,

Guatemala earthquakes. LXXXIII, 1706.

Preservation of sandy beaches. LXXX, 1815. Reinforced concrete flat slab floors.

LXXVII, 1719. Reinforced concrete reservoir. LXXVII,

Stresses in railroad track. LXXXIII, 1581.

Tests of reinforced concrete columns.

LXXVIII, 143.

"The Sewickley Cantilever Bridge Over the Ohio River. LXXVI, 582.
Underpinning Trinity Vestry Building. LXXXI, 109.

BUEL, RICHARD H.

Efficiency of furnaces burning wet fuel. III, 316. Rapid transit in large cities. IV, 240.

BUERGER, CHARLES B.

"A Method of Determining Storm-Water Run-Off." LXXVIII, 1139. Detroit River Tunnel. LXXIV, 360. Engineering education. LXXV, 1128. Golng value of water-works. LXXIII,

Halligan Dam. LXXV, 134.
"Rebuilding Three Large Pumping Engines." LXXV, 649.
Reinforced concrete reservoir. LXXVII.

1067

Sinking a wet shaft. LXXIII, 415. Water-works pumping engines. LXXIV, 33.

BULLOCK, WILLIAM D.

"Description of Guard Gates at the Point Street Bridge at Providence, R. I." XX, 78.

BUNAU-VARILLA, P.

Panama Canal. L, 201.

BURDICK, CHARLES B.

Elevated tanks and stand-pipes. LXIV, 532. Rainfall, and run-off in sterm-water

sewers. LVIII. 504.

BURGESS, H.

Rivers and railroads in the United States. LXXIX, 941.

BURGESS, PHILIP.
Principles of valuation. LXXIX, 189.
Cround-waters. LXIV. 188.

Water purification. LX, 196. Water supply of Parkersburg, W. Va. LXXXI, 811.

BURGWYN, C. P. E.

Improvement of rivers. XIX, 254.

BURKE, M. D.

Road building. XLI, 130.

BURNS, CLINTON S.

Depreciation as an element in appraisal. LXXIX, 801.

Depreciation of public utility properties.

LXXVII, 838. Going value of water-works. LXXIII.

Maximum rates of rainfall, LIV, 200. Principles of valuation. LXXIX, 220. The valuation of public service property. LXX11, 268.

Water-works valuation. LXIV, 75.

BURNS, EDWARD COOK. Memoir of. LXXIX, 1345.

BURNS, JUSTIN. Memoir of. LVII, 529.

BURPEE, MOSES.

Cylindrical wheels and flat-topped rails for railways. XXI, 177. Proper relation to each other of the sec-tions of railway wheels and rails. XXI,

BURR, GEORGE W.

"The Art of Designing and Constructing Mobile Artillery." LIV, Part B, 313, 393.

BURR, JAMES

"The Construction of the Atchison, To-peka and Santa Fé Railroad over the Raton Mountains, and the Performance of Locomotives on its Steep Grades." VIII, 295.

BURR, WM, H.

"Approximate Determination of Stresses in the Eye-Bar Head." VI. 127. Economic depth for canals, XXXIX, 314. Hydraulic-fill dams. LXXXIII, 1775. Kentucky and Indiana Bridge. XVII, 184.

New principle in the theory of struc-tures. LXXXIII, 676 Niagara Cantilever Bridge. XIV, 596. Panama Canal. L, 198.

BURR, WM. H .- (Continued).

Properties of steel: Its use in structures and heavy guns. XVI, 362. Railway bridge designing. XXVI, 128. Rolling friction of draw-bridges. XXV,

Specifications for strength bridges, XV, 429. Steel columns and struts. strength of iron

LXZZIII. 1648.

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 281.

Test of a wrought-iron floor beam. XVIII, 128.

The Bohio Dam. XLVIII, 286. "The Reinforced Concrete Bridge across the Hudson River at Sandy Hill, New York." LIX, 195.
"The Reinforced Concrete Work of the McGraw Building." LX, 443.
"The River Spans of the Cincinnti and Conjugator Everated Reilyron Transfer

Covington Elevated Railway, Transfer and Bridge Company." XXIII, 47. Use of reinforced concrete. LXI, 49. Weights of bridges. XVI, 257.

Weights of Iron and steel railway bridges, XV, 121.

Wrought-iron columns, tests and formulæ. XI, 111.

BURROUGHS, HECTOR ROBINS.

Bond-friction-resistance in concrete. LXXIII, 276.
The bonding of new to old concrete.
LXIV, 270. reluforced

BURROWES, H. G.

"The Sixth Avenue Subway of the Hud-Railroad." son and Manhattan LXXVI. 1.

BURTON, STANDISH BARRY.

Memoir of. LV, 444.

BURTON, W. J.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

BUSH, EDWARD W.

The hydraulic jump. LXXX, 389.

BUSH, H. D.

American railroad bridges. XXI, 566. Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV,

Distortion of riveted pipe by back-filling. XXXVIII, 106.

BUSH, LINCOLN.

Harlem Ship Canal Bridge. LXVII, 23.

BUSSE, O.

Locomotives and other rolling stock.

LIV, Part D, 349.

BUTCHER, WILLIAM L.

Hydraulic-fill dams. LVIII, 258.
Size of high-pressure water-power pipe.
LIX, 178.
Water filtration at Washington, D. C.
LVII, 382.

BUTLER, M. J.

High-alloy steels for bridges. LXXVIII,

Hot-bath tests for cements. 339.

Tests of fire-proof flooring material. XXXV, 130.

BUTLER. W. R.

Bridge superstructure and foundations in Nova Scotia. AAX, 571.

BUXTON, CLIFFORD.

Memoir of. LXVII, 623.

BYERS, MORTON L.

YERS, MORTON L.
Repairing bridge piers. LXXIX, 108.
"The Prospective Competitor Method of
Valuation of Property." LXXXIII, 1313.
"The Renewal of the Channel Pier of
the Cincinnati and Muskingum Valley Railway Bridge over the Scioto River. XXXI, 361.

BYRNE, EDWARD A.

Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 427.

CAESAR, R.

"The Rearrangement of the Railway Terminal System at Altona, with Special Reference to the Avoidance of Grade Crossings," (Translated from the Ger-man by Wm. T. Searles.) XXIX, 295.

CAHN, ELIAS.

Underpinning Trinity Vestry Building. LXXXI, 103.

CAIN, WILLIAM.

Arched dams. LXXXIII, 2084. "Cohesion in Earth: The Need for Comprehensive Experimentation to Determine the Coefficients of Cohesion." mine the Coefficients of Cohesion." LXXX, 1315. Design of masonry dams. LXXV, 211. Design of the New Croton Dam. LVIII,

444

"Determination of the Stresses in Elastic Systems by the Method of Least Work." XXIV, 265.

Earth pressures. LXXXI, 202.
"Experiments on Retaining Walls an Pressures on Tunnels." LXXII, 403.

New principle in the theory of structures. LXXXIII, 692. Raliway bridge designing. XXVI, 208. Reconstruction of Stony River Dam.

LXXXI, 1044.
Reinforced concrete arches. LV, 189.
Reinforced concrete floor systems. LVI, 393.

Safe stresses in steel columns. LXI, 202. Shortened arch computations. LXXVI. 138.

Stability of loaded masonry

XXIII, 13.
"Stresses in Masonry Dams." LXIV, 208.

"Stresses in Masonry Dams." LXIV, 208. The practical column under central or eccentric loads. XLV, 435.
"The Transition Curve whose Curvature Varies Directly as its Length from the P. C. or Point where it Councet with the Tangent." XXVI, 473; XXVII, 203.
"Theory of the Ideal Column." XXXIX, 06

"Theory of the Spherical or Conical Dome of Reinforced Concrete or Metal." LV, 201.

CAIN, WILLIAM—(Continued).

"Stresses in Wedge-Shaped Reinforced Concrete Beams." LXXVII, 745. Dis-cussion, LXXVIII, 740. Working stress for bridges. XLI, 529.

CALDWELL, CHARLES ADOLPHUS. Memoir of. LXXXI, 1687.

CALDWELL, GEORGE BOWERS. Memoir of, LXXIII, 498.

CALKINS, F. A.

"Brick Manufacture and Brick Pave-ment." XXVI, 363. The manufacture and use of paving brick. XXX, 586.

CALLANAN, P.

Controverted questions in road construc-tion. XXVIII, 106.

CAMERON, BREWSTER.

Orlgin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 110.

CAMERON, JOHN B.

Reinforced concrete wharves. LXVI, 303.

CAMP, W. M.

Live loads for railroad bridges. LIV, Part A, 96. Railroad terminals. Railroad terminals. LIV, Part F, 542. The creeping of rails. LIII, 481. Underground railways. LIV, Part F, 371.

CAMPBELL, ALBERT JOHNSTONE.

Memoir of. L1X, 563. "Tequixquiac Tunnel, Valley of Mex-ico." XXXII, 171.

CAMPBELL, C. E. H.

XXXVII, 382. Elevated railroads. Memoir of. LII, 547.

CAMPBELL, G. M.

Purification of water for the production of steam. LIV, Part A, 49.

CAMPBELL, H. H.

"Specifications for Structural Steel." XXXIII, 297.

Tensile strength and composition of structural steel. XXXVIII, 85; XL, 457. "The Physical Qualities of Acid Open-Hearth Nickel Steel, as Compared with Carbon Steel of Similar Tensile Strength." XXXIV, 285.

CAMPBELL, H. J.

Freezing as an aid to excavation. LII, 444.

CAMPBELL, J. L.

Creosoting timber. LVI, 15. Flow of water in pipes. XLVII, 221. Flow of water in wood pipe. LXXIV,

The Bohio Dam. XLVIII, 354.
The Bohio Dam. XLVIII, 305.
"The Water Supply of the El Paso and Southwestern Railway from Carrizozo to Santa Rosa, N. Mex." LXX, 164.

CAMPBELL, JOHN C.

Inter-oceanic canal projects. IX, 28, 158.

CANDLOT, EDOUARD.

"Tests of Materials other than Metals."
(Translated from the French by Paul A. Seurot.) LIV, Part F, 31, 53.

CANFIELD, EDWARD.

Memoir of. LXXXI, 1689.

CAPPELEN, F. W.

Influence of rails on street pavements. XXXVII, 120.

CAREY, A. E.

Harbors. LIV, Part A, 380.

CAREY, C. O.

"Report on a Series of Tests on Concrete Columns Reinforced with a Spiral of Steel." LXXVIII, 97.

CARLIN, JOSEPH P.

Effects of San Francisco earthquake on engineering constructions. LIX, 286.
The supporting power of piles. XLVIII, 216.

CAROTHERS, DANIEL DAWSON.

Memoir of. LXIV, 581.

CARPENTER, A. W.

Elevated tanks and stand-pipes. LXIV, 543.

New facts about eye-bars. LVI, 433.

Nickel steel for bridges. LXIII, 352.

Painting structural steel. LXXVII, 967. Painting structural steel.
Railroad cantillever bridge
Pa. LXXII, 172.
Rust in a seventeen-st
LXXI, 203. bridge at Beaver,

seventeen-story building.

Safe stresses in steel columns. 191. LXI, Tests of large steel columns. LXXIII,

452. Water-proofing railroad bridge floors. LXXIX, 373.

CARPENTER, CLARENCE ALLAN. Memoir of. LXXI, 403.

CARPENTER, CLARENCE E.

Elevated railway improvements. LXXXII, 745. Subway construction problems. LXXXII, 325.

CARPENTER, J. C.

Retracement-resurveys. LXXV, 440. "The Properties of Balsa Wood (Ochroma Lagopus)." LXXXI, 125.

CARPENTER, JAMES WILHELM. Memoir of. LXXIX, 1470.

CARPENTER, ROLLA CLINTON.

Memoir of. LXXXIII, 2167. Performance of a reaction turbi LXXVIII, 1299. Tests of bituminous coals. XLII, 92. of a reaction turbine.

CARR, ALBERT.

Station. Ninety-Sixth Street Power XLÍV, 144. Tuberculation in water pipes. XXVIII,

CARR, WALTER FRANK.

Memoir of. LXXX, 2114.

CARREL, FREDERICK JANVRIN. Memoir of. XXXVII, 559.

CARSON, H. A.

Detroit River Tunnel. LXXIV, 357.

CARSON, HARRY Y.

Cement joints for cast-iron water mains. LXXXIII, 288. Underground railways. LIV, Part F,

CARSTARPHEN, F. C.

"A Simple Method of Computing Deflec-tions of a Cable Span Carrying Mul-tiple Loads Evenly Spaced." LXXXIII,

"An Aerial Tramway for the Saline Valley Salt Company, Inyo County, California. LXXXI, 709.

CARTER, ALFRED ELLSWORTH.

Memoir of. LXXVI, 2207.

CARTER, C. E.

Road construction and maintenance: Design of highway systems. LXXVII,

CARTER, EDWARD C.

"Final Report of Special Committee on Rail Sections." LXX, 456, Proper relation to each other of the sec-tions of railway wheels and rails. XXI, 256.

CARTER, FRANK H.

Earth pressure and stability. LXX, 399.

CARTER, O. M.

Improvement of rivers. XIX. 257. Some Recent Experiments with Dynamite on an Ocean Bar." XXV, 442.

CARTLIDGE, C. H.

Reconstruction of Kenova Bridge. LXXIX, 483.

CARTWRIGHT, ROBERT.

Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV,

"Construction of the Power House of the Rochester Power Company, adjacent to Genesee Falls, Rochester, N. Y." XXVIII, 19.

Consumption and waste of water.

XXXIV, 213. Cranes as labor-saving machines. XV,

Str.
Sewerage of Memphis. X. 37.
"The Electric Station of the Citizens'
Light and Power Company of Rochester, N. Y." XXXI, 335.
The Holland dikes. XXVI. 684.
Timber preservation. XLIV, 198.

CARY, ALBERT A.

Municipal refuse disposal. LX, 392.

CARY, EDGAR SHELDON.

Memoir of. XLVI, 555.

CASE, L. N.

Hydraulics of the Hemlock Lake Conduit, and restriction of the use and waste of water in Rochester, N. Y. XXVI, 49.

CASEY, THOMAS L.

"Report of Progress of the Committee on the Compressive Strength of Ce-ments and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886).

CASS, GEORGE WASHINGTON, JR.

Memoir of. XXXVI, 599.

CATHCART, WILLIAM LEDYARD.

Dry docks - stone vs. wood. XLI, 554.

CHAFFEY, ANDREW M.

Irrigation and river control. LXXVI,

CHAMBERS, HERBERT JAMES.

Memoir of, LXXXII, 1674.

CHANDLER, E. F.

Evaporation from Lake Conchos, Mexico.

LXXX, 1903, Flood flows. LXXVII, 624. Hydrometry as an aid in irrigation. LXXI 249

LXXI, 342. Run-off from rainfall and other data. LXXIX, 1161.

CHANUTE, O.

Construction of railway tracks, XXV,

246.
Efficiency of railroads for the transportation of freight. XII, 138, 180.
"Engineering Progress In the United States." Address read at the Twelfth Annual Convention of the Society held at St. Louis, Mo., May 25th, 1880. IX. 217.

English and American railroads com-pared. XV, 746. Enlargement of the Erie Canal. XIV.

115.

Inclined planes for railroads, VII, 216. Inter-oceanic canal projects, IX, 157. Introduction of M. Ferdinand de Lesseps at public meeting. Feb. 26th, 1880. IX, 87.

IX, 87.

Memoir of, LXXIV, 483.
Niagara Cantilever Bridge, XIV, 594.

"Notes on the Weight of Rails and the Breaking of Iron Rails." III, 111.
Pneumatic foundations. II, 426.
Preservation of railroad ties. XLII, 366.
Presidential Address at the Annual Convention at Chatanooga, Tenn., May 22d. 1891. XXIV, 397.

Rainfall and the flow of streams. X, 245.

245.

249.
"Repairs of Masonry." X. 291.
Report of the Committee on "Railway Signals." IV. 147 (1875).
Report of the Committee on "Rapid Transit and Terminal Freight Facilities." IV. 1 (1875).
Report of the Committee "On the Form.
Weight, Manufacture and Life of

Weight, Manufacture and Life of Rails." First Report, III, 87 (1874); Second Report, IV, 136 (1875); Final Report, V, 327 (1876).

CHANUTE, O .- (Continued).

"Report of the Committee on the Pre-"Report of the Committee on the Freservation of Timber." Preliminary Report, XI, 325 (1882); Final Report, XIV, 247, 398 (1885).
Resistances of rallroad curves. VII, 97.
Stability of stone structures. VIII, 251.

"The Elements of Cost of Railroad Freight Traffic." II, 381. "The Preservation of Railway Ties in

Europe." XLV, 498.
"The Sibley Bridge." XXI, 97. "Uniformity in Railway Rolling Stock."

Use of steel for bridges. VIII, 279. Wind pressure upon bridges. X, 169.

CHAPIN, LOOMIS EATON. Memoir of. LXXX, 2116.

CHAPMAN, PAUL.

Questions in reinforced concrete design. LXX, 90.

The arch principle in long-span bridges. LXXI, 271.

CHARGUERAUD, A.

"Inland Navigation in France." (Translated from the French by Foster Crowell.) LIV, Part F, 235.

CHASE, CLEMENT E.

Effects of straining steel. LXXX, 1497. Hell Gate Arch Bridge, LXXXII, 1033. "The Cherry Street Bridge, Toledo, Ohio." LXXX, 744.

CHASE, DEAN.

Memoir of. LXXXIII, 2416.

CHASE, RICHARD D.

Hydraulic-fill dams. LXXXIII, 1751.

CHASE, WILLIAM BEVERLY. Memoir of, LXIII, 429.

CHATTERTON, ALFRED.

Engineering education. LIV, Part A, 502

Irrigation. LIV, Part C, 154. Surveying. LIV, Part B, 458.

CHENEY, JOHN EUGENE. Memoir of. LIX, 537.

CHESBROUGH, E. S.

Back-water in streams as produced by dams. II, 260.
Brick arches for large sewers. VII, 258.

Construction and maintenance of roads. VIII, 347:

"Detroit River Tunnel." II, 233. Early history of railways. II, 59. Enlargement of the Eric Canal. XIV.

Hudson River Tunnel. IX, 273.
"Sketch of the Plans and Progress of the Detroit River Tunnel." II, 85.
Tests of cement. IX, 345.

CHESTER, J. N.

Consumption and waste of water. XLVI. 431 Decolorization of water. XLVI, 174. Pumping machinery. LIV, Part D, 554. Purification of water for domestic use. LIV, Part D, 220. Steam turbines. LIV, Part E, 109. Decolorization of water.

CHESTER, STEPHEN.

"Electro Science, as a Part of the Edu-cation of Civil Engineers." II, 63. "Nitro-Glycerin: Its Manufacture and Use." I, 117.

CHEW, R. S.

"Effect of Earthquake Shock on High Bulldings." LXI, 238. Tests of large steel columns. LXXIII, 469.

CHIBAS, E. J.

New water-works of Havana, Cuba. XXXVI, 233.
"The Construction of a Light Mountain

Railroad in the Republic of Colombia." XXXVI, 65.

CHILD, STEPHEN.

Forests, reservoirs, and stream flow. LXII, 328.

CHILDS, JAMES EDMUND.

Memoir of. LXXVII, 1849.

CHITTENDEN, HIRAM MARTIN.

Design of a drlft barrier. LXXX. 2077. "Detention Reservoirs with Spillway Outlets as an Agency in Flood Control." LXXXII, 1473.

Flood of March, 1907, in California rivers. LXI, 345.

Floods

and flood prevention. LXXXI, 1256. "Forests and Reservoirs in Their Re-lation to Stream Flow, with Particular Reference to Navigable Rivers." LXII.

245.

Low stage of Lakes Huron and Michigan. LXIII, 48.
Memoir of. LXXXII, 1675.
Missouri River improvements. LIV, 336.
"Ports of the Pacific." LXXVI, 155.
"Reservoir System of the Great Lakes of the St. Lawrence Basin; Its Relation to the Problem of Improving the Navigation of These Bodies of Water and of Their Connecting Channels.' XL, 356.

CHITTENDEN, SAMUEL H.

"Description of the Work of Constructing a Dam across the Potomac River for Increasing the Water Supply of Washington, D. C." XVIII, 50.

CHOATE, Hon. JOSEPH H.

Address at opening of New Society House, XXXVIII, 440.

CHRISTENSEN, GEORGE A.

Review of mathematical tables. LXXXII, 762.

CHRISTIAN, G. L.

Albany Filtration Plant. XLIII, 327 Consumption and waste of water. XI XLVI. 442.

Ground-water in sewers. LXXVI, 1928.
Legitimate use of water. LV, 437.
New water-works of Havana, Cuba
XXXVI, 234. Cuba.

Stadia topographic surveys. XLIV, 115.
The water-works of Syracuse, N. Y.
XXXIV. 62.
Theory of concrete. XLII, 143.

CHRISTIAN, G. L .- (Continued).

Water-works of Porterville, Cai. LIV, 276.

CHRISTIE, JAMES.

Wrought-Iron Struts." XIII, 85, 285. Eye-bar tests. XXXI, 418. Gas engines. LIX, 402. Impact testing.

Movable bridges. LX, 318. Niagara Cantilever Bridge. XIV, 543. Proposed method of testing structural steel. XXX, 669.

Strength of columns. XV. 531.

Test of steel bridge compression members. XX, 260.

Tests of large steel columns. LXXIII,

467. "The Strength and Elasticity of Struc-tural Steel, and its Efficiency in the Form of Beams and Struts." XIII, 253,

285. "The Treatment of Metals for Structural Purposes." XXX, 155,

CHRISTIE, W. W.

Concrete and concrete-steel. LIV, Part E. 545.

CHURCH, BENJAMIN S.

"Notes and Suggestions on the Croton Water-Works and Supply, for the Fu-ture." V, 107, 273. Stoppage of flow in a water main by anchor ice. XVI, 177.

CHURCH, CHARLES TITUS. Memoir of. LXXXIII, 2170.

CHURCH, GEORGE EARL. Memoir of. LXXI, 405.

CHURCH, IRVING P.

Air tanks on pipe lines. LXXXII, 264. Deflections of beams. LI, 18. Flow of water in pipes. XLVII. 205. Hydraulic problems. XLVII. 415. Hydraulics of fire streams. XXI, 474. New principle in the theory of structures. LXXXIII, 646. Penstock and surge-tank problems. LXXXIX, 272. Reconstruction of Stony River dames.

of Stony River dam.

Reconstruction LXXXI, 1076.

Reinforced concrete floor systems. LVI, Spherical and framed domes.

Surges in an open canal. LXXXI, 119. Three-span suspension bridges. LV, 114.

CHURCH, WM. C.

Properties of steel: Its use in structures and heavy guns. XVI, 307.

CHURCHILL, CHARLES S.

Air resistances to trains in tunnels. LXXV. 1024.
"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Rallroad Proparty and Other Public Utilities." LXXXI.

1311.
Live loads for railroad bridges. LIV.
Part A. 98.
Part A. 98.

"Progress Report of the Special Commit-

rrogress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
Railway bridge designing. XXVI, 148.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.
"The Ventilation of Tunnels." LVII.

Train loadings for bridges. XXXI, 189. Unit costs of work. XLIX, 65. Ventilation in the East River tunnels.

LXIX, 420. "Ventilation of Tunnels." LIV, Part C, 525, 577.

CHURTON, C. STANLEY.

Preservation of railroad ties. XLII, 355.

CILLEY, F. H.

"General Methods for the Calculation of Statically Indeterminate Bridges, as Used in the Check Calculations of Designs for the Manhattan Bridge and the Blackwell's Island Bridge, New York." LIII. 413.

Position of loads causing maximum stress

in a bridge truss. XLII, 262. "The Exact Design of Statically Indeterminate Frameworks. An Exposition of its Possibility, but Futility." XLIII,

The Kinzua Viaduct. XLVI, 59.

CILLEY, MORGAN.

Philosophy of engineering. LXXVII, 59.

CISNEROS, FRANCISCO JAVIER. Memoir of. XLI, 622.

CLAFLIN, W. B.

Cinder concrete floors. LXXVII, 1805.

CLAPP, LORENZO RUSSELL. Memoir of. XLIX, 341.

CLAPP, OTIS FRANCIS. Memoir of. LXXXII, 1679.

CLAPP, WILLIAM BILLINGS.

Memoir of. LXXV, 1148.
"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." LXI, 281.

CLARK, H. F.

Municipally owned LXXXI, 432. public utilities.

CLARK, H. W.

LXIV, 367. Sampittic surfacing, LXIV, Sewage disposal, LVII, 132.

CLARK, J. H.

Compressibility of salt marsh earth filling. XXXVII, 220. under

CLARK, JACOB M.

Weights and measures. XI, 412.

CLARK, LUDLOW VICTOR. Memoir of. LXXX, 2254.

CLARK, LYONEL.

Finating dry docks. LVIII, 163.

CLARK, WATSON G.

Road construction and maintenance: Preliminary investigations. LXXIII,

CLARKE, CLARENCE K.

Irrigation and river control. LXXVI, 1542.

CLARKE, D. D.

"A Phenomenal Land Slide." LIII, 322. "A Phenomenal Land Slide - Supple-

ment." LXXXII, 767.
"Submerged Pipe Work at Portland, Oregon." LXXVIII, 1305.
"The Distortion of Riveted Pipe by Back-Filling." XXXVIII, 93.
Water supplies. LIX, 384.

CLARKE, ELIOT C.

Effect of freezing on cement-mortar. XVI, 83.

Excessive rainfalls. XXV, 112

Excessive rainfalls. XXV, 112. Flow of water in streams. XXI, 561. Inspectors and bridge work. XVII, 328. "Record of Tests of Cement made for Boston Main Drainage Works, 1878-1884." XIV, 141. "Report of the Committee on a Uniform System for Tests of Cement." Prehiminary Report, XIII, 53 (1884); Final Report, XIV, 475 (1885). Sewage disposal. XVIII, 24.

CLARKE, ERNEST WILDER.

"Contracts — A Comparison of 'Cost Plus' with Other Forms." LXXXIII, 784.

CLARKE, GEORGE C.

"The New York Tunnel Extension of the Pennsylvania Railroad. The Long Is-land Approaches to the East River Tunnels." LXIX, 91.

"The New York Tunnel Extension of the Pennsylvania Railroad. The Site of the Terminal Station." LXVIII, 340.

CLARKE, JOHN G.

"The Approximate Value of a Reduc-tion of Ruling or Maximum Grades, Especially for the Use of Engineers on Location of Railroads." 11, 399.

CLARKE, ST. JOHN.

Harlem Ship Canal Bridge, LXVII, 26. Structural design of buildings. LIV, 470.

CLARKE, THOMAS C.

A water- tight masonry dam. XXVIII, 349.

"Accidents to Railway Structures." I,

Brick manufacture and brick pavement. XXVI, 404.

Canals from the Lakes to New York.
XLV, 254.
Cost of operating cable railways.
XXVIII, 459.

Early history of rallways.

"Effect of Depth upon Artificial Water-ways." XXXV, 1.

Elevated railroads. XXXVII, 369.

English and American railroads compared. XV, 775.

Enlargement of the Eric Canal. XIV,

100.

"Experiments upon Phænix Columns." XI, 1, 120.

Failure of the Ashtabula Bridge. VI, 86. 207

Forth Bridge, XXII, 424. High masonry dams, XXXIV, 506. Inter-oceanic canal projects, IX, 159. Irrigation, XVI, 102.

Johnsonville, Tenn., Bridge. XXXIII, 187.

Life of iron railroad bridges. XXXIV, 309.

"Loads and Strains of Bridges." II.

Longitudinals vs. cross-ties for railway track, XXV, 624. Memoir of. L, 495.

New water-works of Havana, Cn XXXVI, 232. Niagara Cantilever Bridge, XIV, 544. of Havana, Cuba.

Notes on the Crushing American Iron." I1, 228. 'Notes Strength of

Old-time water-wheels of America. XXVIII, 247.

Railway bridge designing. XXVI, 117. Rainfall and the flow of streams. X,

Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122, 213, (1875).

"Science and Engineering." Presidential Address at the Annual Convention at San Francisco, Cal., June 30th, 1896. XXXV, 508.

Specifications for strength of iron bridges. XV, 483,

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 284.

Subaqueous foundations. XXIV, 237. Suspension bridges. XXXVI, 417. Suspension of solids in rivers. XXX Subaqueous foundations. XXXVI.

Tests and testing machines. V, 102.
Tests of bridge irons. II, 226.
"The Advantages of a Longitudinal Bearing System for Railway Tracks."
XXV, 234.

The American railroad viaduet. XXV, 362.

"The Education of Civil Engineers." III,

Thin floors for bridges. XXVII, 501. Underpinning of heavy buildings. XXXVII, 41.

Upright arched bridges. III, 222. Use of steel for bridges. VIII, 277. Van Buren, Arkansas, Bridge. XX, 192. Wind bracing in high buildings. XXXIII, 204.

CLARKSON, ROBERT C.

Modern office buildings. XLVIII, 17.

CLAYTON, HENRY HELM.

Memoir of. LXXVII, 1924.

CLERMONT, JOHN B.

Structural design of buildings. LIV, 457.

CLEVERDON, HENRY LAWRENCE. Memoir of. L. 507.

CLIFFORD, R. G.

Constant-angle arch dam. LXXVIII, 728. Rainfall and run-off. LXXVII, 366.

CLIFFORD, W. W.

"A Reinforced Concrete Stand-Pipe." LXXIV, 373. Questions in reinforced concrete design.

LXX, 80.

CLOUD, JOHN W.

Journal friction. XIII, 453.

COANE, J. M.

Sewage disposal. LIV, Part E, 212.

COATES, F. R.

Engineering education. LVII, 170.

COBB, ROBERT LINAH.

Memoir of. XXXVI, 545.

COBURN, HOWARD LINCOLN.

Grouted cut-off for the Estacada Dam. LXXVIII, 508. emoir of. LXXXIII, 2173.

Memoir of.

Reconstruction of Stony River Dam. LXXXI, 1038.

Top width of non-overflow dams. LXXX, 739.

COCHRANE, VICTOR H.

Bridge and subway specifications. LXXV,

Sixth Street Viaduct, Kausas City. LXV, 96.

CODRON, C.

Nickel steel for bridges. LXIII, 342.

COE, WILLIAM WATSON.

"Description of the Iron Coal-Pier, Norfolk and Western Railroad Company, at Lambert's Point, Norfolk, Va., and Some of the Methods Used in its Construction." XXVII, 125.

Memoir of. LXXXIII, 2175.

COFFIN, AMORY.

Memoir of, LXXX, 2118.

COFFIN. FREEMAN C.

Financial management of water-works. XXXVIII, 24. Memoir of. LVIII, 532.

Water-works valuation, XXXVIII, 180.

COFFIN, JOHN.

l'roperties of steel: Its use in structures and heavy guns. XVI, 318.

COFFIN, T. A.

Coal-handling machinery, XLI, 295.

COGGESHALL, R. C. P.

Pumping machinery. LIV, Part D, 537.

COGHLAN, RAPIER R.

Tufa cement. LXXVI, 559.

COGSWELL, W. B.

"On the Use of a Surface Condenser in Connection with a Set of Blast Furnace Boilers, at the Franklin Iron Works, Oneida Co., N. Y.' II, 41.

COHEN, J. X.

Engineering education. LXXV, 1106. Sewage clarification by fine screens. LXXVIII, 979.

COHEN, MENDES.

American railway line, Vera Cruz to City of Mexico. XV, 839.

Cause and prevention of decay of building stone. XV, 708.
Combination bridges. XXVIII, 43.
Destruction of rails by excessive weights.

XX, 127.

XX, 127.
English and American railroads compared. XV, 749.
Memoir of. LXXXI, 1656.
Preservation of railway ties. XLV, 533.
Presidential Address at the Annual Convention at Hygeia Hotel, Fortress Monroe, Va., June Sth, 1892. XXVI, 535.
Railroad accounts and returns. V, 338.
Railway tie renewals. XXVII, 649.
Street railway track. XXVIV, 149.
The form of railway excavations and embankments. XXXII, 257.
The Holland dikes. XXVI, 691.
Wind braeing in high buildings. XXVII, 242.

242.

COHILL, ANDREW A.

Grouting operations. LXXXIII, 1072.

COIT, EDWARD WOOLSEY. Memoir of, LXXX, 2260.

COKER, E. G.

Flow of water in pipes. LI, 322.

COLBURN, ZERAH.

Memoir of. XXXVI, 546.

COLBY, ALBERT LADD.

Recent practice in rails. XLIV, 491.

COLBY, ELMER ELLSWORTH, Memoir of. LXXXII, 1680.

COLE, B.

Highway construction. LIV, Part F, 175.

COLE, E. D.

"Concrete-Lined Oil-Storage Reservoirs in California: Construction Methods and Cost Data." LXXX, 691.

COLE, EDWARD S.

Flow of water in pipes. XLVII, 275.

COLE, GEORGE N.

Catenary trolley construction. LXII, 190

Municipal refuse disposal. LX, 417. Tests of large steel columns. LXXIII, 470.

COLE, HOWARD J.

"Concrete Piles." LXV, 467.
Design of masonry dams. LXXV, 158.
Docks and harbors. LXII, 153.
How to build a stone jetty. LXXV, 1059.
Railroad draw bridges. LXXV, 720.
Road building. XII, 115.
The Niagara Gorge. XXXII, 210.

COLE, WILLIAM WEEDEN. Memoir of. LXXX, 2120.

COLEMAN, CLARENCE.

Harbors. LIV, Part A, 370. Memoir of. LXXXIII, 2177.

COLEMAN, J. F.

Subsidence of LXXXII, 425. muck and peat soils.

COLLIER, B. C.

Secure subway supports. LXXX, 943.

COLLIER, H. L.

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 622.

COLLIER, JAMES.

Highway construction. LIV, Part F. 173.

COLLINGWOOD, FRANCIS.

"A Few Facts about the Caissons the East River Bridge." I, 353.
"An Examination into the Method Caissons of

of Determining Wind Pressures." X, 172. Asphaltum for reservoir linings. XXVIII, 142

Back-water in streams as produced by

dams. II, 260.
"Behavior of Cement-Mortars under Various Contingencies of Use. With a Brief Discussion of Certain Tests, etc." XIV, 491.

Borings in Broadway, New York. XXVIII, 17. Brick arches for large sewers. VII, 261. Cause and prevention of decay of building stone. XV, 706. Cause of failure of South Fork Dam.

XXIV, 466.

Cements, mortars and concretes. XXV, 281.Control of non-navigable streams. XLIX,

Controverted questions in road construc-tion. XXVII, 626.

Crushing strength of American iron. II.

Cylindrical wheels and flat-topped rails

cynthical wheels and hat-topped ratis for railways. XXI, 212. Designing and erection of the Oakley Arch. XXIII, 180. Detroit Union Depot Viaduct. XXVIII,

315.

Dry docks — stone vs. wood. XLI, 590. Dunning's Dam, near Scranton, I

XXXII, 416. Education of civil engineers. III, 263. Effect of XVI, 82. freezing on cement-mortar.

English and Americau railroads com-pared. XV, 747. Enlargement of the Eric Canal. XIV,

Erection of bridges. IV, 207. Excessive rainfalls.XXV, 112.

"Experiments on the Power of Water to Transport Sand in Sluices." I, 246. Failure of a masonry pier and a rock

foundation. XXXI, 585.
Foreshore protection. L, 91.
Forests, reservoirs, and stream flow. Forests, res LXII, 319.

Foundations for heavy buildings. XXXV, 477.

"Foundations for the Brooklyn Anchor-

age of the East River Bridge." III, 142; IV, 205.
"Further Notes on the Calssons of the East River Bridge." II, 119.
High masonry dams. XIX, 188.
Improvement of rivers. XIX, 253.

Inspectors and bridge work. XVII, 328. Johnsonville, Tenn., Brldge. XXXIII, 187.

Journal friction. XIII, 474. Lime sulphite fiber manufacture. XX, 286.

Littoral movements of the New Jersey coast. XXIII, 142.

Marine wood-borers. XL, 212. Niagara Cantilever Bridge. XIV, 557. Nomenclature of building stones and of stone masonry. VII, 286. Notes on a mountain silde. XXIV, 561.

"Notes on the Masonry of the East River Bridge." VI, 7.

Old-time water-wheels of America. XXVIII, 245. Painting of iron structures. XXXIII,

548.

Permanent effects of strain in metals. XXIV, 175.

Preumatic foundations. II, 424.
Preservation of timber. XIV, 381.
"Progress of Work at the East River
Bridge." IX, 162. Properties of steel: Its use in structures and heavy guns. XVI, 312.

Proportions of the heads of eye-bars.

11, 337.

Protection of piles from the Teredo. XXXI, 241. Raiufall and the flow of streams, X,

Rebuilding of the Monongahela Bridge.

XII, 386.
Recent experiments with dynamite on an ocean bar. XXV, 446.
"Report of Progress of the Committee on the Compressive Strength of Ceronic Compression of Morrowskip of Morrowskip. ments and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).

264 (1888).

Report of the Committee on "Rapid Transit and Terminal Freight Facilities." IV, 1, 260 (1875).

Resistances of railroad curves. VII, 107.

Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge. XXVIII, 358.

Street railway track. XXIV, 152.

Structural steel. XIII, 47.

"Submarine Blasting." I, 216.

Suspension bridges. XXXVI, 427.

Tensile strength of bar-iron and boilerplate, II, 347.

plate, II, 347. Teredo Navalis, or ship-worm. III, 169. Tests of bridge irons. II, 225. Tests of cement. VII, 280; also, XIII,

"The Preservation of Forests." XIV, 361,

The relative effects of frost and the sulphate of soda tests on building stones. XXXIII, 255.

Transverse breaking strain of plate glass. XXV, 637.

Tuberculation in water pipes. XXVIII, 265.

Use of compressed air in tubular foundations. VIII, 186. Van Buren, Arkansas, Bridge. XX, 192.

Water front of the City of New York. III, 188.

Water power of the Falls of St. Anthony.

Water power of the Falls of the Ohio River. II, 270.

COLLINGWOOD, FRANCIS.—(Continued).
Wind bracing in high buildings. XXVII,
240.

COLLINS, M. F. Lawrence, Mass., Filter. XLVI, 327.

COLMAN, ISAAC D.
Retaining walls. III, 75.

COLMAN, J. B. T.

"The Action of Water under Dams." LXXX, 421.

COLSON, C. Floating dry docks. LVIII, 156.

COMER, H.

Protection of piles from the Teredo.

XXXI, 240.

COMFORT, SILAS GILDERSLEEVE. Memoir of. LXXI, 452.

COMPTON, ALFRED G.
Rainfall and the flow of streams. X, 249.

COMPTON, R. K.
Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 63.

Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 78.

COMSTOCK, C. B. South Pass Jetties. XV, 230, Sweetwater Dam. XIX, 227. The Holland dikes. XXVI, 660.

COMSTOCK, CHARLES W.
Evaporation from Lake Conchos, Mexlco. LXXX, 1948.

CONDRON, T. L.
Reinforced concrete buildings. LX, 482.

CONKLING, CLOUD CLIFFORD.

Memoir of. LXXX, 2122.
Steel sheeting and sheet-piling. LXIV, 452.

CONNELL, WILLIAM II.

Road construction and maintenance: Bituminous surfaces. LXXV, 556. Road construction and maintenance: Cost records and reports. LXXVII,

148. Road construction and maintenance: Engineering organizations for highway work. LXXVII, 1078.

Road construction and mainteance: Surface treatment with tars, heavy oils,

etc. LXXIII, 64.
Road construction and maintenance:
The use of bituminous materials by
mixing methods. LXXIII, 109.

mixing methods. LXXIII, 109.
Road construction and maintenance:
The use of bituminous materials by
penetration methods. LXXIII, S1.
Road construction and maintenance:

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 623. CONNELLY, JOSEPH A. A.
Underpinning Trinity Vestry Building.
LXXXI, 108.

CONNOR, ADDISON.

Memoir of. XXXVI, 551.

CONNOB, E. H.
Elevated railroads. XXXVII, 418.

CONOVER, CHARLES E.

Bridge and subway specifications. LXXV, 370.

CONROW, HERMAN.

Boston South Terminal Station. XLIII, 172.
Railroad freight differentials. XLVI, 233.

Road building. XLI, 133. Theory of concrete. XLII, 123.

CONSIDERE, A.

"Concrete and Concrete-Steel in France."

(Translated from the French by Paul
A. Scurot.) LIV, Part E, 495.

CONSTABLE, CASIMIR.

"Arched Beams." I, 375.

"Retaining Walls.—An Attempt to Reconcile Theory with Practice." III, 67.

concile Theory with Practice. 111, 67.

CONSTABLE, HOWARD.

Elevated railway improvements. LXXXII,

752. Fire-proof construction. XXXIX, 147. Tests of fire-proof flooring material. XXXV, 125.

CONSTANT, F. H.
Engineering education. LXXV, 1094.

CONWAY, GEORGE ROBERT GRAHAM.
"The Water-Works and Sewerage of Monterrey, N. L., Mexico." LXXII, 475.

COOK, HORACE ARTHUR. Memoir of. LXXIX, 1471.

COOKE, R. L. Fires in coal mines. III, 154.

COOKE, SAINT GEORGE HENRY. Memoir of. LXXIX, 1472.

COOLEY, GEORGE W.
"Experiments on the Stability of Bench
Marks." XX, 73.

COOLEY, L. E.

Canals from the Lakes to New York.
XLV, 303.

Jordan Level, Erie Canal. XLIII, 598.

COOMBS, PHLIP HENRY. Memoir of. LXXVI, 2210.

COOMBS, R. D.

Appraisal of public service properties.
LXXV, 855.
Catenary trolley construction. LXII, 194.
Concrete piles. LXV, 502.
Dumbarton Bridge construction. LXXVI, 1615.

COOMBS, R. D .- (Continued).

Hydro-electric power development.

LXXVIII, 1547. Kinetic effects of crowds. LXXVI, 2129. Oil-mixed Portland cement mortar and concrete. LXXIV, 279. "Overhead Construction for High-Ten-

sion Electric Traction or Transmission." LX, 505.

Over-loaded bridges. LVII, 257.
Painting structural steel. LXXVII, 975.
Physical valuation of railroads. LXXVII. 312

Reinforced concrete docks. LXXVIII, 1116.

Reinforced concrete towers. LX, 169. "Round-House Framing." LV, 157. Safe stresses in steel columns. LXI, 201. Structural design of buildings. LIV,

429. Suspension for the contact wires of electric railways. LXI, 27.

COOPER, HUGH L.

Hydro-electric power development. LXXVIII, 1553.

COOPER, K. F.

"An Example of the Legitimate Use of Water for Domestic Purposes." LV,

COOPER, SAMUEL LISPENARD.

Algæ and the purity of water supplies. XXI, 536,

Controverted questions in road construc-tion. XXVIII, 112. Memoir of. LXXVI, 2212.

COOPER, THEODORE.

"American Railroad Bridges." XXI, 1,

Bridge accidents. IV, 214.

Care and maintenance of iron bridges. XI, 424.

Cause and prevention of decay of building stone. XV, 706.
Chimney construction. XIV, 184.

Cranes as labor-saving machines.

Efficiency of railroads for the transporta-tion of freight. XII, 143. Enlargement of the Erie Canal. XIV,

Failure of the Ashtabula Bridge, VI. 214.

Foundations for heavy buildings. XXXV, 472.

High masonry dams. XIX, 177.
Inspection and maintenance of railway structures. XVII, 300.
Journal friction. XIII, 471.
Kentucky and Indiana Bridge. XVII,

Loadings for railroad bridges. LI, 109.

Loadings for railroad bridges. L1, 109. Movable bridges. LX, 317.
"New Facts about Eye-Bars." LVI, 411. Niagara Cantilever Bridge. XIV, 553.
"Notes on the Ercetion of the Illinois and St. Louis Bridge." III, 239.
"Observations on the Stresses Developed in Metallic Bars by Applied Forces." VII 174

VII, 174.

Properties of steel: Its use in structures

and heavy guns. XVI, 317.
Restoration of the cable ends of the
Covington and Cincinnati Suspension
Bridge. XXVIII, 368.

Rolling friction of draw-bridges. XXV, 653.

653.
"Some General Notes on Ocean Waves and Wave Force." XXXVI, 139.
Specifications for strength of iron bridges. XV, 415.
Stability of stone structures. VIII, 253.
Stiffened suspension bridges. LV, 35.
Stoppage of flow in a water main by anchor ice. XVI, 178.
Strength of wrought-iron struts and of structural steel in the form of beams

Strength of Wrought-from struts and of structural steel in the form of beams and struts. XIII, 274.

Structural design of buildings. LIV, 432.

Structural steel. XIII, 47.

Suspension bridges. XXXVI, 428.

Sweetwater Dam. XIX, 228.

Text. of a green through through the structural steel.

Test of a wrong XVIII, 126. Testing machines. wrought-iron floor beam.

"Tests of Friction of Hydraulic Cupped-Leather Packing." XVI, 30. The Launhardt formula and bridge specifications. XLI, 215.

"The Use of Steel for Bridges." VIII,

263. "Train Loadings for Railroad Bridges." XXXI, 174.

Use of asphaltum in building sea walls. XXIV, 228.

Vibration, or the effect of passing trains

vibration, or the effect of passing trains on bridges. XII, 448.
Weights of iron and steel railway bridges. XV, 98.
Wind pressure against bridges. IX, 393.
Wind pressure on bridges. LIV, 37. Wrought-iron columns, tests and formu-Iæ. XI, 66.

COPELAND, WILLIAM R.

Automatic modules for regulating the speed of filtration. LI, 152. Filtration of water. LIII, 254.

Infitration well and pumping plant. LXXV, 706. Pittsburgh flood of March 22d, 1912. LXXVI, 327.

Water and Ohio, LXV and sewage works, Columbus, LXVII, 337.

Water purification at Steelton, Pa. LXVI, 199.

COPPÉE, H. ST. L.

"Bank Revetment on the Lower Missis-sippl." XXXV, 141. Dredges and dredging. XL, 324. "Standard Levee Sections." XXXIX, 191. The discharge of the Mississippi. XXXV,

319.

CORBETT, J.

Water and sewage works, Columbus, Ohio. LXVII, 335.

CORNER, CHARLES.

Physical valuation of railroads. LXXVII,

CORNISH, L. D.

"Earth Pressures: A Practical Comparison of Theories and Experiments. LXXXI, 191.

l'ier construction in New York Harbor.

LXXVII, 545. The hydraulic jump. LXXX, 404.

CORREA, EDWARD ARNOLD.

Memoir of. XLV, 621.

CORRY, T. A.

Gauge of railways. LXXVIII, 427.

CORTHELL, ELMER LAWRENCE.

Artificial waterways. LIV, Part F. 285. Brazos River Harbor improvement. XXV, 561; XXVI, 520.

Dredging river channels. LII, 240. English and American railroads compared. XV, 745. Enlargement of the Erie Canal. XIV,

43.

Harbors. LIV, Part A, 381. High-alloy steels for bridges. LXXVIII,

a6.
Improvement of the mouth of the Mississippi River. V, 275.
Land reclamation. LIV, 83.
Levees of the Mississippi. IV, 85.
Memoir of. LXXXI, 1658.
Natural waterways. LIV, Part D, 450.
Naval architecture. LIV, Part D, 123.
Overflow of the Mississippi River. XI, 256.

256. Practice." LIV. Part F, 499, 545.
Reaction breakwater. XLH, 501; XLIII.

102.

Approaches and Transportation The Paclities of the Paris Exposition of 1900," XLI, 298.
"The South Pass Jetties, Descriptive and Incidental Notes and Memoranda."

VII. 131, 164. "The South Pass Jetties — Ten Years' Practical Teachings in River and Harbor Hydraulies." XIII, 313; XV, 269.
Valuation of railroad properties. LII, 346.

CORY, H. T.

Colorado River siphon. LXXVII, 35.
"Irrigation and River Control in the
Colorado River Delta." LXXVI, 1204. State and national water laws. LXXVI, 714.

orage for impounding reservoirs. LXXVII, 1649. Storage

"Water Supply of the San Francisco-Oakland Metropolitan District. LXXX, 1.

CORYELL, MARTIN.

"Cheap Transportation vs. Rapid Transit and Delivery." IX, 401.
Tests of cement. IX, 341.
"The Anthracite Coal Trade and Labor Question, as Connected." I, 367.
"The Conflagration now Existing in the Coal at Kidder Slope." III, 147; IV, 217.

"The Production of Traffic and the Transportation of Freight and Pas-sengers." II, 240.

COSBY, SPENCER.

"Lighthouse Construction in the Philippines." LVIII, 278.

COTTON, JOSEPH POTTER.

Memoir of. LXXVII, 1851.

COUCHOT, GEORGE JOHN. Memoir of. LXXVII, 1911.

COUCHOT, MAURICE C.

A concrete water tower. LXX, 318. Effects of San Francisco earthquake on engineering constructions, LIX, 223. Halligan Dam. LXXV, 135.

COUNTY, A. J.

National railroad question of to-day. LXXXIII, 935.

COUVREUX, A., fils.

Inter-oceanic canal projects. IX, 124.

COVELL, V. R.
The Sewickley Cantilever Bridge, LXXVI, 631

COVERDALE, W. II.

Railroad location. L11, 521. Valuation of railroad properties. LII, 349.

COVODE, JAMES HENRY.

Memoir of. LXXII, 589,

COWAN, HERBERT WHEELER.

Memoir of. LXXX, 2124.

COWLES, LUZERNE S.

Safe stresses in steel columns. LXI, 163.

COWLES, W. L.

Elevated railroads. XXXVII, 404. Railway bridge designing. XXVI, 162. Wheel concentrations and fatigue formulas. XLII, 203.

COX, LEONARD M.

Pearl Harbor Dry Dock. LXXX, 315. Properties of balsa wood. LXXXI, 160. "The Naval Floating Dock; Its Advantages, Design and Construction." LVIII, 97; LX, 120.

COXE, ECKLEY BRINTON.

Memoir of, XXXVI, 552,

COY, BURGIS G.

"The Laramie-Poudre Tunnel." LXXV,

CRAIGHILL, WILLIAM P.

Address at opening of House, XXXVIII, 429. of New Society

Brazos improvement. XXVI, 518. Concrete-iron highway bridges. XXXI,

460.

Electric light and power station, Rochester, N. Y. XXXI, 357.
Erosion of river banks, XXXI, 24.
Improvement of harbors, XXX, 503.
Improvement of James River, Va.

XXVIII, 449.

Improvement of sedimentary rivers, XX, 116

Memoir of. LXV, 517.
Movable dams, XXXI, 546.
Naval architecture, LIV, Part D, 121.
Presidential Address at the Annual Convention at the Cataract House, Niagara Falls, N, Y., June 20th, 1894.
XXXI, 555.

"Some Observations on the Subject of the Improvement of Several of the Rivers of the Atlantic Coast." XIX, 233.
Uniform practice in pile-driving. XXVII,

165.

CRANDALL, CHARLES LEE,

"Frietion Rollers." XXXII, 99.

CRANDALL, CHARLES LEE .- (Continued).

Memoir of. LXXXII, 1682. Methods of tunnel alignment. XXVII,

Precise spirit leveling. XLV, 181.
"The Adjustment of a Transit Survey as Compared with that of a Compass Survey." XLV, 453. vey." XLV, 453. Translation of paper by F. Guillain.

XXIX, 1.

CRANE, W. E.

Panama Canal. L. 196.

CRANFORD, F. L.

Earth pressures and bracing, LX, 72,

CRAVEN, A. W.

"Description of a Line of Large Water-Mains. Laid by the Croton Aqueduct Department of the City of New York; and an Inquiry into the Causes of Fail-ure of a Few of Them." I. 3. Presidential Address at the Second An-

nual Convention, June 15th, 1870. I,

CRAVEN, ALFRED.

Changes at the New Croton Dam. LVI. 52

CRAWFORD, GEORGE LENOX.

Memoir of. LXXX, 2249,

CREAGER, WILLIAM P.

Action of water under dams. LXXX, 460.

Arch action in arch dams. LXXXIII, 332.

Hydro-electric power plants. LXXIX, 1036.

Pressures in penstocks. LXXXIII, 769. "The Economical Top Width of Non-Overflow Dams." LXXX, 723.

CREHORE, WILLIAM WILLIAMS.

Elevated railroads. XXXVII, 370. Memoir of. LXXXIII, 2181.

Physical valuation of railroads. LXXVII,

290.Preservation of materials of construction.

L, 318. Reinforced con LXXVII, 1721. concrete flat slab

Stiffened suspension bridges. LV, 33. Structural design of buildings. LIV, 471.

CRESSON, B. F., Jr.

Preservation of sandy beaches. LXXX, 1816.

"The New York Tunnel Extension

the Pennsylvania Railroad. The Terminal Station-West." LXVIII, 303.
"The Problem of the Lower West Side Manhattan Water-Front of the Port of New York." LXXV, 226.
Tunnel surveying. LXXV, 91.

CROES, J. JAMES R.

"A Centucy of Civil Engineering." Presidential Address at the Annual Convention at Niagara Falls, N. Y. June 25th, 1901. XLV, 599.

Aeration of water. XV, 144.

Algae and the purity of water supplies.

XXI, 529.

Brooklyn Elevated R. R improvement. XXXII, 379.

Cause and prevention of decay of building stone. XV, 705. Concrete tunnel lining. XXXI, 326.

Construction and maintenance of roads. VIII, 365.

Consumption and waste of water. XXXIV, 207.
Croton Water-Works and supply for the future. V, 270; VI, 68.
Effect of freezing on cement-mortar. XVI, 84.

Electricity vs. steam for branch railroads. XLII, 382.

Engineering ethics. XLIX, 55. English and American railroads compared. XV, 747. Hot tests for Portland cement. XXVII,

436.

Impervious concrete. LI, 121. Improvement of James River, Va.

XXVIII, 446.
Inspection and maintenance of railway structures. XVII, 312.

structures. XVII, 312.
Inspectors and bridge work. XVII, 328.
Irrigation works. XLIX, 43.
Memoir of. LVIII, 524.
"Memoir of the Construction of a Masonry Dam." III, 337.
"Notes on the Flow of the West Branch of the Croton River." III, 76; IV, 307.

307. Preservation of railway ties. XLV, 530. Preservation of timber. XIV, 375. Rainfall and the flow of streams. X,

Report of the Committee on "Nomenclature of Building Stones and of Stone Masonry." VI, 297 (1877); VII, 285.
Self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 68.
Sewage of Memphis. X, 34.
Spongilla in main pipes. XV, 340.
Sweetwater Dam. XIX, 221.
Temperature of water at various depths in lakes and oceans. XIII, 79.
Tests of cement. XIII, 63.
The Holland dikes. XXVI, 691.
The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 587.
The Shone hydro-pneumatic system of sewerage. XXVIII, 59.
The water-works of Syracuse, N. Y. XXXIV, 54.

XXXIV, 54.
3-in. cast-iron submerged pipe line. 28-in. XXXIII, 275.

CROSBY, B. L.

Dredges and dredging. XL, 311. Marine wood-borers. XL, 211.

CROSBY, WALTER WILSON.
"Final Report of the Special Committee
on Materials for Road Construction and on Standards for Their Test and Use. LXXXII, 1384.

Paving practice in Chicago. LXVI, 34.
Precarious engineering expedients.
LXVII, 48.
"Brogress Report of Special Committee
on Bituminous Materials for Road Construction." LXVI, 420.
Road construction and maintenance:
Bituminous surfaces LXVV, 662.

oad construction and maintenance:
Bituminous surfaces. LXXV, 562.
oad construction and maintenance:
Cost records and reports. LXXVII,

132

CROSBY, WALTER WILSON,-(Continued).

Road eonstruction and maintenance: Drainage and foundations. LXXV, 523. Road construction and maintenance: Engineering organizations for high-way work. LXXVII, 1106.

way work. LAXVII, 1100.
oad construction and maintenance:
Factors limiting the selection of materials and of methods in highway
construction. LXXVII, 1133.
oad construction and maintenance: Road

Fillers for brick and block pavements. LXXV, 539.

Road construction and maintenance: Preliminary investigations. LXXIII, 4. nead construction and maintenance:
Relative value of three methods of
carrying on work. LXXIII, 19,
oad construction and maintenance:
Surface treatment with tars, heavy
oils, etc. LXXIII, 49.

Road

LXXIII, 49.

Road construction oad construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 74, 96.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV,

"Sampittic Surfacing." LXIV, 352 Water-bound macadam roads. LXXVI. 992.

CROSBY, WILSON.

Cheap freight transportation. IV. 256. Cylindrical wheels and flat-topped rails for railways. XXI, 165. "Fconomy of Railroad Curvature." II,

Journal friction. XIII, 449.

Memoir of. LXVII, 625.
Proper relation to each other of the sections of railway wheels and rails.

XXI, 256.

Ruling grade for railroads. II, 402.

CROWELL, FOSTER.

A concrete sewer. XXIV, 395.

Asphaltum for reservoir linings. XXVIII, 139

Availability of the caffons of the Colorado for railway purposes. XXVI.

Cements, mortars and concretes. XXV. 279.

"Characteristics of the Ravine du Sud in the Island of Haytl, and Plan for Averting its Overflow." XXIV, 470, 488; XXV, 346. Concrete-iron highway bridges. XXXI,

Concrete tunnel lining. XXXI, 321. Construction of railway tracks. XXV,

Consumption and waste of water. XLVI.

444.

Cost of sewer construction. XXXV, 116 Cylindrical wheels and flat-topped rails for railways. XXI, 182. Dunning's Dam, near Scrauton, Pa.

Dunning's XXXII, 415.

English and American railroads com-pared, XV, 752. Foundations for heavy buildings, XXXV,

479 Friction, waste and loss of water in mains, XIX, 109. Gauges of railway track. XXX, 538. Longitudinals vs. cross-ties for railway track. XXV, 625. Memolr of. LXXX, 2129. Methods of tunnel alignment. XXVII,

460

Notes on a mountain slide. XXIV, 562. "On the Designing and Erection of the Oakley Arch. A Full Centered Oblique Construction of Extreme Skew, to Carry a Railway Embankment over Another Double Track Railway." XXIII,

On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 453.

Pile-driving formulas. XLII, 277.

Preservation of timber. XIV. 380.

Proper relation to each other of the restriction of the relation to each other of the restriction.

sections of railway wheels and rails. XXI, 256.

Protection of steel and aluminum exposed to sea water. XXXVI, 498.
Railroad location. XXXI, 109.
Railroad signaling—the block system.
XXXII, 453.

Railway signaling. XXVIII, 276. Reclamation of the Potomac Potomac Flats.

XXXI, 491. "Report of the Committee on Standard Rail Sections." Progress Report XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).

Right of way for railroads. XXV, 326. Shall civil engineering practice be regulated by law? XLVI, 135. Small rock-fill dams. L. 360. Structural design of buildings. LIV, 466.

Substructure, Lonesome Valley Viaduct. XXXIV, 252.

Suspension bridges. XXXVI, 464. Suspension of solids in rivers. XXXVI,

The discharge of the Mississippi. XXXV,

The form of railway excavations and embankments, XXXII, 256.

The Halsted Street Lift-Bridge. 41. The Holland dikes. XXVI, 690.

Translation of paper by A. Charguéraud. LIV, Part F, 235. Translation of paper by Baron E. T. Quinette de Rochemont. LIV, Part A.

Translation of paper by E. Prieto Basave.

XXIX, 357.

Translation of paper by Francisco Da Silva Ribeiro. XXIX, 447.

Translation of paper by S. V. Pascal. XXIX, 373.

Turn-table on the Silverton Railroad. XXIII, 122.

28-in. cast-iron submerged pipe line. XXXIII, 276.

"Uniform Practice in Pile-Dri XXVII, 99, 160, 593. Unit costs of work. XLIX. 70. Water-works valuation. XXXVIII, in Pile-Driving."

Wind bracing in high buildings. XXVII,

CRYSLER, ARTHUR GARFIELD.

Memolr of. LXXVI, 2254.

CUDWORTH, F. E.

Coffer-dam for 1000-foot pier. LXXXI. 569.

CUDWORTH, F. G.

Road building. XLI, 126.

CULGIN, GUY W.

Cost keeping. LXIV, 431.

CUMMINGS, NOAH.

Invar (nickel-steel) tapes. LX, 246.

CUMMINGS, ROBERT A.

A high-speed gravity filter bed. XXXV, 62.

Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV,

Hoisting apparatus of canal head-gates. XXXII, 312.

Hot-bath tests for cements. XXXII, 337. Light mountain railroad construction. XXXVI, 86.

Reclamation of the Potomac Flats. XXXI, 489.

Submarine rock excavation. XXXII, 254.

CUMMINGS, W. W.

Unit costs of work, XLIX, 71.

CUNNINGHAM, ANDREW CHASE.

"An Instructive Eye-Bar Test." XXXI, 415.

Elevated railroads. XXXVII, 405. Floating dry docks. LVIII, 159. "Hardening Structural Steel." XXVII.

351, 378.

Memoir of. LXXXI, 1691.

Proposed method of testing structural steel. XXX, 669.

Specifications for structural steel. XXXIII, 357.

"The Condition of Steel in Bridge Pins."

XXXVI, 91.

"The Relation of Tensile Strength to Composition in Structural Steel." XXXVIII, 78, 89; XL, 456.

CUNNINGHAM, DAVID WEST. Memoir of. LXXXI, 1695.

CUNNINGHAM, EDWARD.

Impervious concrete. LI, 126.

CUNNINGHAM, JAMES H. American railroad bridges. XXI, 571. English railroad track. XX, 61.

CUNNINGHAM, JOHN MILLER. Memoir of, LIV, 537.

CUNNINGHAM, JOSEPH H. Hydraulic power plants. LV, 250,

CUNNINGHAM, PAUL DAVIS. Memoir of. LII, 556.

CUNTZ, WILLIAM COOPER. 'Memoir of. LXXXI, 1825.

CURRIE, D. M.

Bank revetment on the Lower Mississippi. XXXV, 227.

CURRIER, CHARLES G.

"Self-Purification of Flowing Water and the Influence of Polluted Water in the Causation of Disease." XXIV, 21.

Test of a mechanical filter. XLIII, 84.

CURTIS, C. E.

Hydraulic-fill dams, LXXXIII, 1746.

CURTIS, FAYETTE S.

Address at the Annual Convention in St. Paul and Minneapolis, Minn., June 17th, 1919. LXXXIII, 776.

CURTIS, W. G.

Emergencies on railroads. XXVII, 48. Memoir of. XLV, 624. "Notes on a Mountain Slide." XXIV,

556. Proper relation to each other of the sections of railway wheels and rails. XXI, 257.

CURTIS, WALTER W.

"The Artificial Preservation of Railroad Ties by the Use of Zinc Chloride. XLII, 288.

The Halsted Street Lift-Bridge, XXXIII, 49

Timber preservation. XLIV, 204.

CUSHING, E. B.

Early practice XXXVII, 13. in bridge building. Influence of rails on street pavements. XXXVII, 112.

CUSHING, SAMUEL BARRETT.

Memoir of. XLIX, 343.

CUSHING, W. C.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

CUSHMAN, ALLERTON S.

Painting structural steel. LXXVII, 958.

CUSHMAN, WILLIAM II.

Grouted cut-off for the Estacada Dam. LXXVIII, 508.

CUTSHAW, WILFRED EMORY.

Memoir of. LXXI, 408.

DABNEY, T. G. Atchafalaya River, LVIII, 15, Colorado River and Salton Basin, LIX, 54.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

Hydraulic-fill dams. LVIII, 259.

Levees of the Mississippi River. LI, 389.

The discharge of the Mississippi. XXXV, 308.

DAGRON, JAMES G.

Inspection and maintenance of railway structures. XVII, 278.
Niagara Cantilever Bridge. XIV, 589.
"Some Experiments on the Strength of Bessemer Steel Bridge Compression Members." XX, 254.
Specifications for strength of iron bridges. XV, 458.
Structural steel. XXVII, 376.

"The Protection from Corrosion, of Iron-Work Used as Covering for Railroad Tunnels." XXVII, 324.

DAHLSTROM, KARL P.

Locomotives and other rolling stock. LIV, Part D, 352. Steam turbines. LIV, Part E, 118.

DAKIN, ROBERT EDWARD,

Memoir of, LXXXIII, 2360.

DALRYMPLE, F. W.

Engineering ethics, XLIX, 57. Legitimate use of water. LV, 434.

DANA, RICHARD T.

"A New Safety Explosive." L, 382. Cost keeping. LXIV, 421. Principles of valuation. LXXIX, 170. Reinforced concrete floor systems. LVI, The valuation of public service property.

LXXII, 246.

DANENHOWER, J. W.

Properties of steel: Its use in structures and heavy guns. XVI, 302.

DANFORTH, FREDERIC.

Memoir of. LXXVII, 1853. DANIEL, Z. T. Electric generating stations and transmission. LIV, Part D, 398.

DARLING, JOHN H.

Harbors. LIV, Part A, 361.

DARLINGTON, F. G.

Cause and prevention of decay of building stone. XV, 713. Niagara Cantilever Bridge, XIV, 595.

DARRACH, CHARLES G.

Concrete and concrete-steel. LIV, Part E, 561.

Consumption and waste of water. XXXIV, 204. Control of non-navigable streams. XLIX,

Engineering ethics. XLIX, 58. Flow of water in wood pipe. LXXIV, 472.

Irrigation works. XLIX, 44. "Mechanical Installation in the Modern

Office Building." XLVIII, 1.
Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa. XLVIII, 549.
Reading Terminal in Philadelphia.
XXXIV, 180.

Separate versus general contracts. XLIX,

Steel and masonry construction. XLIX,

74, 93. Stream contamination and sewage puri-

Stream contamination and sewage purification. XLII, 177.

Structural design of buildings. LIV, 464.

Temperature of lakes. XXXIV, 110.

"The Flow of Water in Pipes under Pressure." VII, 114.

The separate sewer system without automatic flush tanks. XXXIV, 226.

Unit costs of work. XLIX, 70.

DART, C. R.

Movable Bridges. LX, 296.

DAUGHERTY, R. L.

"Investigation of the Performance of a Reaction Turbine." LXXVIII, 1270.

DAUZATS, V.

Inter-oceanic canal projects. IX, 97.

DAVENPORT, JAMES AUBREY. Memoir of. LXXXII, 1685.

DAVEY, HENRY.

Filtration of water. XLIV, 419.

DAVID, F. P.

Uniform practice in pile-driving. XXVII, 169.

DAVIES, J. VIPOND.

"Air Resistances to Trains in Tube Tun-nels." LXXV, 982.
Location and design of terminal rail-road stations, and comparison of track, signals, and ventilation in the tunnels of the Pennsylvania and Hudson and Manhattan Railroads; together with ventilation tests in the latter, LXIX. 401.

Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 454. Subaqueous highway tunnels. LXXVIII,

306.

"The Astoria Tunnel Under the East River for Gas Distribution in New York City." LXXX, 594. Tunnel construction methods. LXXXI,

483.

DAVIES, WILLIAM GOMER.

Memoir of. LXXIX, 1474.

State and national water laws. LXXVI,

DAVIS, ARTHUR P.

Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV, 96.

Contracts: "Cost plus" and other forms.

LXXXIII, 805.

Design of masonry dams. LXXV, 207.

Electricity vs. steam for branch railroads.

XLII, 385.
Irrigation. LXII, 52.
Rainfall and stream flow. LIX, 509.
"Specifications and Methods of Tests for Portland Cement." LXXXII, 166.

DAVIS, CHANDLER.

Long-time tests of Portland cement. LXXVI, 1033.

Pier construction in New York Harbor. LXXVII, 546. Reinforced concrete docks. LXXVIII,

1120.

DAVIS, CHARLES.

Memoir of. LXXI, 411.

DAVIS, CHARLES E. L. B.

Lighthouse construction. LVIII, 291.

DAVIS, CHARLES HENRY.

Electric motive power for suburban traf-

fic. XXXVII, 189.
Electricity vs. steam for branch railroads.
XLII, 387.

DAVIS, FRANK LESLIE. Memoir of. LXXIII, 500.

DAVIS, GEORGE JACOB, Jr. Curve resistance in water pipes. LXII,

DAVIS, JAMES L.

Action of frost on coment and cement mortar. LXIV, 337. Laws of proportioning concrete. LIX, Retracement-resurveys. LXXV, 437. The bonding of new to old concrete. LXIV, 271.

DAVIS, JOHN WOODBRIDGE. Memoir of. XLIX, 370.

DAVIS, JOSEPH BAKER.

Adjustment of magnetic bearings of a survey. XV, 344.

Memoir of. LXXXIII, 2183. Metric system of weights and measures. V, 364. Resistances of railway trains. V, 347.
Specifications for strength of iro Specifications for strength bridges. XV, 445. iron

DAVIS, JOSEPH P.

Croton Water-Works and supply for the future. V, 265. Mean horse-power of a stream. XXII, Nomenclature of building stones and of stone masonry. VII, 286. Rainfall and the flow of streams. X, 237. Spongilla In main pipes. XV, 339.
Temperature of water at various depths in lakes and oceans. XIII, 78.

DAVIS, PHILIP CHAPIN. Memoir of. LXXVII, 1912.

DAVIS, W. M.

Geology in its relations to topography. XXXIX, 86. Railroad location. XXXI, 105.

DAVISON, G. S.

Electricity vs. steam for branch rall-roads. XL11, 380. Impurities in sand for concrete. LXV, 262.Oiling of roads. LXV, 466.

DAWLEY, E. P.

Inspection and maintenance of railway structures. XVII, 293. Memoir of, LXXI, 413.

DAWLEY, W. M.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

DAWSON, WILLIAM BELL.

"Rapid Methods in Topographical Surveying." XI, 397.

DAY, W. E.

Tests of concrete in sea water. LXXXI, 684.

DAYMARD, V.

"Marine Engineering in France." (Translated from the French by Paul A. Seurot.) LIV, Part C, 243.

DEACON, GEORGE F. Filtration of water. XLIV, 405.

DEAN, A. L.

Timber preservation. LXXI, 395.

DEAN, A. W.

"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use.

LXXXII, 1384.

"Progress Report of Special Committee on Bituminous Materials for Road Construction." LXVI, 429.

Road construction and maintenance: Bi-tuminous surfaces. LXXV, 548, 570. Road construction and maintenance: En-

gineering organizations for highway work. LXXVII, 1095. Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 65.

DEAN, STANLEY.

Memoir of. LXXXIII, 2362.

DEANE, H.

Gauge of railways. LXXVIII, 432.

DEANS, J. STERLING.

EANS, J. STEASON American railroad bridges. XXI, 572. Memoir of. LXXXIII, 2187. Memoir of. LXXXIII, 2187. Railway bridge designing. Specifications for structure Specifications structural XXX111, 394. The Halsted Street Lift-Bridge. XXXIII, 39.

DEARBORN, WILLIAM L.

"Experiments for Making Brick Mason-ry Impervious to Water, Tried on the Walls of the Back Bays of the Gate-Houses of the New Croton Reservoir in New York, and on the Brick Arch of High Bridge, ln 1863." I, 203.

DEAS, JAMES.

"History of the Conversion of the River Clyde into a Navigable Water-Way, and of the Progress of Glasgow Harbour from its Commencement to the Present Day." XXIX, 128; XXX, 482.

DECKEBACH, F. G.

Improvement of Gray's Harbor, Wash. XXXII, 489.

DECKER, GEORGE P.

Stream administration. LXXVIII, 664.

DECKER, JOHN HULL. Memoir of. LXXXIII, 2365.

DE CONINGH, VAN VRYBERGHE.

Preservation of railroad tles. XLII, 357.

DeCOURCY, BOLTON W.

Emergencies on railroads. XXVII, 52.
"Improvement of Gray's Harbor, Washington." XXXII, 477.
Jetty harbors of the Pacific Coast.
XXVIII, 376.
"On the Straits of Juan de Fuca, Puget

Sound; and Government Improvements on the Pacific Coast." XXV, 420. Rainfall, flow of streams, and storage.

XXVII. 297.

Recent experiments with dynamite on an ocean bar. XXV, 449.
The Holland Dikes. XXVI, 664.

28-in cast-iron submerged pipe line. XXXIII, 283.

DEDICKE, ERNEST CHARLES. Memoir of. LXXXIII, 2418.

DEFOREST, GEO. T. Steel bridge pins. XXXVI, 102.

de FUNIAK, FREDERICK. Memoir of. LIV, 524.

DEGHUÉE, J. H.

Timber preservation. XLIV, 195.

DE KINDER, J. J.

English and American railroads compared. XV, 751.

De KNIGHT, EDWARD W.

Water-proofing railroad bridge floors. LXXIX, 363.

DELAFIELD, CLARENCE.

"The Vicksburg Settling Basins." XXI, 88.

DeLAMERE, C. T.

Water-proofing railroad bridge floors. LXXIX, 382.

DELANO, FREDERIC A.

Proper relation to each other of the sections of railway wheels and rails. XXI, 268.

de la TORRE, ALBERTO.

Memoir of. LXXVII, 1913.

de LAVAL, CARL GEORGE.

Induced currents of fluids. LXXX, 898. Pumping machinery. LIV, Part D, 533.

de LINT, J. A.

"The Improvement of Three Holland Ship Canals." LIV, Part F, 209.

DELSON, ISIDORE.

Stress measurements, Hell Gate Arch. LXXXII, 1087.

de MEYIER, J. E.

"Irrigation in Java." LIV, Part C, 33, 179.

DeMOTT, C. L.

Size of high-pressure water-power pipe. LIX, 183.

DENHAM, DONALD POWER.

Memoir of. LXXXIII, 2420.

DENNIS, A. C.

"Construction Methods for Rogers Pass Tunnel." LXXXI, 448. Traction of freight trains. LXVI, 68. "Virtual Grades for Freight Trains." L, 1.

DENNIS, W. F.

Laws of proportioning concrete. LIX,

"The Scranton Tunnel of the Lackawanna and Wyoming Valley Rallroad." LVI, 219.

"Uniformity of Requirement and Clearness of Specification in Agreements for the Graduation of Railroads." 321.

DENT, ELLIOTT J.

"The Preservation of Sandy Beaches in the Vicinity of New York City." LXXX, 1786.

DENTON, J. E.

Proportional water meter. XXIV, 533. The nozzle as an accurate water meter. XXIV, 520.

DERLETH, CHARLES, Jr.

Effects of San Francisco earthquake engineering constructions. LIX, 223, 311.

DERRICK, HENRY CLAY.

Memoir of. LXXX, 2133.

DESMOND, THOMAS C. Concrete piles. LXV, 498.

DESPRES, H.

"The Plant of Maritime Commercial Ports of France." (Translated from the French by Charles Warren Hunt.) XXX, 235.

DEVIN, GEORGE.

Test of a wrought-iron floor beam. XVIII, 123.

DEYO, S. L. F.

"Final Report of the Special Committee to Investigate the Conditions of Em-ployment of, and Compensation of, Civil Engineers," LXXXI, 1207.

DIAMANT, ARTHUR H.

nder concrete floor construction. LXXIX, 640. Cinder

Cinder concrete floors. LXXVII, 1800.
"The Installation of a Pneumatic Pumping Plant." LIV, 1.
Use and care of the current meter.

LXVI, 106.

DICKINSON, POMEROY P. Memoir of. XLIII, 611.

DIECK, ROBERT G.

Flow of water in wood pipe. LXXIV,

The sewer system of San Francisco. LXV, 385.

DIEHL, GEORGE C.

Road construction and maintenance: Systems of maintenance. LXXIII, 28.

DIETZ, W.

Indeterminate frameworks. XLIII, 421.

DILLMAN, GEORGE L.

phenomenal land slide. LIII, 398;

LXXXII, 797.

"A Proposed New Type of Masonry Dam." XLIX, 04.

Correction of foundation troubles LXXXIII, 1311.

Design of the New Croton Dam. LVIII.

Effects of San Francisco earthquake on engineering constructions. LIX, 245. Flood of March, 1907, in California rivers.

Flood of March, 1907, in California rivers. LXI, 357.
Grading contracts. LVIII, 352.
Hydraulic-fill dams. LXXXIII, 1771.
Morena Rock Fill Dam. LXXV, 52.
Railroad surveys. LXV, 143.
Redemption of the Great Valley of California. LXVI, 259.
State and national water laws. LXXVI.

690.

DILLON, SIDNEY.

Memoir of, XXXVI, 603.

DIRKS, JUSTUS. Inter-oceanic canal projects. IX, 95, 117.

DIVEN, ALEXANDER SAMUEL. Memoir of. XXXVII, 571.

DIVEN, J. M. Water purification at Steelton, Pa. LXVI,

DOANE, F. W. W.

214.

Bridge substructure and foundations in Nova Scotia. XXX, 569.

DOANE. THOMAS.

Cylindrical wheels and flat-topped rails for railways. XXI, 163. Memoir of, XXXIX, 690.

DOANE, W. A.

Wheel concentrations and fatigue formulas. XLII, 192.

DOBLE, WILLIAM.

Water power and compressed air transmission plant. XXXVI, 191.

DODD, J. N.

Depreciation as an element in appraisal. LXXIX, 819.

DODGE, ARTHUR P.

Motive power for street railways. XXVII.

DODGE, JOSEPH T.

ost of operating XXVIII, 459. Cost cable railways.

"Destruction of Rails by Excessive Weights," XX, 121. Old-time water-wheels of America. XXVIII, 247. The manufacture of brick. XVIII, 304.

D'OLIER, WILLIAM L.

Sewage clarification by fine screens. LXXVIII, 1019.

DONALDSON, FRANCIS.

Grouting operations. LXXXIII, 100 Subway tunnel work. LXXXI, 405. 1068

DONHAM, B. C.

Highway construction. LIV, Part F,

DOOLITTLE, H. J.

Economic canal location. LXXIV, 189.

DORSEY, EDWARD BATES.

"English and American Railroads Com-

pared." First Paper, XV, 1, (Jan., 1886); Supplementary Paper, XV, 733 (Nov., 1886).
"English and American Railroads Compared in Operating Expenses." XX,

131.

"Excavation and Embankment by Water Power." XV, 348. Flow of water in pipes. XIV, 16. "Free Railway Construction vs. Govern-

ment Controlled and Owned Railways." XXV, 628. "Irrigation." XVI, 85.

"AN, 050."
"Irrigation." XVI, 85.
Niagara Cantilever Bridge. XIV, 568.
"On the Comparative Liability to, and
Danger from Conflagrations, in London and in American Cities." XIII, 172.

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 286.
"Structural Steel." First Paper, XIII, 41 (1884); Supplementary Paper, XIV, 197 (1885).

Temperature of water at various depths in lakes and oceans. XIII, 81. Water power with high pressures and wrought-iron water pipe. XIII, 33.

DOTEN, LEONARD S.

External corrosion of cast-iron pipe. LXXVIII, 871.

"Sewage and Wastes Disposal for the United States Army." LXXXIII, 337.

DOUGHERTY, R. E.

Tunnel construction methods. LXXXI,

DOUGLAS, BENJAMIN.

Memoir of. LXXV, 1151. Railway bridge designing. XXVI, 205.

DOUGLAS, E. M.

Spirit leveling. XXXIX, 389.

DOUGLAS, H. S.

Standard levee sections. XXXIX, 214.

DOUGLAS, H. T.

Mexico and Pacific Railroad. LXXX, 1609.

DOUGLAS, WALTER J.

A reinforced concrete stand-pipe. LXXIV, 393.

Design of masonry dams. LXXV, 203. Multiple-arch dams. LXXXI, 892. Progress report of Special Committee on Concrete and Reinforced Concrete. LXVI, 481.

"Reinforced Concrete Bridge Across the Almendares River, Havana, Cuba.

LXXIV, 216.
Reinforced concrete buildings. LX, 460.
Reinforced concrete docks. LXXVIII, 1128.

DOW, A. W.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV, 647.

DOW, ALEX.

Valuation of public utility property. LXXIX, 879.

DOWNE, GEORGE.

English and American railroads compared. XV, 759.

"Street Motors on the Government Tramways at Sydney, New South Wales. XXVIII, 150.

DOWNS, W. S.

of Stony River Dam. Reconstruction LXXXI, 1036.

DOYEN, G. E.

Shear tests on joints in T-beam stems. LXXVII, 1530.

DRAKE, M. M.

Enlargement of the Eric Canal. XIV, SS.

DRAKE, R. M.

Effects of San Francisco earthquake on engineering constructions. LIX, 258.

DRESSER, GEORGE W.

Sewerage of Memphis. X, 36.

DRISCOLL, MICHAEL.

Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 68. Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 88.

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 614.

DROWN, THOS. M.

Purification of sewage and water by filtration. XXX, 705.

DROWNE, HENRY B.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous payements. LXXVII, 178.

Road construction and maintenance:
Relative value of three methods of
carrying on work. LXXIII, 15.
Sampittic surfacing. LXIV, 373.

DRURY, EDMUND HAZEN.

Memoir of. LXXXI, 1697.

DRUYVESTEYN, W. F.

"Cylindrical Foundations for a Quay Wall in the Harbour of Delfzyl." LIV, Part E, 125.

DUANE, JAMES.

Concrete tunnel lining. XXXI, 322.

High masonry dams. XXXIV, 513.

On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 463.

Protection of piles from the Teredo.

Protection of piles from the Teredo. XXXI, 234.

"The Effect of Tuberculation on the Delivery of a 48-In. Water Main." XXVIII, 26, 274.

The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 589.

3-in. cast-iron submerged pipe line. XXXIII, 280.

DUANE, JAMES CHATHAM.

Memoir of. XXXIX, 686.

DU BOIS, AUGUSTUS JAY.

"A New Formula for the Strength of Columns." XXVII, 69.

Columns." XXVII, 69.
"Formulas for the Weights of Bridges."
First Paper, XVI, 191, 242, 259 (1887);
Supplementary Paper, XVIII, 179

(1888).

Memoir of. LXXXI, 1699.

Railway bridge designing. XXVI, 152. Theory of continuous girders. V, 222. Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 496. Weights of iron and steel railway bridges. XV, 105.

DUBOIS, GUSTAVO ADOLFO.

Memoir of. LXXXIII, 2367.

DUDLEY, C. B.

Painting of iron structures. XXXIII,

DUDLEY, CHARLES TARBELL.

Memoir of. LXIV, 588.

DUDLEY, P. H.

sections of railway wheels and rails. XXI, 272. Proper relation to each other of the

The creeping of rails. LIII, 488.

DULLER, DAVID M.

Irrigation. LIV, Part C, 161.

DUMAS, L.

Nickel steel for bridges. LXIII, 327.

DuMOULIN, W. L.

"The Pumping Plant of the Morenci Water Company." LXXIX, 1268.

DUN, JAMES.

Memoir of. LXI, 560.

DUNCAN, LINDSAY.

Design of masonry dams. LXXV, 207. Pumping plant, Morenci Water Co. LXXIX, 1320.

DUNCKLEE, JOHN B.
"The Iron Wharf at Fort Monroe, Va."
XXVII, 115.

DUNHAM, FREDERICK.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV. maintenance: 607.

DUNHAM, H. F.

"A Method of Tunnel Alignment." XXVII 453.

American highways. LXXXIII, 569. Bacteria and other organisms in water. XXXIII, 446.

Concrete and concrete-steel. LIV, Part E. 573.

Consumption XXXIV, 204. and waste of water.

Decolorization of water. XLVI, 180.
Design of masonry dams. LXXV, 197.
Detroit River Tunnel. LXXIV, 358.
Efficiency of centrifugal pumps. LVI, 162

Fatigue of cement products. LI, 449.

DUNHAM, H. F .- (Continued).

Faults in the theory of flexure. LXXV. 930

Flushing in pipe sewers. XL. 28

Going value of water-works. LXXIII, 373.

High masonry dams. XXXIV, 517. Hydraulic-fill dams. LXXXIII, 1774. Hydrography of the Potomac Ba Hydrography XXVII, 35. Basin.

nfiltration well and pumping plant. LXXV, 707. Infiltration

Johnsonville, Tenn., Bridge. XXXIII,

Lateral earth pressures. LIII, 306.

railways of the battle front. Light LXXXIII, 1247.

Oil-mixed Portland cement mortar and concrete. LXXIV, 282.

Physiography of water-sheds and channels. LXXXIII, 1140.

Pumping machinery. LIV, Part D, 538.
Purification of ground-waters. LXIV,

Railroad construction. LI, 439.

Reconstruction of Stony River Dam. LXXXI, 1039.

Restoration of the cable ends of the

Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge. XXVIII, 367.
Sinking a wet shaft. LXXIII, 418.
Steel concrete construction. XXXIX, 638. The hydraulic jump. LXXX, 390.
The Tieton Canal. LXXI, 187.
Theory of concrete. XLII, 119.
28-in. cast-Iron submerged plpe line. XXXIII, 282.
Water supply for camps, cantonments, etc. LXXXIII, 531.
Water supply of Parkersburg, W. Va. LXXXI, 806.
Water-works of Porterville. Cal. LIV.

Water-works of Porterville, Cal. LIV,

Water-works valuation. XXXVIII, Wind bracing in high buildings. XXVII,

Yale Bowl. LXXXI, 286.

DUNN, B. W.

Investigations of explosives. LXX, 314.

DURAND, W. F.

"Marine Engineering." LIV, Part C, 1S3. Naval architecture. LIV, Part D, 124.

DURANT, THOMAS C.

Memoir of. XXXVI, 602.

DURHAM, C. WHEELER.

Uniform practice in pile-driving. XXVII, 164.

DURHAM, EDWARD B.

Method of computing cable deflections. LXXXIII, 1400.

DURHAM, HENRY W.

Road construction and maintenance: Cost records and reports. LXXVII, 150.

and maintenance: Road construction Engineering organizations for highway work. LXXVII, 1096.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1151.

DURYEA, EDWIN.

"A Study of the Depth of Annual Eva-poration from Lake Conchos, Mexico."

LXXX, 1829.

Action of frost on cement and cement mortar. LXIV, 345.

Changes at the New Croton Dam. LVI.

65. Durability of wooden stave pipe. LVIII.

Effects of San Francisco earthquake engineering constructions. LIX, 208, 264.

Efficiency of centrifugal pumps. LVI, 167.

Flood of March, 1907, in California rivers. LXI, 360.

LXI, 360.

Dam and Reservoir.

LIII, 172.

Lake

Legitimate use of water. LV, 441. Multiple-arch dams. LXXXI, 894. Rain and run-off near San Francisco. LXI, 517.

Suspension bridges. XLVIII, 442, The Bohio Dam. XLVIII, 298. Water supply of the San Francis Oakland Meteory. ater supply of the San Francisco-Oakland Metropolitan District. LXXX,

DUSENBERRY, WALTER LORTON. Memoir of. LXV, 533.

DUTTON, CHAUNCEY N.

Effect of depth npon artificial waterways. XXXV, 19.

DYER, C. W. D.

167.

Weir." "The Cippoletti Trapezoidal XXXII, 9.

EADS, JAMES B.

Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122 (1875). South Pass Jetties. IX, 291; also, XV,

276.

Tests of cement. IX, 342. "Upright Arched Bridges." III, 195, 319; IV, 174, 177. Wind pressure against bridges. IX, 395.

EAGER, VERNON M.

Mississippi Valley drainage. LXXIX,

EAKIN, H. M.

Floods and flood prevention. LXXXI, 1235.

EARLY, JOHN E.

Availability of the canons of the Colorado for railway purposes. XXVI, 342. Memoir of. LXI, 562.

EASBY, M. WARD.

Reconstruction of substructure of the Johnsonville Bridge. XXXI, 602. Separate versus general contracts. XLIX, 10.

EATON, FREDERICK.

Irrlgation. XVI, 117.

EATON, HORACE LAFAYETTE. Memoir of. XXXVI, 554.

EATON, J. SHIRLEY.

Physical valuation of railroads. LXXVII,

EAYRS, N. W.

Bridge painting, XXXIX, 44. Littoral movements of the New Jersey coast. XXIII, 145. Painting of iron structures. XXXIII,

Preservation of railroad ties. XLII, "The Ventilation of Tunnels." X2 XXIII.

Tornadoes and wind bracing for high buildings. XXXVII, 292.

EBER, JOHN WILLIAM.

Memoir of. LXXX, 2135.

EBERLY, CLARENCE FREDERICK. Memoir of. LXXXIII, 2369.

EBERLY, VIRGIL A.

"A Brief Review of Trigonometrical Mathematical Tables, and a Contempla-tion of the Specifications for Trigono-metrical Tables for General Use." LXXXII, 753.

ECKART, N. A.

Electric generating stations and transmission. LIV, Part D, 398.

ECKART, WILLIAM ROBERTS.

Memoir of. LXXIX, 1347.

ECKERSLEY, J. O.

Nomographic solutions for form LXXVIII, 1383. Strength of columns. LXXVI, 280. solutions for formulas.

Steel stresses in flat slabs. LXXVII, 1392.

EDDY, HENRY T.

"A New Graphical Solution of the Problem, What Position a Train of Concentrated Loads must have in Order to Cause the Greatest Stress in any Given Part of a Bridge Truss or Girder." XXII, 259.

Concrete and reinforced concrete.

LXXXI, 1167.

Designing reinforced concrete slabs.
LXXX, 1722.
New principle in the theory of structures. LXXXIII, 687.
Permanent effects of strain in metals.
XXIV, 166.
Railway bridge designing. XXVI, 138.
Reinforced concrete flat slab floors.

Reinforced con LXXVII, 1705.

"Steel Stresses in Flat Slabs." LXXVII, 1338.

EDE, J. A.

Mining engineering. LIV, Part A, 135.

EDWARDS, JAMES H.

"Final Report of the Special Commit-tee on Steel Columns and Struts," LXXXIII, 1583.

BDWARDS, JOSEPH.

"The Improvement of the Channels at the Entrance to the Harbor of New York." XXV, 573.

EDWARDS, N. M.

Enlargement of the Erie Canal. XIV. 101.

High masonry dams. XIX, 199. Rainfall. XIII, 374. Water power of the Falls of St. Anthony. XII, 423.

EDWARDS, W. W.

"The Construction of the Kloudike Pipe Line." LXXVIII, 547.

EGLESTON, THOMAS.

"An Accident to Steam Pipes Arising from the Use of Blast Furnace Wool." XII, 253.

English and American railroads compared. XV, 747.

Peculiar phase of metallic behavior. XI,

Preservation of forests. XIV, 393. Preservation of timber. XI, 356; XIV,

374. Rebuilding of the Monongahela Bridge.

"The Cause and Prevention of the Decay of Building Stone." XV, 647.
"The Disintegration of the Egyptian Obelisk in the Central Park, New York." XV, 79.

EHLE, BOYD.

Panama Canal. L, 196. The Bohio Dam. XLVIII, 283.

EHRHART, R. N.

Steam turbines. LIV, Part E, 119.

EICHBAUM, GEORGE R.

"Selection of Stone for Masonry." II, 167.

EIDLITZ, LEOPOLD.

"The Strength of Pillars. — An Analy-sis." XXXV, 371.

ELDRIDGE, ARCHIBALD R.

"Is It Unprofessional for an Engineer to be a Patentee?" XLVIII, 314.

ELIOT, W. M.

solutions for formulas. Nomographic so: LXXVIII, 1393.

ELLIOT, MICHAEL.

Irrigation, LIV, Part C. 153.

ELLIOTT, G. A. M.

Hydraulic-fiil dams. LXXXIII, 1752.

ELLIOTT, J. S.

Weights of iron bridges. XV, 118. and steel railway

ELLIOTT, MALCOLM.

Action of water under dams. LXXX, Designing an earth dam. LXXXI, 39.

ELLIS, FRED. E.

Road construction and maintenance: Bi-tuminous surfaces. LXXV, 557.

Road construction and maintenance: Rel-

ative value of three methods of carrying on work. LXXIII, 20. Road construction and maintenance: Sur-face treatment with tars, heavy olls, etc. LXXIII, 67.

ELLIS, GEORGE HENRY.

"The Flow of Water in Irrigation Channels." LXXX, 1644.

ELLIS, JOHN WALDO.

Memoir of, LXXXI, 1702.

ELLIS, THEODORE G.

"Description and Results of Hydraulie Experiments with Large Apertures, at Holyoke, Mass., in 1874." V, 19, 297. Erection of bridges. 1V, 206.

"Experimental Strains upon a Bowstring

"Experimental Strains upon a Doubting Trussed Girder." II, 107.
Flexure of beams. III, 56.
Flood discharge of rivers. XI, 228.
Flow of water in pipes under pressure, and in open channels. VII, 12 Memoir of. XXXVII, 557.

Metric system of weights and measures.

V, 369.

"Mexican Method of Making Hard Lime Floors." II, 179. Rainfall, resulting water supply and

gauging of streams. IV, 303. Report of the Committee on "The Failure of the Dam on Mill River." 111, 118

(1874).

Report of the Committee "On the Failure of the Worcester Dam." V. 244 (1876). Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122,

208 (1875). River mouths. 1V, 292. "The Aneroid Barometer and its Use in Estimating Altitudes." I, 277.

"The Causes of the Formation of Bars at the Mouths of Rivers, as Shown in an Examination of the Connecticut River." II, 313, "The Flow of Water in Open Channels."

VI, 250.

ELLMS, JOSEPH W.

"A Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing." LXXX, 1342. Purification of ground-waters. LXIV.

Water and sewage works, Columbus, Ohio. LXVII, 324.

ELLSWORTH, EMORY ALEXANDER. Memoir of. LXXX, 2136.

ELWELL, JOHN D.

Street railway track. XXIV, 135.

ELY, THEODORE NEWEL.

Memoir of, LXXXI, 1705.

EMERSON, GEORGE II.

Improvement of Gray's Harbor, Wash. XXXII, 488.

EMERY, A. H.

Properties of steel: Its use in structures and heavy guns. XVI, 315. Testing machines. XVI, 15.

EMERY, CHARLES E.

"A Novel Application of the Polar Planimeter." XVIII, 312.

Accidents to steam pipes. XII, 262. Bacteria and other organisms in water. XXXIII, 447.

Chimney for the Narragansett Electric Lighting Company, Providence, R. I. XXV, 7.

"Clamp for Pulling Sheet Piling." XX,

Compensation for railroad curves. XIII,

"Compound and Non-Compound Engines, Steam-Jackets, etc." III, 368. "Connected-Arc Marine Boilers, a Demon-stration of the Principles of their Construction." VI, 169.

"Cost of Steam Power," XII, 425. Cranes as labor-saving machines, XV, 376.

Cushioning the reciprocating parts of steam engines. IX, 111. "District Steam Systems." XXIV, 188,

217.

Efficiency of furnaces burning wet fuel. III, 334.

Efficiency of railroads for the transporta-tion of freight. XII, 136. Electric light and power station, Roch-ester, N. Y. XXXI, 359.

Electric motive power for suburban traf-fic. XXXVII, 178. "Flexure and Transverse Resistance of Beams," VIII, 149.

Flow of water in pipes. XXII, 69. Flow of water in pipes under pressure, and in open channels. VII, 124. High masonry dams. XIX, 178.

High masonry dams. XIX, Journal friction. XIII, 472

Kentucky and Indiana Bridge, XVII, 180.

Mean horse-power of a stream. XXII, 402

Memoir of, XLII, 558.

Motive power for street railways, XXVII, 581. "Observations on the Forth Bridge."

XXII, 409. l'ainting of iron structures. XXXIII,

Power required to drive electric street cars. XXVII, 676.
Preservation of the Falls of St. Anthony. XII, 410.
Rainfall and the flow of streams. X,

Rapid transit in large cities. IV, 251.
"Relative Quantitles of Material in
Bridges of Different Kinds, of Varlous
Heights." VI, 235 (Section I); VI, 277 (Section II).

Resistances of railroad curves.

Right of way for railroads. XXV, 328. Screw steamship and tow-barge efficiency. XXV, 385. Stability of stone structures. VIII, 255. "Steam Engine Economy. A Uniform Basis for Comparison." VII, 60. Subaqueous foundations. XXIV, 239. Substructure, Lonesome Valley Vladuct. XXXIV, 252. Testing machines. XVI. 23

Testing machines. XVI, 23.
Tests and testing machines. IV, 271.
The Halsted Street Lift-Bridge. XXXIII, 39.

"The Station B Chimney of the New York Steam Co." XIV, 180.

The water-works of Syracuse, N. Y. XXXIV, 60.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXV, 494. 28-in. cast iron submerged pipe line. XXXIII, 276.

EMERY, CHARLES E .- (Continued).

Twenty-eighth Street electric light and power central station. XXXV, 451. Underpinning XXXVII, 47. heavy buildings. of

Vibration, or the effect of passing trains

on bridges. XII, 449.
Water power with high pressures and wrought-iron water pipe. XIII, 36.
Water-works valuation. XXXVIII, 145. Wind bracing in high buildings. XXXIII,

Wrought-iron columns, tests and formu-

Iæ. XI, 93.

EMIGH, JOHN HALL.

Memoir of. LXVII, 628.

EMMONS, CHARLES MORTON.

Memoir of. LXXIV, 499.

LXL Safe stresses in steel columns. 164.

EMONTS, WILLIAM ALEXIS GEORGE, Memoir of. XXXVI, 594.

EMPERGER, FRITZ von.

"Concrete-Steel Bridges." LIV, Part E, 523. 616

"Hollow Tile Floors, Past and Present."
XXXIV, 521.
Tests of fire-proof flooring material.
XXXV, 133.

"The Development and Recent Improvement of Concrete-Iron Highway Bridges." XXXI, 438.

ENDICOTT, M. T.

"Address at the 43d Annual Convention. Chattanooga. Tennessee, June 13th, 1911." LXXIII, 392. Dry docks - stone vs. wood. XLI, 570.

ENGELS, H.

Attainable in Improving "The Limits the Navigability of Rivers by Means of Regulation." (Translated from the German by Kenneth Allen.) XXIX. 202; XXX, 492.

ENGER, MELVIN.

Flow of water in wood pipe. LXXIV,

ENGESSER, FR.

The arch principle in long-span bridges. LXXI, 257.

ENGSTROM, FRANS.

Memoir of, LXXXI, 1798.

ENNIS, WILLIAM D.

Expansion of pipes. LXX, 31.

EPPELE, FRANK J.

Surface treatment with oils, etc. LXXIII, 57. maintenance: Road construction with tars, heavy

oad construction and maintenance: The use of bituminous materials by Road construction mixing methods. LXXIII, 108.

ERDMAN, SEWARD.

Caisson disease and its prevention. LXV. 32.

ERDMANN, EARL EDWIN, Memoir of, LXXIV, 529.

ERLANDSEN, OSCAR.

Surveying instruments. XLVIII, 125.

ERLINGHAGEN, OSWALD.

Concrete and concrete-steel. LIV, Part E. 556. Stiffened suspension bridges. LV, 40. The mannfacture of cement. LIV, Part B, 129. The manufacture of steel. LIV, Part E. 411.

ERNST, O. II.

Brazos River Harbor improvement. XXV, 538.

ESPINOZA, LUIS.

Tequixquiac Tunnel. XXXII, 267.

EVANS, J. M.

Influence of rails on street pavements. XXXVII, 129 Maintenance of asphalt streets. XLIX.

Street grades and cross-sections. XLII, 17.

EVANS, M. E.

Asphalt and asphalt pavements. XXXVIII, 237. Bridge painting. XXXIX, 28.

EVANS, RICHARD.

Memoir of. LXXXI, 1709.

EVANS, WALTON W.

English and American railroads eom-pared. XV, 776. Enlargement of the Erie Canal. XIV, 96

Inter-oceanic canal projects. I Manufacture of rails. IV, 236. Manufacture of rails. IV, 236, "The Abt System of Railway for Steep Inclines." XV, 147.

EVEREST, CHARLES M.

Bridge painting. XXXIX, 38.

EWALD, ROBERT F.

The hydraulic jump. LXXX, 390.

EWING, WILLIAM BION.

Memoir of, LXXIV, 500.

FAIJA, HENRY.

"On the Manufacture and Testing of Portland Cement." XXX, 43, 607. "Portland Cement Testing." XVII, 218.

FAIRCHILD, C. B.

Street railway track. XXIV, 150.

FAIRLEIGH, J. A.

Tests of eement. LIV, Part F. 45. The manufacture of cement. LIV, Part B, 125.

FALES, ALMON L.

Sewage and wastes disposal for the U.S. Army, LXXXIII, 357.

FALK, MYRON S.

"A System of Cost Keeping." LXIV, 401.

FALK, MYRON S .- (Continued).

concrete Cinder floor construction.

Cinder concrete Hoof Constitution LXXIX, 623.

"Note on the Coefficient of Elasticity of Concrete and Mortar Beams during Flexure." L, 473.

Sanitary disposal of refuse. L, 144.

"The Production of Toluol from Gas Plants." LXXXIII, 904.

"Two Reinforced Concrete Coal Pockets."

LXXI, 192. Use of reinforced concrete. LXI, 61.

FANNING, JOHN T.

"A Water Conduit under Pressure." VI, 69.

Flow of water in pipes under pressure. and in open channels. VII, 128.

Friction, waste and loss of water in mains, XIX, 110. Hoisting apparatus gates. XXXII, 299. of canal head-

Pulp mill at Niagara Falls. XXXII, 220. Pumping machinery. LIV, Part D, 584. Sandrock sewers of St. Paul. XXXII, 202

Temperature of lakes. XXXIV, 110. The Holland dikes. XXVI, 667. The Niagara Gorge. XXXII, 211.

FARGUSSON, M.

Asphaltum for reservoir linings. XXVIII,

FARNHAM, HENRY.

Memoir of, XXXVI, 605.

FARNHAM, IRVING TUPPER. Memoir of. LXXI, 415.

FARQUHAR, F. U.

"Preservation of the Falls of St. Anthony." XII, 393.

FARR, W. B.

Economics of steel arch bridges. LXXXIII, 66.

FARRINGTON, WILLIAM R.

Road construction and maintenance: Equipment and methods for maintenance: Equipment and methods for maintain-ing bituminous surfaces and bitumi-nous pavements. LXXVII, 1155.

FELL, GEORGE E.

Buffalo Breakwater. LII, 205.

FELLOWS, A. L.

Irrigation. LXII, 19.

FELT, C. F. W.

Timber preservation. XLIV, 210.

FELT, E. P.

breeding. Prevention of mosquito LXXVI, 771.

FELTON, HERBERT C.

Screw steamship and tow-barge efficiency. XXV, 385.

FELTON, S. M.

"Final Report of Special Committee on Rail Sections." LXX, 456.

Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).

"Report of the Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Ralls." Pre-liminary Report, XIX. 1 (1888); Final Report, XXI, 223 (1889).

FENKELL, GEORGE H.

"Experiments at Detroit, Mich., on the Effect of Curvature upon the Flow of Water in Pipes." XLVII, 1. Flow of water in Ogden, Utah, pipe line.

XLIV, 73. Flow of water in pipes. LI, 323.

FERET, R.

Laws of proportioning concrete. LIX. 152.

FERGUSON, LEWIS R.

Tests of concrete in sea water. LXXXI. 703.

FERGUSON, O. W.

Spirit leveling. XXXIX, 411.

FERGUSSON, JOHN C.

High-alloy steels for bridges. LXXVIII,

FERNALD, ROBERT HEYWOOD. Gas engines. LIX, 405.

FERRIER, JOSEPH JAMES.

Memoir of. LXXIV, 530. FERRIS, JAMES JOSEPH. Memoir of. LXXVII, 1855.

FERRIS, WALTER.

Flow of water in pipes. XLVII, 268,

FERRY, CHARLES A.

"The Yale Bowl." LXXXI, 249.

FETHERSTON, J. T.

"Municipal Refuse Disposal: An Investigation." LX, 345.

FICHTHORN, J. H.

Water-proofing railroad bridge floors. LXXIX, 362.

FICKES, C. R.

Sinking bridge piers. LXII, 120.

FIDLER, T. CLAXTON.

Nickel steel for bridges. LXIII, 312.

FIEBEGER, G. J.

Influence of rails on street pavements. XXXVII, 93.

FIELD, BURR KELLOGG.

Memolr of. XL, 568.

FIELD, JOHN E.

Hydraulic-fill dams. LXXXIII, 1801.

FIESEL, RICHARD A.

Secure subway supports. LXXX, 941.

FILLEY, H. H.

American railway line, Vera Cruz to City of Mexico. XV, 838. Railway bridge designing. XXVI, 185.

FINCH, J. K.

Rainfall and run-off. LXXVII, 376. Reconstruction of Stony River Dam. LXXXI, 1027.

Reinforced concrete reservoir. LXXVII, 1061.

FINK, ALBERT.

Memoir of, XLI, 626. Railroad accounts and returns. V. 332.

FINKLE, F. C. Irrigation. LXII, 37.

FIRMSTONE, FRANK. Memoir of. LXXXI, 1711.

FIRTH, ELMER W.

Sanitary disposal of refuse. L. 143,

FISCHER, E. G.

Precise spirit leveling. XLV, 127. "Surveying." LIV, Part B, 399, 468.

FISHER, CHARLES H.

Efficiency of railroads for the transporta-tion of freight. XII, 138. Erection of bridges. IV, 205. Rapid transit in large eities. IV, 242. Report of the Committee on "Railway Signals." IV, 147, 237 (1875).

FISHER, CLARK.

Draw-bridges. IV, 204.

FISHER, EDWIN A.

Municipal refuse disposal. LX, 419.

FISHER, ELSTNER.

Memoir of. LXVI, 497.

FISHER, FRANCIS D.

Tunnel surveying. XXIII, 33.

FISHER, FRANK R.

Grouted eut-off for the Estacada Dam. LXXVIII, 506.

FISHER, SAMUEL B.

Underground railways. LIV, Part F, 368.

FISHER, WAGER.

Flow of water in pipes. XLVII, 288. Stadia topographle surveys. XLIV, 114.

FITCH, ASA BETTS.

Memoir of, LXXX, 2138.

FITTING, HAROLD HANSEN. Memoir of. LXXIX, 1477.

FITZGERALD, DESMOND.

water-tight masonry dam, XXVIII. 348.

"Analysis of the Rainfall at Lake Cochi-tuate, Mass., 1852-1883." XIII, 359. Bacteria and other organisms in water.

XXXIII, 450.

Comparison of water supply systems from a financial point of ylew, XXIV.

Consumption onsumption and waste of XXXIV, 201; also, XLVI, 427. water. Decolorization of water. XLVI, 178. "Evaporation." XV, 581.

"Flow of Water in 48-In. Pipes." XXXV, 241.

Flow of water in Ogden, Utah, pipe line.

Flow of water in Ogden, Ctan, pipe index XLIV, S6.
Hoisting apparatus of canal head-gates. XXXII, 298.
Irrigation in India. XXIII, 253.
"Lining a Water-Works Tunnel with Concrete." XXXI, 294.
"Maximum Rates of Rainfall." XXI, 93.

Presidential Address at the Annual Convention at Cape May. N. J., June 27th, 1899. XLI, 596.

Protection from corrosion of iron tun-nel linings. XXVII, 329.

nel linings. XXVII, 329.
Quality of water supplies. XXXII, 157.
"Rainfall, Flow of Streams, and Storage." XXVII, 253.
Temperature of water at various depths in lakes and oceans. XIII, 78.
The form of railway exeavations and embankments. XXXII, 259.
The Holland dikes. XXVII, 663.
"The Spongilla in Main Pipes." XV, 259.

337. "The Temperature of Lakes." XXXIV, 67.

Tuberculation in water pipes. XXVIII, 266.

in the Freshet of Feb. 10th-13th, 1886. XXV, 253. "Yield of the Sudbury River Watershed

FITZGERALD, J. LELAND.

"Comparison of Water Supply Systems from a Financial Point of View." XXIV,

FLAD, EDWARD.

Dredges and dredging. XL, 311. and water by

Purification of sewage filtration. XXX, 702.

Reinforced Concrete Reservoir and Coagulation Plant at St. Louis, Mo. "Reinforced and LXXVII, 1052.

FLAD, HENRY.

Memoir of, XLII, 561. Presidential Address at the Annual Convention, at Denver, Colo., July 2d. vention, at I 1886. XV, 499.

FLAGG, J. FOSTER.

Asphaltum for reservoir linings, XXVIII,

Connected are marine boilers. VI, 294. "Efficiency of Steam Vacuum Pumps."

V, 381.

Erection of bridges. IV, 207.

Excessive rainfalls. XXV, 108.

Failure of a masonry pier and a rock foundation. XXXI, 583.

Levees as a system for reclaiming low-lands. VI, 305.

"Mexlean Bridge Construction." XV, 345.

Nomenclature of building stones and of stone masonry. VII, 284.

Railroad construction. VIII, 306.

Railroad construction. VIII, 306, Resistances of railroad curves. VIII, 185, South Pass Jettles. VII, 166, Steam engine economy. VII, 193. The Shone hydro-pneumatic system of sewerage. XXVIII, 59. Tower of the New City Hall, Philadel-phia. XXXI, 275.

FLAMANT, A.

Flow of water in pipes. LI, 313. Fountain flow of water in vertical pipes. LVII, 302.

Suspension of solids in rivers. XXXVI,

FLATHER, J. J.

Continuous rope driving. XXXIX, 185.

FLEMING, SANDFORD.

"On Uniform Standard Time, for Railways, Telegraphs and Civil Purposes Generally." X, 387.

FLETCHER, ROBERT.

"Engineering Education." LIV. Part A.

Forests, res LXII. 447. reservoirs, and stream flow.

diversion and hydraulic models. LXXXII, 1156.

LXXXII. 1156.

Ocean waves, XXXVI. 161.

On the loss of head resulting from the massage of water through a 24-inch ston valve XXVI. 459.

Reinfall, XIII. 372.

The Niagara Gorge, XXXII. 209.

"The Proper Profile for Resisting Wave Action. (Abstract.)" XXXVI. 514

Wind pressure upon bridges, X. 165.

FLINN, ALFRED D.

"Engineering Achievements and Activi-ties of New York City" LXXVI, 1853 External corrosion of cast-iron pipe. T. VVVIII. 867. Multiple-arch dams LXXVI 884
"The Cinpoletti Trapezoidal Weir." XXXII. 9.

FLINN, RICHARD J.

Pumping machinery. LIV, Part D, 542,

FLINT, BERTRAM B.

"Experiments on Iron and Steel Joints. Riveted on an Angle." XXVII, 406.

FLOY, HENRY.

Appraisal of public service properties. LXXV. 851. Depreciation of public utility properties. LXXVII, 835.

FOLLANSBEE, ROBERT.

Evaporation from Lake Conchos, Mexico. LXXX, 1926. Hydrometry as an aid in irrigation. LXXI, 346.

FOLLETT, WILLIAM WALLACE.

"Cost of Sewer Construction, Denver, Colo." XXXV, 102.
Electric railways. LIX, 333.
Irrigation, LXII, 22.
Irrigation and river control. LXXVI,

Memoir of, LXXX, 2143.
"Topographical Surveys Made by the
American Section of the International
Boundary Commission, United States
and Mexico." LXXVII, 989.

FOLWELL, A. PRESCOTT.

The separate sewer system without automatic flush tanks. XXXIV, 230.

FOOTE, ARTHUR D.

"A Cheap Covered Reservoir." XXV, 228.

"A Water Meter for Irrigation." XVI, 134

"A Water Power and Compressed Transmission Plant for the North Star Mining Company, Grass Valley, Cal. XXXVI, 171.

"An Automatic Waste Weir." XVIII, 59.

Hoisting apparatus of canal head-gates. XXXII, 310.
Irrigation. XVI, 103.

Irrigation studies. XLIV, 177.
"The Redemption of the Great Valley of California." LXVI, 229.

FOOTE, EMERSON.

Economic depth for canals. XXXIX, 297.

FORBES, JAMES HYDE.

Hydraulic phenomena. LXXXII, 831.

FORBES, MURRAY.

Memoir of, LXXVII, 1915.

FORBES, R. H.

Irrigation and river control. LXXVI.

FORCE, C. G.

"Design and Construction Table for Egg-Shaped Sewers." IX, 202. The Walworth Sewer, Cleveland, Ohio. LV, 401.

FORCHHAMMER, H. T.

Reinforced concrete floor systems. LVI. Swing bridges. LV. 141.

Theory of rectangular frameworks. LV. __424.

FORCHHEIMER, PHILIPP.

The Bohio Dam. XLVIII, 302.

FORD, J. T.

The Bohio Dam. XLVIII, 307.

FORD, P. D.

Concrete tunnel lining. XXXI, 323.

FORD, ROBERT H. P.

Repairing bridge piers. LXXIX, 111.

FORESTIER, G.

(Translated from the French by Paul A. Seurot.) LIV, Part F, 129. "Highway Construction

FORGIE, JAMES.

Preservation of materials of construction. L, 295.

Proposed New York and New J Vehicular Tunnel. LXXXIII, 456. Jersey est Side LXXV, 254. West Manhattan water-front.

FORNEY, M. N.

Early history of railways. II, 60,

Early history of railways. 11, 60. Edificiency of railroads for the transportation of freight." XII, 141. English and American railroads compared. XV, 770. Report of the Committee on "Rapid Transit and Terminal Freight Facilities." IV, 1 (1875). Report of the Committee "On the Form, Weight. Manufacture and Life of

Weight, Manufacture and Life of Rails". First Report, III, 87 (1874); Second Report, IV, 136 (1875); Final Report, V, 327 (1876). Structural steel. XIII, 48.

FORSHEY, CALEB G.

'Cut-Offs on the Mississippi River. Their Effect on the Channel Above and Below." V, 317.

Levees as a system for reclaiming low-lands. V, 299.
"Levees of the Mississlppi River." III,

267.

Memoir of. XXXVII, 560.

FORSYTH, WILLIAM.

"American Locomotives." LIV, Part D, 259.

Proper relation to each other of the sections of railway wheels and rails. XXI, 274.

FORSYTHE, W. T.

Railroad location. LII, 527.

FORT, E. J.

The bonding of new to old concrete. LXIV, 276.

FORTIER, SAMUEL.

East Canyon Creek Dam. LXXXIII, 602. Standard levee sections. XXXIX, 218.

FORTIN, S. J.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 495.

FOSTER, E. H.

Hydraulie rams ydraulic rams for water-works of Narragansett Bay coaling station. Municipal refuse disposal. LX, 396.

FOSTER, FRANK.

Gauge of railways. LXXVIII, 429.

FOSTER, W. C.

Road building. XLI, 135.

FOUHY, JAMES F.

Underpinning Trinity Vestry Bullding. LXXXI, 107.

FOUQUET, JOHN DOUGLAS.

Memoir of. LXXVII, 1857. The water-works of Denver, Colorado. XXXI, 172.

FOWLER, CHARLES EDWARD.

Sewerage systems. X, 384.

FOWLER, CHARLES EVAN.

Albany Filtration Plant. XLIII, 311. Dipper-dredges on the Panama Canal. LXXXII, 529.

of steel arch bridges. Economics LXXXIII, 47.

Elevated railroads. XXXVII, 409. Hell Gate Arch Bridge. LXXXII, 1011. High-alloy steels for bridges. LXXVIII, 43.

Lawrence, Mass., Filter. XLVI, 359. Nickel steel for bridges. LXIII, 300. Obstruction to flow by bridge piers. LXXXII, 379.

Pearl Harbor Dry Dock. LXXX, 295.
"Revision of the Niagara Railway Arch
Bridge." LXXXIII, 1919.
Sand-blast cleaning of steel. L, 277.
Steel columns and struts. LXXXIII,

1637.

Steel sheeting and sheet-piling. LXIV, 459.

The Launhardt formula and bridge specifications. XLI, 203. Theory of concrete. XLII, 117.

FOWLER, FREDERICK HALL.

Redemption of the Great Valley of California. LXVI, 257.

FOWLER, GILBERT.

Sewage disposal. LIV, Part E, 210. Water and sewage works, Colum Ohio. LXVII, 394. sewage works, Columbus,

FOX, CHARLES KIRBY.

Philosophy of engineering. LXXVII, 54.

FOX, Sir DOUGLAS.

Construction and maintenance of roads. VIII, 342.

Filiciency of railroads for the trans-portation of freight. XII, 339. Niagara Cantilever Bridge. XIV, 570. Preservation of timber. VI, 189. Proportions of the heads of eye-bars.

III, 285. Wind pressure upon bridges. X, 150.

FOX, FRANCIS.

"Ventilation of Tunnels." LIV, Part C, 553.

FOX, S. WATERS.

"Technical Methods of River Improve-ment as Developed on the Lower Mis-souri River, by the General Govern-ment, from 1876 to 1903." LIV, 280.

FOXLEE, WILLIAM THEODORE.

"British Railroad Terminals." LIV, Part F, 441.

FRANCIS, CHARLES.

Memoir of. LXXX, 2146. Quality of water supplies. XXXII, 159.

FRANCIS, GEORGE BLINN.

Bridge substructure, and concrete work. LXI, 383.

"Electric Railways in the Ohio Valley between Steubenville, Ohio, and Van-port, Pennsylvania." LXIII, 73.

Electrification of suburban zone, New York Central & Hudson River R. R. In the vicinity of New York City. LXI, 117.

FRANCIS, GEORGE BLINN-(Continued).

Memoir of. LXXVI, 2214.
Overloaded bridges. LVII, 261.
Panama Canal. LVI, 204.
Sinking bridge piers. LXII. 123.
Substructure of Marsh River Bridge.

LII, 465.

"The New York Tunnel Extension of the Pennsylvania Railroad. Certain Engineering Structures of the New York Terminal Area." LXIX, 152.

"The Scranton Tunnel of the Lackatter and Warning Valley Railroad."

wanna and Wyoming Valley Railroad.

LVI, 219.

"The South Terminal Station, Boston, Mass." XLIII, 107.

Uniform practice in pile-driving. XXVII, 589.

FRANCIS, JAMES.

Hoisting apparatus of canal head-gates. XXXII, 313. Memoir of. XLV, 627.

FRANCIS, JAMES B.

Aeration of water, XV, 143. Algae and the purity of water supplies. XXI, 534.

American irrigation engineering. XXV,

Comparative tests of electric motor and steam locomotive. XXIII, 210. Comparison of water supply systems from a financial point of view. XXIV,

Construction of railway tracks. XXV, 245.

Cost of steam power. XII, 431. Croton Water-Works and supply for the

future. V, 258.
Cylindrical wheels and flat-topped rails for railways. XXI, 153.
Designing and erection of the Oakley Arch. XXIII, 181.

Destruction of rails by excessive weights. XX, 128.

"Distribution of Rain-Fall during the Great Storm of October 3 and 4, 1869." VII, 224.

Durability of east-iron water mains. I, 26,

"Experiments on the Deflection of Con-

Experiments on the Denection of Continuous Beams, Supported at Equidistant Points," II, 117.
"Experiments on the Flow of Water over Submerged Weirs." XIII, 303.
"Experiments on the Humphrey Turbine Water-Wheel, at the Tremont and Suffolk Mills, in Lowell, Mass." XIII, 295 XIII. 295.

ATI, 290.

Priction, waste and loss of water in mains. XIX, 106.

"High Walls or Dams to Resist the Pressure of Water." XIX, 147.

Irrigation in India. XXIII, 253.

Littoral movements of the New Jersey capet XXIII 444.

Littoral movements of the New Jersey coast. XXIII, 144.

"Memorandum and Tables, Exhibiting the Results of Some of Darcy's Experiments on the Flow of Water through Pipes." II, 45.

"On the Cause of the Maximum Velocity of Water Flowing in Open Channels Being below the Surface." VII, 109, 168.

168.

"On the Effect of a Rapidly Increasing Supply of Water to a Stream, on the Flow below the Point of Supply." XXI, 558.

Preservation of forests. XIV, 392. Preservation of timber. XI, 357; XIV, 372.

Presidential Address at the Thirteenth Annual Convention of the Society, at Montreal, June 15th, 1881. X, 187. Montreal, June 15th, 1881. X "Provincetown Dike." I. 329.

Rainfall, flow of streams, and storage.
XXVII, 286.
"Report of the Committee on the Cause

of the Failure of the South Fork Dam." XXIV, 431 (1891).

Report of the Committee on "The Failure of the Dam on Mill River". (1874)

Steam heating. XXIV, 216.
"Stoppage of Flow in a Water Main by Anchor Ice." XVI, 171.

Anchor Ice. XVI XIX, 219. Sweetwater Dam. XIX, 219. Tests of cement. IX, 342. Tests of cement. IX, 342.

The manufacture of brick. XVIII, 305. Venturi water meter. XVIII, 141. Water power of the Falls of St. Anthony. XII, 424.

FRANKENFIELD, H. C.

Rainfall and stream flow. LIX, 489.

FRANKLAND, F. II.

Contracts: "Cost plus" and other forms. LXXXIII. 797.

Economics of steel arch bridges. LXXXIII, 86.

to Obstruction flow by bridge piers. LXXXII, 378. Stress measuren LXXXII, 1079. measurements, Hell Gate Arch.

FRANZE, G.

Sewage clarification by fine screens. LXXVIII, 976.

FRANZIUS, L.

"Description of the Lower Weser and Its Improvement." (Translated from the German by T. II. McCann, assisted by Albert Beyer.) XXIX, 173.

FRASER, CHARLES E.

Sinking caissons, underpinning buildings near tunnel caissons, and tunneling under East River. LXIX, 391.

FRAZEE, JOHN HATFIELD.

Memoir of. LXXXII, 1723.

FRAZER, JOSEPH HECKART. Memoir of. LXXV, 1198.

FRAZIER, JAMES LEWIS. Memoir of. LXXIX, 1416.

FREAR, W. F.

Pearl Harbor Dry Dock. LXXX, 302.

FREEMAN, JOHN R.

"Experiments Relating to Hydraulics of Fire Streams." XXI, 303. Fire-proof construction. XXXIX, 150.

Flow of water in pipes. XXII. 74.
"Hoisting Apparatus of the Canal Head-Gates at Sewall's Falls, X. H." XXXII.

278. Proportional water meter. XXIV, 537. With Nozzle as an Accurate Water-"The Nozzle as an Accurate Meter." XXIV, 492.

FREEMAN, MILTON H.

Astoria Gas Tunnel. LXXX, 677. Grouting operations. LXXXIII, 1073.

FREEMAN, W. B.

State and national water laws. LXXVI,

FREITAG, J. K.

Effects of San Francisco earthquake on engineering constructions, L1X, 277. Structural design of buildings. L1V, 437.

FRENCH, ALEXIS HENRY.

Memoir of. LXXX, 2148.

FRENCH, ARTHUR W.

Reinforced concrete floor systems. LVI,

FRENCH, EDMUND.

Memoir of. XXXVII, 561.

FRENCH, FREDERCK REGINALD.

Memoir of. LIV, 526.

FRENCH, JAMES B.

Bridge and subway specifications. LXXV, 363.

Kinetic effects of crowds. LXXVI, LXXXIII, Repairing a swing bridge. 1108.

Rust in a seventeen-story building. LXXI, 209. Tests of bridge members. XXXVIII, 70.

Yale Bowl. LXXXI, 283.

FRENCH, OWEN B.

"Invar (Nickel-Steel) Tapes on the Mea-surement of Six Primary Base Lines." LX, 219.

FRENCH, R. D.

Contracts: "Cost plus" and other forms. LXXXIII, 853.

FRICKSTAD, WALTER N.

The sewer system of San Francisco. LXV, 405.

FRINK, F. G.

Water-bound macadam roads. LXXVI, 991.

FRITH, A. J.

Jetty harbors XXVIII, 382. harbors of the Pacific Coast.

Restoration of the cable ends of the Covington and Cincinnati Suspension Covington and Cineir Bridge, XXVIII, 364.

Use of asphaltum in building sea walls. XXIV, 228.

FRIZELL, JOSEPH P.

Concrete tunnel lining. XXXI, 319. Cost of steam power. XII, 434. Economic depth for canals. XXXIX, 299.

Flow of water in pipes. XLVII, 242. Flow of water in streams. XXI, 561. Governing of water power under variable loads. XXXVII, 24. High masoury dams. XIX, 184.

High masonry dams. XIX, 184. Hoisting apparatus of canal head-gates. XXXII, 304.

Cheesman Dam and Reservoir. Lake LIII, 133. Memoir of, LXXIII, 501

Movable dams. XXXI, 547; also, XXXIX, 583.

Power plant at Ogden, Utah. XXXVIII,

"Pressures Resulting from Changes of Velocity of Water in Pipes." XXXIX,

Protection from corrosion of iron tun-nel linings. XXVII, 330. "Storage and Pondage of Water." XXXI,

The Niagara Gorge. XXXII, 209.
"The Old-Time Water-Wheels of America." XXVIII, 237.
"Water-Power of the Falls of St. Authony." XII, 412.

FROST, GEORGE HENRY.

Memoir of. LXXXI, 1827.

FRYE, ALBERT I.

Bond-friction-resistance in reinforced concrete. LXXIII, 278. Bridge and subway specifications. LXXV,

360 Going value of water-works. LXXIII,

361. The practical column under central or eccentric loads. XLV, 438.

FTELEY, ALPHONSE.

Algæ and the purity of water supplies. XXI, 512.

Cements, mortars and concretes. XXV, 280.

Covered reservoirs. XXV, 230.

Covered reservoirs. XXV, 230.

"Description of Some Experiments on the Flow of Water made during the Construction of Works for Conveying the Water of Sudbury River to Boston," XII, 1.

Designing and erection of the Oakley Arch. XXIII, 181.

Friction, waste and loss of water in mains. XIX, 116.

High masonry dams. XIX, 176.

Main relief sewer of Brooklyn. XXVI, 508.

508.

Memoir of. LIV, 509. Presidential Address at the Annual Convention at Detroit, Mich., July 26th,

vention at Detroit, Mich., July 26th, 1898. XXXIX, 665.
Proportional water meter. XXIV, 533.
Rainfall and river-flow. XXVIII, 338.
Rainfall, flow of streams, and storage.
XXVII, 286.

Recent experiments with dynamite on an ocean bar. XXV, 447.
"Report of the Committee on the Cause of the Failure of the South Fork Dam.

XXIV, 431 (1891). Stability of beuch marks. XX, 76. Standard levee sections. XXXIX, 209. Storage and pondage of water. XXXI,

Subaqueous foundations. XXIV, 237. Sweetwater Dam. XIX. 226. "The Flow of the Sudbury River, Mas-sachusetts, for the Years 1875 to 1879."

X, 225.

The nozzle as an accurate water meter. XXIV, 513.

The Shone hydro-pneumatic system of sewerage. XXVIII, 63.

FTELEY, ALPHONSE—(Continued).

The water-works of Denver, Colorado. XXXI, 166.

Water power with high pressures and wrought-iron water pipe. XIII, 34.

FUERTES, ESTEVAN A.

Education of civil engineers. III, 259. Flexure of beams. III, 56. Flow of water over dams. XLIV, 339. High masonry dams. XIX, 190. Mexican method of making hard lime Mexican method of making hard lime floors. II, 182.

Preservation of timber. XIV, 373.

"Short and Easy Methods for Computing Probable Errors." XLVI, 251.

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 271.

The Holland dikes. XXVI, 686.

FUERTES, JAMES II. Adjustment of transit and compass surveys. XLV, 470. Plushing in pipe sewers. XL, 20. Gravity and filters at Nyack, N. Y. Gravity sar XLV, 491. Movable dams. XXXIX, 592. Stream contamination and sewage purification. XLII, 186. "The Purification of the Water Supply of Steelton, Pennsylvania." LXVI, 135. Water supply of Parkersburg, W. Va. LXXXI, 821.

FULLER, ALMON H.

Bridge and subway specifications, LXXV. Engineering education. LXXV, 1117. Irrigation. LIV, Part C, 158. Reinforced concrete arches. LV, 195. Revision of Niagara Railway Arch Bridge, LXXXIII, 2017. Stress measurements, Hell Gate Arch. LXXXII, 1083.

FULLER, FRANK LOUIS.

Comparison of water supply systems from a financial point of view. XXIV, Memoir of. LXXXIII, 2189. Purification of water for domestic use. LIV, Part D. 235.

FULLER, GEORGE W.

Albany Filtration Plant. XLIII, 313. Bacteria and other organisms in water. XXXIII, 457. Chemi-hydrometry. LXXX, 1276, Decolorization of water. XLVI, 166, Determination of storm-water run-off.

LXXVIII, 1198.
Disposal of municipal refuse. LIV, Part E, 330.

Filtration of water. XLIV, 408; also,

Lill, 263. Going value of water-works. LXXIII,

Lawrence, Mass., Filter. XLVI, 329.
Purification of water for domestic use.
LIV, Part D, 246.
Sedimentation. LIII, 77.
Sewage clarification by fine screens.

LXXVIII, 978.

"Sewage Disposal in America." LIV, Part E, 147, 257.

Test of a mechanical filter. XLIII, 79 Tests of concrete in sea water. LXXXI. 685.

"The Filtration Works of the East Jersey Water Company, at Little Falls, New Jersey." L, 394.

Translation of paper by M. Bechmann, LIV, Part E, 195. Washing rapid sand filters. LXXX, 1382.

Water and sewage works, Columbus, Ohio. LXVII, 419. Water filtration at Washington, D. C.

LVII, 417.

Water purification at Steelton, Pa. LXVI, 213.

Water supplies. LIX, 367, 400.
Water supply for camps, cantonments, etc. LXXXIII, 517.
Water supply of Parkersburg, W. Va. LXXXI, 796.

FULLER, MYRON L.

Floods and flood prevention. LXXXI, 1269

FULLER, WESTON E.

Determination of storm-water run-off. LXXVIII, 1193.
"Flood Flows." LXXVII, 564.
Hydrology of the Panan Hydrology o LXXVI, 987. Panama Canal.

FULLER, WILLIAM B.

new type of masonry dam. XLIX, 106. Albany Filtration Plant. XLIII, Concrete and concrete-steel. LIV, Part E. 566. Filtration of water. LIII, 231. Filtration works. L, 453. Groined arches. XLIII, 63 Groined arches. XLIII, 63.
Impervious concrete. LI, 133.
Lawrence, Mass., Filter. XLVI, 361.
Steel-concrete construction. XLVI, 127.
"The Laws of Proportioning Concrete."
LIX, 67.
Theory of concrete. XLII, 142.
Water and sewage works, Columbus,
Ohio. LXVII, 400.
Water filtration at Washington, D. C.
LVII, 427.

LVII, 427

Water supplies. LIX, 390.

FÜLSCHER, J.

"The North and East Sea Canal." (Translated from the German by Kenneth Allen.) XXX, 421. The North Sea Canal of Holland. XXX, 712.

FULTON, JOHN A.

Railway bridge designing. XXVI, 199. Train loadings for bridges. XXXI, 192. Virtual grades for railroads. L, 15.

FULWEILER, W. H.

Road construction and maintenance: Bituminous surfaces. LXXV, 567.

Road construction and maintenance: Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1166.
Road construction and maintenance:

Equipment for the construction of bi-tuminous surfaces and bituminous pavements. LXXVII, 196.

FURBER, WILLIAM COPELAND.

Height of buildings. XLIV, 472. Modern office buildings. XLVIII, 24.

GAGE, R. B.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV,

GAHAGAN, WALTER H.

Earth pressures and bracing. LX, 66. Substructure, Lonesome Valley Viaduct. XXXIV, 256.

"The Reconstruction of a Portion of the substructure of the Johnsonville Bridge." XXXI, 587.

GAILLARD, DAVID DuB.

"Harbors on Lake Superior, Particularly Duluth-Superior Harbor." LIV, Part A, 263.

GAINES, RICHARD H.

Effect of alkali on concrete. LXVII, 602. Laws of proportioning concrete. LIX, 159.

GALLOWAY, J. D.

Control of hydraulic mining in Califor-

nia. LVII, 34. Effects of San Francisco earthquake on engineering constructions. LIX, 223,

Morena Rock Fill Dam. LXXV, 55. Necaxa light and power plant. LVIII,

58.

"The Design of Hydro-Electric Power Plants," LXXIX, 1000. Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 139.

GANDOLFO, J. H.

Depreciation of public utility properties. LXXVII, 863.

Location and design of railroad terminal stations. LXIX, 428. Physical valuation of railroads. LXXVII,

303.

Precarious engineering expedients. LXVII, 57.

"The Valuation of Public Utility Property." LXXIX, 842.

West Side Manhattan water-front, LXXV, 292.

GANNETT, FARLEY.

Floods and flood prevention. LXXXI, 1288

GANNETT, HENRY.

Railroad location, XXXI, 102. Topographic surveys, XXX, 615.

GARAY, FRANCISCO DE.

"The Drainage of the Valley of Mexico." XII, 153.

GARDINER, F. W.

Bridge ridge and LXXV, 361. subway specifications.

"Manhattan Elevated Railway Improve-

ments." LXXXII, 551. Rust in a seventeen-LXXI, 211. seventeen-story building.

GARDINER, J. B. W.

Water-proofing railroad bridge floors. LXXIX, 347.

GARDNER, H. A.

Painting structural steel. LXXVII, 964.

GARRISON, F. LYNWOOD.

"Notes upon Testing Building Stones."
XXXII, 87.
Specifications for structural steel.
XXXIII, 398.
Steel and masonry construction. XLIX,

Strength and weathering quali-roofing slates. XXXII, 541. The Niagara Gorge. XXXII, 208. qualities of

GARVER, N. B.

Engineering education. LXXV, 1092.

GARY, MAX.

"The Testing of Portland Cement and the Development of the Cement Industry in Germany." (Translated from the German by John S. Siebert.) XXX,

GATES, C. L.

Elevated railroads. XXXVII, 440. Railway bridge designing. XXVI, 146. "The Crippling Strength of Wrought-Iron Columns." IX, 407. The manufacture of brick. XVIII, 308.

Wrought-iron columns, tests and formulæ. XI, 118.

GATES, WARREN AUSTIN.

Memoir of. LXXX, 2257.

GATLING, R. J.

Properties of steel: Its use in structures and heavy guns. XVI, 311.

GAY, LEON LINCOLN.

Memoir of. LXXIX, 1479.

GAY, MARTIN.

Harlem Ship Canal Bridge. LXVII, 24. Movable bridges. LX, 306.

GAYLER, CARL.

Concrete and reinforced concrete. LXXXI, 1163.

Concrete-iron highway bridges. XXXI,

Niagara Cantilever Bridge. XIV, Painting of iron structures. XXXIII,

Railway bridge designing. XXVI, 124. Reinforced concrete buildings. LX, 462. Reinforced concrete viaducts. LXXVIII, 1259.

GAYNOR, JAMES L.

Road construction and maintenance: Equipment for the construction of bltuminous surfaces and bituminous pavements. LXXVII, 180.

GAYOL, ROBERTO.

"Some Specialties of the System for Flushing the New Sewers of the City of Mexico." LV, 262. GAZLAY, WEBSTER. Memolr of. LXXVII, 1861.

GEDDES, JAMES K.

Railway curves. XLVIII, 365.

GEDYE, NICHOLAS G.

Lighthouses and other aids to navigation. LIV, Part B, 69.

GEELEN, TIMOLEON. Gas engines. LIX, 413.

GEURMANN, ADOLPH.

Bacteria and other organisms in water. XXXIII, 450.

GELBCKE, F. A.

"Surveys for Railway Location." (Translated from the German by R. P. Miller.) XXIX, 429; XXX, 530.

GELETTE, WILLIAM DURFEE. Memoir of. L, 500.

GEMMELL, R. C.

Asphaltum for reservoir linings. XXVIII. 130.

The Santa Ana Canal of the Bear Valley Irrigation Company, XXXIII, 589. The water-works of Denver, Colorado. XXXI, 163.

GERBER, EMIL.

Memoir of. LXXIX, 1418.
"Painting of Iron Structures Exposed to Weather." XXXIII, 485.

"Progress Report of Special Committee on Steel Columns and Struts," LXVI. 401.

The relative effects of frost and the sulphate of soda tests on building stones. XXXIII, 249.

GERIG, WILLIAM.

Dredging river channels. LII, 252.

GERRY, M. II., Jr.

"A High-Voltage Power Transmission." L. 212.

Design of masonry dams. LXXV, 160.

GETMAN, FRANK L.

Fountain flow of water in vertical pipes. LVII, 303.

GETTRUST, JOHN S.

"A Study of the Behavior of Rapid Sand Filters Subjected to the High-Velocity Method of Washing." LXXX, 1342

GIBBON, THOMAS II.

Street railway track. XXIV, 140.

GIBBS, C. W.

"The Turn-Table on the Main Track of the Silverton Railroad in Colorado." XXIII, 120.

GIBBS, GEORGE.

Air resistances to trains in tunnels. LXXV, 1018.

Cylindrical wheels and flat-topped rails for railways. XXI, 174. Electric railways. LIX, 330.

Electrification of suburban zone, in the vicinity of New York City. New York Central & Hudson River R. R. LXI, 108.

Movable bridges. LX, 326.
Proper relation to each other of the sections of railway wheels and rails.

Sections of railway wheels and fails. XXI, 276.

"The New York Tunnel Extension of the Pennsylvania Railroad. Station Construction. Road. Track, Yard Equipment, Electric Traction, and Locomotives." LXIX, 226, 434.

GIBBS, NATHAN JACKSON. Memoir of, LXXV, 1188.

GIBBS, WILLIAM WETMORE.

Memoir of. LXXXIII, 2371.

GIBSON, NORMAN R.

"Pressures in Penstocks Caused by the Gradual Closing of Turbine Gates." LXXXIII, 707.

Pulsations in pipe lines. LXXXII, 236.

GIDEON. A.

Preservation of materials of construction. L, 313.

GIFFORD, GEORGE E.

Separate versus general contracts. XLIX, Wind pressure on bridges. LIV, 40.

GIFFORD, L. R.

Earth pressures and bracing. LX, 84, "Steel Sheeting and Sheet-Piling." LXIV, 441.

GILES, ROBERT.

The Launhardt formula and bridge specifications. XLI, 217.

GILLETTE, CASSIUS E.

"Seacoast Harbors in the United States." LIV, Part A, 297, 385.

GILLETTE, E.

"The First Trip through Big Horn Cañon." XXV, 8.

GILLETTE, HALBERT P.

Depreciation as an element in appraisal. LXXIX, 806.

Going value of water-works. LXXIII,

Grading contracts. LVIII, 359.

Highway construction. LIV, Part F, 165.

Physical valuation of railroads, LXXVII, 259.

The valuation of public service property. LXXII, 275.

GILLHAM, ROBERT.

Memoir of, XLIII, 613.
"Transmission of Power in Operating
Cable Railways." XXIX, 543; XXX. 554.

GILLISS, JOHN ROBERTS.

Memoir of, XXXVI, 555, "Tunnels of the Pacific Railroad," I, 153.

GILLMORE, Q. A.

"Report of the Committee on a Uniform System for Tests of Cement."
Preliminary Report, XIII, 53 (1884);
Final Report, XIV, 475 (1885).
South Pass Jetties XV, 266.

GILMAN, C. E.

Effects of San Francisco earthquake on engineering constructions. LIX, 216,

GILMAN, CHARLES CARROLL.

"Experiments with a New Method Heating and Ventilation." XXXV 59.

GILMAN, E. DOW.

Materials for road construction. LXXXII, 1466.

GILPIN, E.

Bridge substructure and foundations in Nova Scotia. XXX, 573.

GLAESER, FREDERICK.

Contracts; "Cost plus" and other forms. LXXXIII, 817.

GLEIM, C. O.

Rearrangement of the railway terminal system at Altona. XXX, 512. Stability of quay walls. XXX, 689. Surveys for railway location. XXX, 526. The water-works of Denver, Colorado. XXXI, 171.

GOAD, CHARLES E.

Construction of railway tracks, XXV, 248.

Effects of San Francisco earthquake on engineering constructions, LIX, 289. English and American railroads compared, XV, 748.

Friction, waste and loss of water in mains. XIX, 110.

Memoir of. LXXI, 418.

GOBERT, A.

Freezing as an aid to excavation. LII,

GODFREY, EDWARD.

Bond-friction-resistance in reinforced concrete. LXXIII, 267. Cherry Street Bridge, Toledo, Ohi LXXX, 792. Design of masonry dams. LXXV, 147. Toledo, Ohio.

Designing reinforced concrete stabs. LXXX, 1697. East Canyon Creek Dam. LXXXIII, 599. Faults in the theory of flexure. LXXV,

New principle in the theory of structures. LXXXIII, 643.

Reinforced concrete flat slab floors, LXXVII, 1699.
"Some Mooted Questions in Reinforced Concrete Design." LXX, 54.
Steel columns and struts. LXXXIII,

1644.

Steel stresses in flat slabs. LXXVII,

Strength of columns. LXXVI, 275.
Tests of reinforced concrete columns.
LXXVIII, 140.

GODWIN, W. S.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 182.

GOETHALS, GEORGE W.

"Fortifications." LIV, Part A, 57.

GOETZE, EUGEN.

"Filtration for Public Water Supplies, with Especial Reference to the Double Filtration Plant at Bremen, Germany. LIII, 210.

GOLDBECK, A. T.

Hydraulic-fill dams. LXXXIII, 1763. Oil-mixed mortars and concretes. LXXVI, 1108.

Water-proofing railroad bridge floors. LXXIX, 353.

GOLDMARK, HENRY.

Bridge painting. XXXIX, 34. Cause of failure of South Fork Dam. XXIV, 467.

Continuous superstructure of the Mem-

Continuous superstructure of the Memphis Bridge, XXX, 560.
Cost of sewer construction. XXXV, 115.
Distortion of riveted pipe by back-filling. XXXVII, 104.
Flow of water in Ogden, Utah, pipe line.

XL, 529.

Indeterminate frameworks. XLIII, 408.
Niagara Railway Arch. XL, 161.
Portland cement concrete. XXXVII, 510.
Pressures resulting from changes of velocity of water in pipes. XXXIX, 8.
Specifications for structural steel.

XXXIII, 392.

Stadia topographic surveys. XLIV, 105.
"The Distribution of Stresses in Mitering Lock-Gates, with Special Refer-

ing Lock-Gates, with Special Reference to the Gates on the Panama Canal." LXXXI, 1621.
"The Power Plant, Pipe Line and Dam of the Pioneer Electric Power Company at Ogden, Utah." XXXVIII, 246. Three-hinged masonry arches. XL, 78. Timber preservation. XLIV, 197.

GOLDSMITH, CLARENCE.

Water supply for camps, cantonments, etc. LXXXIII, 520.

GOLDSMITH, WILLIAM.

Reinforced concrete docks. LXXVIII, 1116.

Road construction and maintenance: Engineering organizations for highway work. LXXVII, 1112.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1148.

GOODRICH, C. F.

Properties of steel: Its use in structures and heavy guns. XVI, 328.

GOODRICH, E. P.

Cohesion in earth. LXXX, 1328. Concrete and concrete-steel. LIV, Part reinforced concrete slabs.

Designing re LXXX, 1701.

GOODRICH, E. P .- (Continued).

Docks and harbors. LXII, 152.

Docks and harbors. LXII, 152.
Dry docks. LIV, Part F, 409.
Earth pressure and stability. LXX, 393.
Earth pressures and bracing. LX, 59.
Effect of alkali on concrete. LXVII, 611.
Failure of grain elevator. LXXX, 842.
"Lateral Earth Pressures and Related Phenomena." LIII, 272.
Nagasaki graving dock. LVI, 79.
Ports of the Pacific. LXXVI, 223.
Onestions in reinforced concrete design.

Questions in reinforced concrete design. LXX, 95.

Reinforced concrete buildings. LX, 476. Reinforced concrete floor systems. LVI, 332.

Retrogression in tensile strength of cement. LXXIV, 406.

Steel sheeting and sheet-piling. LXIV, 462.

reservoirs. Storage for LXXVII, 1645. impounding

Stresses in railroad track. LXXXIII, Structural design of buildings. LIV,

446. The Bonding of New to Old Concrete."

"The

LXIV, 247.
"The Supporting Power of XLVIII, 180. Piles.''

Use of reinforced concrete. LXI, 35, 70. Wharves and piers. LIV, Part F, 13. Wind pressure on bridges. LIV, 45.

GOODRICH, R. D .

Flow of water through contractions. LXXXIII, 1215.

Obstruction to flow by bridge piers.
LXXXII, 366.

GOODRICH, W. FRANCIS.

Disposal of municipal refuse. LIV, Part E, 319.

GOODSELL, D. B.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1150.

GOODWIN, GEORGE A.

"The Relative Merits of Working Hoist-lng Machinery by Steam, Water and Electricity." XXIX, 695.

GOODWIN, II. STANLEY.

English and American railroads compared. XV, 766.

Inspection and maintenance of railway structures. XVII, 304. "Progress Report of the Committee on Standard Rail Sections." XXIV, 1 (1891).

"Report of the Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails." Preliminary Report, XIX. 1 (1888); Final Report, XXI, 223 (1889).

GOODWIN, JOHN M.

Cylindrical wheels and flat-topped rails for railways. XXI, 213. Inspection and maintenance of railway structures. XVII, 289. "The Proposed Lake Erie and Ohio River Ship Canal." XXV, 411.

GOODWIN, RALPH E.

"Proof of an Assumption in the Theory of Concrete Beams." LXXVIII, 1263.

GORDON, B. B.

Standard levee sections. XXXIX, 216.

GORDON, ROBERT.

"The Steamship America." XV, 384.

GOSLING, EDGAR B.

A concrete sewer on piles. XXXI, 579. Concrete-iron highway bridges. XXXI, 467.

Improvement River, Va. of James XXVIII, 445. Reclamation of the Potomac Flats.

XXXI, 494. Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge. XXVIII, 368.

GOSS, O. P. M.

Wood stave pipe design. LXXXII, 497.

GOSS, W. F. M.

Locomotives and other rolling stock. LIV, Part D, 347. Pumping machinery. LIV, Part D, 537.

GOTTLIEB, A.

Cylindrical wheels and flat-topped rails for railways. XXI, 180. Destruction of rails by excessive weights.

XX, 126.

Preservation of timber. XI, 356.
Properties of steel: Its use in structures and heavy guns. XVI, 364.
Structural steel. XXVII, 375.
Weights of bridges. XVI, 219.
Wind pressure upon bridges. X, 161.

GOULD, E. SHERMAN.

water-tight masonry dam. XXVIII, 350.

Astoria, Oregon, Water-Works. XXXVI,

Concrete tunnel lining. XXXI, 324. Flow of water in pipes. XXII, 71; also, XXXV, 276; also, XLVII, 271. Foundations of New Croton Dam. XLIII,

High masonry dams. XIX, 185. Hot tests for Portland cement. XXVII, 438.

Hydraulics of the Hemlock Lake Conduit, and restriction of the use and waste of water in Rochester, N. Y." XXVI, 38.

Lake Cheesman Dam and Reservoir.

Cheesman Dam and Reservoir.

Lake Cheesman Lill, 139.

Light mountain railroad construction, XXXVI, 86.

Memoir of. LIV, 528.

Pile-driving formulas. XLII, 280.

Railroad location. LIV, 139.
Rainfall, flow of streams, and storage.
XXVII, 293.

Test of a mechanical filter. XLIII, 83. "The Dunning's Dam, near Scranton, Pa." XXXII, 389.

The Halsted Street Lift-Bridge, XXXIII,

"The The New Water-Works of Havana, Cuba." XXXVI, 217.

GOULD, E. SHERMAN-(Continued).

The supporting power of piles. XLVIII, 213.

The water-works of Syracuse, N. Y.

XXXIV, 56.
Theory of concrete. XLII, 120.
28-in. cast-iron submerged pipe line.
XXXIII, 277.

GOULD, HARRY MADERA.

Memoir of. LXXXII, 1686.

GOWEN, CHARLES S.

Design of the New Croton Dam. LVIII.

ake Cheesman Dam and Reservoir. LIII, 147. Lake

"The Changes at the New Croton Dam." LVI, 32.

"The Effect of Temperature Changes on Masonry." LXI, 399.

"The Foundations of the New Croton Dam." XLIII. 469. Tunnel surveying. XXIII, 32.

GRABILL, L. R.

Road construction and maintenance: The use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIII, 42.

GRAFF, FREDERIC.

Algæ and the purity of water supplies. XXI, 535.
English and American railroads compared. XV, 749.
Presidential Address at the Annual Convention, at Deer Park, Md., June 24th, 1885. XIV, 227.
"Report of the Committee on the Preservation of Timber." XIV, 247 (1885).

GRAHAM, CHARLES H.

Road building. XLI, 115.

GRAHAM, CHARLES K.

Report of the Committee on "Rapid Transit and Terminal Freight Facili-ties." IV, 1 (1875).

GRAHAM, JOSEPH MARSHALL.

Memoir of. LXIV, 583.

GRANBERY, J. H.

Sewage clarification by fine screens. LXXVIII, 994.

GRANT, C. J.

Irrigation, LIV, Part C, 152.

GRANT, JUSTUS HERBERT.

Memoir of. LXXIX, 1423.

GRANT, KENNETH C.

Floods and flood prevention, LXXXI. 1245.

Reconstruction of Stony River Dam. LXXXI, 1066.

Reservoirs for flood control. LXXXII, 1531.

State and national water laws. LXXVI, 704.

"The Flood of March 22d, 1912, at Pittsburgh, Pa." LXXVI, 302.

GRANT, T. H.

Railway signaling. XXVIII, 285.

GRANT, WILLIAM H.

"Calculations of the Mean Horse-Power of a Variable Stream and the Cost of Replacing the l'ower Lost by a Par-tial Diversion of the Flow." XXII, 389

Controverted questions in road construc-tion, XXVIII, 85. Memoir of, XXXVI, 557. "Notes on Cements, Mortars and Con-cretes." XXV, 259.

GRAVES, EDWIN D.

Bridge painting. XXXIX, 41.

GRAY, EDWARD.

Memoir of. LXXX, 2150.

GRAY, GEORGE EDWARD.

Memoir of. LXXVI, 2198. 'Notes on Early Practice in Bridge Build-ing." XXXVII, 1.

GRAY, HAROLD FARNSWORTH.

Flow of water in irrigation channels. LXXX, 1663,

Prevention of mosquito breeding. LXXVI, 767.

"The Sanitation of Construction Camps." LXXVI, 493.

GREELEY, SAMUEL A.

Determination of storm-water run-off. LXXVIII, 1190.

Sewage clarification by fine screens. LXXVIII, 1006.

Water supply for camps, cantonments, etc. LXXXIII, 541.

GREEN, ANDREW H.

Railroad freight differentials, XLVI, 222.

GREEN, ARTHUR B.

Engineering education. LXXV, 1100.

GREEN, BERNARD RICHARDSON.

Concrete-iron highway bridges, XXXI, 477.

Distortion of riveted pipe by back-fill-ing. XXXVIII, 103. Electric light and power station, Roch-ester, N. Y. XXXI, 358.

ester, N. 1. XXXI, 338.
Engineering education. LVII, 163.
Failure of a masonry pier and a rock
foundation. XXXI, 583.
Impervious concrete. LI, 124.
Memoir of. LXXX, 2151.
Substructure, Lonesome Valley Viaduct.

XXXIV, 253.

GREEN, F. M.

"The New York Tunnel Extension of the Pennsylvania Railroad. The Lining of the Four Permanent Shafts of the East River Division." LXIX, 78.

GREEN, F. W.

Cohesion in earth. LXXX, 1327.

Depreciation as an element in appraisal. LXXIX, 792. Light railways

of the battle front. LXXXIII, 1239.

Nomographic solutions for formulas. LXXVIII. 1402.

Physical valuation of railroads, LXXVII, 328.

GREEN, F. W .- (Continued).

Trafficway viaduet, Kansas City, Mo. LXXX, 533. Valuation of public utility property. LXXIX, 886.

GREEN, P. E.

"A Review of Chicago Paving Practice." LXVI, 1.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1123. The valuation of public service property.

LXXII, 241.

GREEN, RUTGER B.

Colorado River and Salton Basin. LIX,

Effects of San Francisco earthquake on engineering constructions. LIX, 292. Memoir of. LXIV, 585. Municipal refuse disposal. LX, 417.

GREENE, A. E.

Reinforced concrete flat slab floors. LXXVII, 1728.

GREENE, CHARLES W.

The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 592.

GREENE, DAVID M.

Back-water in streams as produced by dams. II, 260. Gauging of streams. V, 251. Memoir of. LVI, 466.

Pumping engines. IV. 223.

"Report of the Committee "On the Failure of the Worcester Dam". V, 244 (1876).

Transportation of freight and pas-sengers. II. 247. Tuberculation in water pipes. XXVIII,

352.

GREENE, FRANCIS V.

"An Account of Some Observations of Street Traffic." XV, 123. Use of asphaltum in building sea walls. XXIV, 226.

GREENE, GEORGE S.

High masonry dams. Memoir of. XLIX, 335. XIX, 180.

GREENE, GEORGE S., Jr.

Failure in a water main. VII, 15.
"Notes on the Resistance of Bricks to a
Crushing Force." II, 185.
Submarine rock excavation. XXXII, 254.
Temperature of water at various depths
in lakes and oceans. XIII, 78.

GREENE, HOWARD ARNOLD.

Memoir of. LXXXI, 1800.

GREENE, J. N.

Filtration of water. XLIV, 420. Memoir of. LV, 446. The water-works of Syracuse, N. Y. XXXIV, 61.

GREENE, ROBERT MAXSON.

Memoir of. LXXIX, 1425.

GREENMAN, R. S.

Retrogression in tensile strength of cement. LXXIV, 405.

GREENSFELDER, ALBERT P.

Railroad terminals. LIV, Part F, 527.

GREGG, TRESHAM D.

"Temperature Stresses in a Series of Spans," LXXX, 1626.

GREGORY, CHARLES EMERSON.

Design of concrete bridges, LXXVII, 711.

Design of masonry dams. LXXV. 168. Determination of storm-water run-off. LXXVIII, 1187.

LXXVIII, 1187. Earth pressure and stability. LXX. 3 Earth pressure and stability. LXX. 3 Maximum rates of rainfall. LIV, 183.
Memoir of. LXXXIII, 2191.
"Rainfall, and Run-Off in Storm-Water Sewers." LVIII, 458.
Reconstruction of Story River Dam.

LXXXI, 1058.

Sewage clarification by fine screens.
LXXVIII, 989.

The Sewer system of San Francisco. LXV, 390. The Walworth Sewer, Cleveland, Ohio. LV, 401.

GREGORY, JOHN H.

Automatic modules for regulating the speed of filtration. LI. 145. Filtration of water. LIII, 250. Filtration works. L, 456. Ground-water in sewers. LXXVI, 1916. Lawrence, Mass. Filter. XLVI, 349. Sewage clarification by fine screens.

Sewage clarifica LXXVIII, 1031.

Sewage Disposal. LVII, 128.
"The Improved Water and Sewage Works of Columbus, Ohio." LXVII. 206.
Washing rapid sand filters. LXXX, 1411.

Water filtration at Washington, D. C. LVII, 445. Water-works pumping engines. LXXIV,

GREGORY, W. B.

Dredges: Their construction and performance. LIV, Part C, 508.

Efficiency of centrifugal pumps. LVI,

Pumping machinery. LIV, Part D, 546. "Tests of Creosoted Timber." LXX, 37. "Tests of Creosoted Timber." LXXVI, 1192.

GREINER, J. E.

"Coal Piers on the Atlantic Seaboard." LXXVII, 454.

Elevated railroads. XXXVII, 400.
"Final Report of the Special Committee on Concrete and Reinforced Concrete." LXXXI, 1101.

Live loads for railroad bridges. LIV, Part A, 92.

Movable bridges. LX, 305. Overloaded bridges. LVII, 263. Painting of iron structures. XXXIII, 551.

Dol.
 Progress Report of Special Committee on Concrete and Reinforced Concrete.
 LXVI, 431.
 Progress Report of the Special Committee on Concrete and Reinforced Concrete.
 LXXVII, 385.
 Pailroad Logation, VXVI, 113.

Railroad location. XXXI, 113.

GREINER, J. E .- (Continued).

"Recent Tests of Bridge Members." XXXVIII. 41.

Specifications for structural steel.

Specifications for structural steel. XXXIII, 390.

Suspension bridges. XXXVI, 467.

"The American Railroad Viaduct.—Its Origin and Evolution." XXV, 349.

The Launhardt formula and bridge specifications. XLI, 218.

"The Reconstruction of the Baltimore and Ohio Railroad Bridge over the Ohio River, at Benwood, West Virginia." LV, 146.
Train loadings for bridges. XXXI, 205.

Treatment of metals for structural pur-poses. XXX. 659. "What is the Life of an Iron Railroad Bridge?" XXXIV, 294.

GRETH, JOHN CHARLES WILLIAM. Memoir of. LXXIX, 1427.

GRIBBLE, T. G.

"Street Railway Track." XXIV, 80.

GRIDLEY, VERNON HILL. Memoir of. XXXVI, 595.

GRIEST, MAURICE.

Subway tunnel work. LXXXI, 392.

GRIFFEN, JOHN.

"Experiments upon Phœnix Columns." XÎ. 1.

"Loads and Strains of Bridges."

GRIFFIN, A.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX,

GRIFFIN, J. ALDEN.

A Rational Formula for Street Surfaces." LXXVII, 64. Asphalt

GRIFFIN, MARTIN L.

"Some Remarks on the Chemistry of the Processes of Lime Sulphite Fiber Manufacture." XX, 281.

GRIFFIN, P. H.

"Sections and Mechanical Conditions of Car Wheels." XXV, 23.

GRIFFITH, JOHN H.

"The Ultimate Load on Pile Foundations: A Static Theory." LXX, 412.

GRIFFITH, JOHN PURSER.

Improvement of harbors, XXX, 490; also, XXX, 498. Improvement of rivers, XXX, 496. Manufacture and testing of Portland ce-

ment. XXX, 605.
Proposed method of testing structural steel. XXX, 674.

GRIGGS, JULIAN.

Water and sewage works, Columbus, Ohio. LXVII, 325.

GRIMM, CARL ROBERT.

Memoir of, LXXX, 2157.
"The Arch Principle in Engineering and

Esthetic Aspects, and Its Application to Long Spans." LXXI, 233.
"The Kinzua Viaduct of the Eric Railroad Company." XLVI, 21.
"The Tower of the New City Hall at Philadelphia, Pa." XXXI, 249.

GRIMSHAW, JAMES WALTER.

Memoir of. LXXXI, 1712.

GROAT, BENJAMIN F.

"Characteristics of Cup and Screw Cur-rent Meters; Performance of These Meters in Tail-Races and Large Moun-tain Streams; Statistical Synthesis of

Discharge Curves." LXXVI, 819.
"Chemi-Hydrometry and Its Application to the Precise Testing of Hydro-Electric Generators." LXXX, 951.
Floods and flood prevention. LXXXI,

1255.

"Ice Diversion, Hydraulic Models, and Hydraulic Similarity." LXXXII, 1138. The hydraulic jump. LXXX, 354. Verification of Bazin weir formula. LXXXIII, 187.

GROHN, -

Disposal of municipal refuse. LIV, Part E, 335.

GROVE, WILLIAM G.

"Reconstruction of the Norfolk and Wes-tern Railway Company's Bridge Over the Ohio River at Kenova, West Virginia." LXXIX, 411.

GROVER, ALVA J.

"Flood Waves in Sewers and their Automatic Measurement." XXVIII, 1, 10, 204.

GROVER, N. C.

Floods and flood prevention.

Rainfall and stream flow. LIX, 510. Weather Bureau service in California. LXXXI, 171.

GRUNER, E.

"The Operation of Mines in France." (Translated from the French by Paul A. Seurot.) LIV, Part A, 113.

GRUNSKY, C. E.

"Depreciation as an Element for Consideration in the Appraisal of Public Service Properties." LXXIX, 727.

Designing an earth dam. LXXXI, 33.

Determination of storm-water run-off.

LXXVIII, 1178.

Evaporation from Lake Conchos, Mexico.

LXXV 1068

LXXX, 1968.
"Final Report of the Special Committee on Floods and Flood Prevention." Flood Prevention." on Floods and Flood Prevention." LXXXI, 1218. Flood of March, 1907, in California rivers.

LXI, 331

Floods and flood prevention. LXXXI, 1295.

Irrigation and river control. LXXVI,

Principles of valuation. LXXIX, 213. Prospective competitor method of valua-tion. LXXXIII, 1361.
"Rain and Run-Off near San Francisco, California." LXI, 496.

GRUNSKY, C. E .- (Continued).

Redemption of the Great Valley of Cali-

Redemption of the Great Valley of California. LXVI, 263.
Rnn-off from rainfall and other data.
LXXIX, 1165.
Sampittic surfacing. LXIV, 370.
"The Appraisal of Public Service Properties as a Basis for the Regulation of Rates." LXXV, 770.
"The Low Stage of Lakes Huron and Michigan." LXIII, 31.
"The Lower Colorado River and the Salton Basin." LIX, 1.
"The Sewer System of San Francisco, and a Solution of the Storm-Water Flow Problem.". LXV, 294.
Use and care of the current meter. LXVI, 110.

se and ca LXVI, 110.

Valuation of public utilities. LXXXI, 1590.

Water supply for Panama Canal, LXVII, 91.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 104.

GUILD, JOSEPHUS CONN.

Memoir of. LIX, 540.

GUILLAIN, F.

"Navigation Works Executed in France from 1876 to 1891." (Translated from the French by C. L. Crandall, assisted by C. W. Sherman.) XXIX, 1.

GUTMAN, DAVID.

Failure of grain elevator. LXXX, 833. Shear tests on joints in T-beam stems. LXXVII, 1525.

GUZMAN, OCTAVIO.

Water supplies. LIX, 392.

GZOWSKI, SIR CASIMIR STANISLAUS. Memoir of. XLII, 567.

HAAS, E. F.

Effects of San Francisco earthquake on engineering constructions. LIX, 263.

HADDEN, GAVIN.

of the battle front. Light, railways LXXXIII, 1280.

HADFIELD, R. A.

The manufacture of steel. LIV, Part E. 407.

HADSALL, JOSEPH CANBY.

Memoir of. LXXV, 1190.

HAEHL, H. L.

"A Study of the Depth of Annual Evaporation from Lake Conchos, Mexico." LXXX, 1829.
Effects of San Francisco earthquake on engineering constructions, LIX, 216.

Rain and run-off near San Francisco. LXI, 520.

HAGAR, EDWARD McKIM. Memoir of. LXXXII, 1727.

HAGER, ALBERT B.

Railroad cantilever bridge at Beaver, Pa. LXXIII, 169.

HAGUE, CHARLES ARTHUR.

Memoir of. LXXVII, 1863. Pumping machinery. LIV, Part D, 561. Steam turbines. LIV, Part E, 110. "The Present-Day Pumping Engine for Water-Works." LXXIV, 15.

HAGUE, WILLIAM.

Memoir of. LXXXII, 1729.

HAIGHT, STEPHEN S.

"Accuracy of Measurement as Increased by Repetition." XI, 242.
Brick manufacture and brick pavement.
XXVI, 414.

HAINES, E. G.

Earth pressures and bracing. LX, 27. Impurities in sand for concrete. LXV. 267.

LXXXIII, 1867. Notes on tunnel lining.

HAINES, H. S.

Electricity vs. steam for branch railroads. XLII, 375, 386.

Locomotives and other rolling stock. LIV, Part D. 353. Preservation of railroad ties.

XLII, 345. Railroad freight differentials. XLVI.

Railway signaling. XXVIII, 280.
Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge. XXVIII, 366.
Steel and masonry construction. XLIX,

85.

HAINS, PETER C.

Foundations for heavy buildings. XXXV,

"Reclamation of the Potomac Flats at Washington, D. C." XXXI, 55, 497.

HALCOMBE, NORMAN MARSHALL. Memoir of. LXXXIII, 2373.

HALDANE, J. S.

Caisson disease and its prevention. LXV. 24.

HALE, H. M.

Sinking a wet shaft. LXXIII, 417.

HALL, G. THOMAS.

"On the Construction of the Second Avenue Line of the Metropolitan Elevated Railway of New York." X, 107.

HALL, JAMES.

Controverted questions in road construction. XXVIII, 122.

HALL, JOHN L.

"Theory of Reinforced Concrete Joists." LXXVI, 145.

HALL, JULIEN ASTIN.

"Construction and Maintenance of Track." XXIII, 330. Memoir of. LXXV, 1153. "Right of Way for Railroads." XXV,

HALL, W. CARVEL.

Spirit leveling. XXXIX, 382.

HALL, WILLIAM HAM.

"The Santa Ana Canal of the Bear Valley Irrigation Company." XXXIII, 61, 603.

HALL, WILLIAM M.

Brafford's Ridge Tunnel. XXXII, 63.

Brafford's Ridge Tunnel. XXXII, 63.

Dredges: Their construction and performance. LIV, Part C, 507.

Elevated railroads. XXXVII, 380.

Improvement of rivers. XLIX, 313.

Natural waterways. LIV, Part D, 449.

Reservoirs for flood control. LXXXII, 1501. 1501.

"The Water Supply of Parkersburg, W. Va." LXXXI, 749.
Theory of concrete. XLII, 131.

HALLOCK, JAMES CURRIE.

Memoir of. LXXXIII, 2197.

HALLSTED, JAMES C.

Nickel steel for bridges. LXIII, 361.

HALMOS, EUGENE E.

Pressures in penstocks. LXXXIII, 747.

HAMBLETON, FRANCIS HENRY. Memoir of. LXXIX, 1429.

HAMILTON, SCHUYLER.

"Fabrication of Beton Blocks by Manual Labor." IV, 93.

HAMMATT, W. C.

"A Western Type of Movable Weir Dam." LXXVI, 121.

"Catifornia Practice in Highway Con-struction." LXXVII, 1760. Cost keeping. LXIV, 411.

"Determination of the Duty of Water by Analytical Experiment." LXXXIII, 200. Engineers as patentees. XLVIII, 325. Laramie-Poudre Tunnel. LXXV, 750. Seepage losses in irrigation systems. LXXVI, 366.

The sewer system of San Francisco. LXV, 385.

Yuba River debris barrier. LXXI, The

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 171.

HAMMEL, EDWARD F.

Contracts: "Cost plus" and other forms. LXXXIII, 799.

HAMMOND, GEORGE T.

Monterrey water-works and sewerage. LXXII, 567.

Railway development in the United States. LXXIV, 144.

Sewage and wastes disposal for the U. S. Army. LXXXIII, 369.
Sewage clarification by fine screens.

LXXVIII, 1014.

The valuation of public service property. LXXII, 250.

HAND, F. C.

Physical valuation of railroads. LXXVII,

HANDY, J. O.

"The Purification of Water for the Production of Steam." LIV, Part A. 3.

HANKINSON, A. W.

Street grades and cross-sections. XLII, 16. Annual States

HANLEY, E. J.

Sewage disposal. LIV, Part E, 238.

HANNA, F. W.

Rainfall and stream flow. LIX, 511. surveying. LIV, Part B, 452.

HANNA, WALTER SCOTT.

Memoir of. LXXV, 1191.

HANSEL, CHARLES.

The valuation of public service property. LXXII, 261.

HANSSON, H. T.

The naval floating dock; its advantages, design, and construction. LX, 115.

HARBY, ISAAC.

"The Footbridge for Building the Cables of the New East River Bridge." XLIX, 165.

HARDEE, THOMAS S.

"A Novel Railroad Survey." VI, 258.

HARDEE, WILLIAM JOSEPH.

Memoir of. LXXXIII, 2199.

HARDESTY, SHORTRIDGE. Repairing a swing bridge, LXXXIII, 1108.

HARDING, H. McL.

West Side Manhattan water-front, LXXV, 250.

HARDING, HENRY.

Memoir of. LXXII, 591.

HARDING, HORACE.

Memoir of, XLIII, 618.

HARDING, S. T.

Determination of duty of water. LXXXIII, 263.

Flow of water in irrigation channels. LXXX, 1666.

HARDMAN, R. C.

Sanitation of construction camps. LXXVI, 509.

HARDY, E. D.

"Water Purification Plant, Washington, D. C., Results of Operation." LXXII, 301.

"Works for the Purification of the Water Supply of Washington, D. C." 307.

HARDY, GEORGE R.

Construction and maintenance of track. XXIII, 368.

Cost of sewer construction. XXXV, 117. Early practic practice in bridge building.

Permanent effects of strain in metals.

XXIV, 177. Railway signaling. XXVIII, 287; also, XXX, 546.

HARDY, GEORGE R .- (Continued).

Relation of wheels to frog points and to guard rails. XXXI, 520. Right of way for railroads. XXV, 329. Street railway track. XXIV, 133. Subaqueous foundations. XXIV, 239. Surveys for railway location. XXX, 525. Twenty-eighth Street electric light and power central station. XXXV, 453.

Gravity sand filters at Nyack, N. Y. XLV, 487. Stream contamination and sewage puri-

fication. XLII, 185. The engineer and the inspection of work. LVI, 123.
Water-works valuation. XXXVIII, 134.

HARLEY, ALFRED F.

HARING, JAMES S.

Street grades and cross-sections. XLII, 20.

Theory of concrete. XLII, 145.

HARLOW, JAMES HAYWARD.

Astoria, Oregon, Water-Works. XXXVI,

Consumption and waste of water. XLVI 434.

434.
LXXVIII, 1546.
Memoir of. LXXXIII, 2200.
Pumping engines. IV, 223.
Tests of cement. IX, 344.
Tests of water meters. XLI, 382.
"The Consumption and Waste of Water Delivered by Public Works." VI, 107.

HARPER, FREDERICK, C.

The bonding of new to old concrete. LXIV, 280.

HARRINGTON, JOHN LYLE.

Traffieway viaduct, Kansas City LXXX, 567. Mo

HARRIS, A. L.

"The Diversion of Irrigating Water from Arizona Streams." LXXVII, 932.

HARRIS, ELMO G.

Efficiency of centrifugal pumps. LVI, Pneumatic pumping plants. LIV. Pumping machinery. LIV, 19.
Pumping machinery. LIV, Part D, 544.
Steam turbines. LIV, Part E, 110.
"Theory of Centrifugal Pumps and Fans:
Analysis of Their Action, with Suggestions for Designs." LI, 166.

HARRIS, FRANK S. M.

Municipally owned public utilities. LXXXI, 423.

HARRIS, FREDERIC R.

Coffer-dam for 1000-foot pier. LXXXI, 543.

Pearl Harbor Dry Dock. LXXX, 304.
Pier construction in New York Harbor.
LXXVII, 535.
Water supply for camps, cantonments,

Water supply for ca etc. LXXXIII, 535.

HARRIS, HENRIQUE.

Memoir of. XXXVII, 562.

HARRIS, ROBERT L.

"A Coffer Dam or Caisson without Timber or Iron in its Construction. XXIV, 230.

Asphaltum for reservoir linings. XXVIII,

Bacteria and other organisms in water. XXXIII, 446. Borings in Broadway, New York.

Borings in XXVIII, 15. Construction and maintenance of track.

Efficiency of railroads for the transporta-tion of freight. XII, 150.
English and American railroads com-pared. XV, 766.
Enlargement of the Eric Canal. XIV,

126.

Foundations for heavy buildings. XXXV,

Motive power for street railways. XXVII, 576.

Potomac Flats. Reclamation of the

Reclamation XXXI, 495.
Right of way for railroads. XXV, 322.
Street railway track. XXIV, 151.
Temperature of water at various depths in labos and oceans. XIII, 80.

in lakes and oceans. XIII, 80. "The Railroad Ferry Steamer Solano." XXII, 247.

The water-works of Denver, Colorado. XXXI, 172. Wind bracing in high buildings. XXVII,

HARRIS, WILLIAM P.

American irrigation engineering. XXV,

HARRISON, BURT S.

241.

Passenger elevators. LIV, Part B, 191.

HARRISON CHARLES LEWIS.

Design of tunnel approaches and rate of progress on East River Tunnels. LXIX, 397.

Filtration works. L, 449.
"Lake Cheesman Dam and Reservoir."
LIII, 89.

Memoir of. LXXVI, 2218.
Panama Canal. L, 192.
"Provision for Uplift and Ice Pressure in Designing Masonry Dams." sure in I LXXV, 142

The Gatun Dam. LIII, 41.

HARRISON, EDLOW W.

Lake Cheesman Dam and Reservoir. LIII, 144.

Road building. XLI, 107. Stream contamination and sewage purification. XLII, 177. /est Side Manhattan water-front. LXXV, 257. West

HARROD, BENJAMIN MORGAN.

ARROD, BENJAMIN of New Address at opening of New House. XXXVIII, 425. and dredging. XL, 314. XLIX, 55. of New Society

Dredges and dredging. XL, 314. Engineering ethics. XLIX, 55. Levees of the Mississippi River. LI, 331, 400.

Morine wood-borers. XL, 210.
Memoir of. LXXVI, 2194.
Presidential Address at the Annual Convention at the Chateau Frontenac, Quebec, June 30th, 1897. XXXVII, 537.

HARROD, BENJAMIN MORGAN-(Con-Rainfall, flow of streams, and storage.

XXVII, 302.

"Report of the Committee on the Preservation of Timber." Preliminary Report, XI, 325 (1882); Final Report, XIV, 247 (1885).

"The Dangers Threatening the Naviga-tion of the Mississippi River and the Reclamation of its Alluvial Lands."

VII. 243. The discharge of the Mississippi. XXXV,

Theory of concrete. XLII, 130.

HARROUN, PHILIP E.

Effects of San Francisco earthquake on engineering constructions. LIX, 245.
"Tests of a Three-Stage, Direct-Con-Centrifugal Pumping LVI, 144.
"The Water-Works of Porterville, California." LIV, 235.

HART, R. A.

Effect of alkali on concrete, LXVII, 587.

HARTE, CHARLES RUFUS.

Catenary trolley construction. LXII, 180. Depreciation of public utility properties. LXXVII, 868.

Overhead construction for electric traction or transmission. LX, 549. Physical valuation of railroads, LXXVII,

Principles of valuation. LXXIX, 196.

Suspension for the contact wires of electric railways. LXI, 27.

The creeping of rails. LIII, 503.

Track elevation. LXXVI, 1900.

Underpinning Trinity Vestry Building.
LXXXI, 107. Valuation of public utility property. LXXIX, 882.

Water-proofing railroad bridge floors. LXXIX, 391.

HARTMANN, ERNEST F.

Timber preservation. LXXI, 388.

HARTRICK, EDWARD MACAULAY. Memoir of. LXXX, 2159.

HARTS, WILLIAM W.

"Description of Coos Bay, Oregon, and the Improvement of Its Entrance by the Government." XLVI, 482. Dredging river channels. LII, 239. Effects of San Francisco earthquake on engineering constructions. LIX, 208,

282.

Forests, res LX11, 347. reservoirs, and stream flow.

Redemption of the Great Valley of Cali-

reference of the Great Valley of Canfornia. LXVI, 246.

River and harbor outlets. LV, 308.

"Rivers and Railroads in the United States." LXXIX, 919.

"The Control of Hydraulic Mining in California by the Federal Government."

LVII.

he Yuba River debris barrier. LXXI, The

HARTSHORNE, JOSEPH.

Specifications for structural steel. XXXIII, 382.

HARWOOD, GEORGE A.

Electrification of suburban zone, New York Central & Hudson River R.R. in the vicinity of New York City. LXI,

Location and design of railroad terminal stations, cost of track, etc. LXIX,

HASBROUCK, CHARLES ALFRED.

Memoir of. LXX, 473.

HASELL, BENTLEY D.

Railroad signaling — the block system. XXXII, 468.

HASKELL, E. E.

Cup and screw current meters. LXXVI, 844.

Current meter and weir discharges. XLVII, 387. Flow of water in pipes. XLVII, 283.

HASTINGS, L. M.

Protection of steel and aluminum exposed to sea water. XXXVI, 504.

HASWELL, CHARLES H.

Dry docks - stone vs. wood. XLI, 591. Memoir of. LXI, 553. "Pile Driving Formulas: Their Con-struction and Factors of Safety." XLII,

Sanitary disposal of refuse. L, 145.
Screw steamship and tow-barge efficiency.
XXV, 390.
"Triple Thermic Motor: Description,
Operation and Results of a Single Expansion, Non-Condensing Steam Engine, Supplemented by the Evaporatine, supplemented by the Evapora-tion of the Bisulphide of Carbon and Expansion of its Vapor, at Brush Electric Light Company, Cleveland, Ohio." XVII, 193.

HATCH, FREDERICK N.

"A Reinforced Concrete Infiltration Well and Pumping Plant." LXXV, 697.

HATFIELD, ROBERT G.

"Experimental Tests of Building Stones." II, 145. Memoir of. XXXVI, 558.

HATT, W. K.

Concrete and concrete-steel. LIV, Part E, 583.

Concrete and mortar beams. L, 483.
Concrete and reinforced concrete.
LXXXII, 1558.
Creosoting timber. LVI, 31.
"Final Report of the Special Committee."

on Concrete and Reinforced Concrete.

Impervious concrete. LI, 128.
Nickel steel for bridges. LXIII, 306.
"Progress Report of Special Committee on Concrete and Reinforced Concrete."
LXVI, 431.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete," LXXVII, 385.

Saturation and strength of concrete. LXXVII, 448.

Steel stresses in flat slabs. LXXVII, 1411.

HATT, W. K .- (Continued). Tests of timber. LIV, Part F, 93. Timber tests. LI, 67, 98.

HATTON, HERBERT W.

Action of frost on cement and cement mortar. LXIV, 334.

HATTON, T. CHALKLEY.

Durability of wooden stave pipe. LVIII, Separate versus general contracts. XLIX, Unit costs of work. XLIX, 67.

HAUGH, JAMES CHARLES. Creosoting timber. LVI, 10. Memoir of. LXXVII, 1864.

HAUPT, LEWIS M.

Bar harbors on the coast of Oregon. LXXI, 360. Brazos River Harbor improvement, XXV.

540. Canals from the Lakes to New York. XLV, 292.

Coos Bay Harbor improvement. XLVI,

Dredges and dredging, XL, 340.
Dredges: Their construction and performance. LIV, Part C, 507.
Effect of depth upon artificial waterways. XXXV, 35.

Foreshore protection. L, 86. Harbors. LIV, Part A, 341. How to build a stone jetty. LXXV, 1049.

Irrigation works. XLIX, 44.

Lake front improvements, Chicago, Ill. XXXVIII, 335.
Levees of the Mississippi River. LI,

359.Coast, with Remarks on Beach Protection and Jetty Reaction." XXIII, 123.

Natural waterways. LIV, Part D, 450. Nicaragua Canal. L, 54. Origin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 99. Philosophy of engineering. LXXVII, 53. Ports of the Pacific. LXXVI, 228. Preservation of sandy beaches. LXXX, 1806.

Principles of valuation. LXXIX, 166. Rainfall, flow of streams, and storage. XXVII, 301.

Recent experiments with dynamite on an ocean bar. XXV, 449.
Single jetty harbor improvement. XXXVI,

Surveying. LIV, Part B, 456. "The Reaction Breakwater as Applied to the Improvement of Ocean Bars." XLII, 485, 530; XLIII, 104. Uniform practice in pile-driving. XXVII,

Ventilation of tunnels. XXIII, 299.

HAUSMAN, FREDERICK APPEL.

Memoir of, LVII, 533,

HAVEN, WILLIAM APPLETON.

Inspection and maintenance of railway structures. XVII, 289. Memoir of. LXXXIII, 2205.

HAVENS, VERNE L. Hydraulic power plants. LV, 256.

HAVILAND, ARTHUR. Memoir of. LXXXIII, 2214.

HAWES, LOUIS EDWIN.

Memoir of. LXXIII, 508.

HAWGOOD, H.

Economic conduit location. LXXVII, 784. Evaporation from Lake Conchos, Mexico. LXXX, 1946.
"Huacal Dam, Sonora, Mexico." (Concrete arch dam). LXXVIII, 564.
Morena Rock Fill Dam. LXXV, 60.

Pumping plant, Morenci Water LXXIX, 1321.

HAWKESWORTH, JOHN.

Memoir of. LXXVI, 2255.
"Precarious Expedients in Engineering
Practice." LXVII, 32. Reinforced concrete wharves. LXVI, 303.

HAWKINS, EDWIN N.

Mining of metals. LXI, 438.

HAWKINS, IRVING.

Memoir of. LXXIV, 523.

HAWKS, A. McL.

"A High-Speed Gravity Filter Bed." XXXV, 41. Flow of water in pipes. XXXV, 284. Friction coefficient for riveted steel pipe.

XLII, 155.

Ordering of water power under variable loads. XXXVII, 24.
"The Colorado Automatic Refrigerator System at Denver, Colo." XXIV, 389.

HAWKS, J. D.

Cylindrical wheels and flat-topped rails for railways. XXI, 183. Niagara Cantilever Bridge. XIV, 549. Proper relation to each other of the sections of railway wheels and rails.

XXI, 276.

"Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).

HAWLEY, G. P.

Durability of wooden stave pipe. LVIII,

HAWLEY, R. W.

Prospective competitor method of valuation. LXXXIII, 1378.

HAWLEY, W. C.

Financial management of water-works. XXXVIII, 22. Tests of water meters. XLI, 384.

HAY, DAVID.

"Underground Rallways in Great Britain." LIV, Part F, 325.

HAY, WILLIAM WREN.

Light railways of the battle front. LXXXIII, 1238.

HAYCROFT, JAMES ISAAC. Memoir of. LXII, 564.

HAYES, RICHARD SOMERS. Memoir of. LV, 448.

HAYFORD, JOHN F.

Precise spirit leveling. XLV, 135, "Surveying." LIV, Part B, 399. Surveying instruments. XLVIII, 115.

HAYLOW, J. H.

Pavements. LIX, 341.

HAYS, JAMES B.

Action of water under dams. LXXX, 458.

"Designing an Earth Dam Having a Gravel Foundation, with the Results Obtained in Tests on a Model." LXXXI,

HAYS, JOHN WILLIS.

Memoir of. LXXVII, 1865.

HAYWARD, R. F.

Power plant at Ogden, Utah. XXXVIII, 307.

HAZEN, ALLEN.

A high-speed gravity filter bed. XXXV,

Bacteria and other organisms in water. XXXIII, 455. Centrifugal pumps and fans. LI, 231.

Consumption and waste of water. XXXIV, 218.
Dams on sand foundations. LXXIII.

199.

Decolorization of water. XLVI, 162.
Depreciation of public utility properties. LXXVII, 809. Design of masonry dams.

LXXV, 153.

Design of masonry dams. LXXV, 153. Filtration of water. L111, 245. Filtration works. L. 444. Flood flows. LXXVII, 626. Flow of water in irrigation channels. LXXX, 1672. Flow of water in pipes. LI, 316. Gravity sand filters at Nyack. N. Y. XLV, 493. Groined arches. XLIII, 61. "Hydraulic-Fill Dams." LXXXIII, 1713. Jordan Level. Erie Canal. XLIII, 582. Lawrence, Mass., Filter. XLVI, 309. Laws of proportioning concrete. LIX, 149.

149.

Municipally owned public LXXXI, 435. Nomographic solutions for utilities.

solutions for formulas. LXXVIII, 1381. "On Sedimentation." LIII, 45.

Purification of sewage and water by filtration. XXX, 702.
"Purification of Water for Domestic Use: American Practice." LIV, Part D, 131, American Practice." 247.

247.
Sewage disposal. LIV, Part E, 236.
"Storage to be Provided in Impounding Reservoirs for Municipal Water Supply." LXXVII, 1539.
"The Albany Water Filtration Plant."

"The Albany Water Filtration Plant."
XLIII, 244.
The Bohio Dam. XLVIII, 277.
Theory of concrete. XLII, 125.
Tidal phenomena in New York Harbor.
LXXVI, 2094.

Translation of paper by M. Bechmann. LIV, Part D., 183. Washington water filtration plant.

LXXII, 362,

Water and sewage works, Columbus, Ohio. LXVII, 399.

Water supply for Panama Canal, LXVII,

Water supply of the San Francisco-Oakland Metropolitan District, LXXX, 137.

Water-works valuation. LXIV, 85. Weir measurement of stream

Weir measurement of LXXVII, 1287.

"Works for the Purification of the Water Supply of Washington, D. C." LVII, 307.

HAZEN, HENRY ALLEN.

Tornadoes and wind bracing for high buildings. XXXVII, 298.

HAZEN, JOHN VOSE.

Memoir of, LXXXIII, 2216.

HAZLEHURST, GEORGE BLAGDEN.

Cylindrical wheels and flat-topped rails for railways. XXI, 161. Life of iron railroad bridges. XXXIV, 315. Memoir of, LXXXIII, 2219.

HAZLEHURST, JAMES NISBET.

Memoir of, LXXXIII, 2220. "The Maintenance of Asphalt Streets." XLIX, 182. Water-works valuation, LXIV, 81,

HEAP, D. P.

Lighthouses and other aids to navigation. LIV, Part B, 76.

HEBBLETHWAITE, F. H.

Virtual grades for railroads. L, 19.

HEERMANS, T. W.

The Halsted Street Lift-Bridge, XXXIII,

HEGLY, M.

Evaporation from Lake Conchos, Mexico, LXXX, 1991.

HEIDENREICH, E. LEE.

"American Grain Elevators." XXIX, 644; XXX, 584.

HEISER, ALFRED B.

Shear tests on joints in T-beam stems. LXXVII, 1526.

HELMERT, F. R.

Surveying, LIV, Part B, 449.

HEMMING, DUNKIN WIRGMAN. Memoir of. LIX, 543.

HENDERER, WILLIAM OSWALD. Memoir of. LXXXI, 1713.

HENDERSON, G. R.

Electric locomotives. LXIX, 420. Electric locomotives. IATA, 420.
Electrication of suburban zone, New York Central & Hudson River R.R. in the vicinity of New York City. LXI, 106

HENDERSON, G. R .- (Continued).

Locomotives and other rolling stock. LIV, Part D, 348.

HENDERSON, W. O'B.

Flow of water in irrigation channels. LXXX, 1685.

HENDRIE, JOHN GIBSON.

Memoir of, LXXXIII, 2223.

HENLEY, ROBERT DWIGGINS MONTEITH.

Memoir of. LXXXIII, 2376.

HENNING, GUS C.

Specifications for structural steel. XXXIII, 343

HENNY, DAVID C.

Astoria, Oregon, Water-Works. XXXVI.

Constant-angle arch dam. LXXVIII, 722 Designing an earth dam. LXXXI, 55 Durability of wooden stave pipe. LVIII.

Flow of water in Ogden, Utah, pipe line, XL, 550; XLIV, 80. Flow of water through contractions, LXXXIII, 1210.

Hydraulic-fill dams. LXXXIII. Power plant at Ogden, Utah. XXXVIII,

a10.

Redemption of the Great Valley of California. LXVI. 269.

Stare pipe. XLI. 68.

The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII. 595.

"Two Earth Dams of the United States Reclamation Service." LXXIV, 28.

Water fitration at Washington, D. C. LVII. 386.

LVII, 386.

Water-works of Porterville, Cal. LIV, 270.

Water-works valuation. XXXVIII, 169. Wood stave pipe design. LXXXII, 473.

HENRY, ALFRED J.

Rainfall and stream flow. LIX, 489.

HENRY, D. FARRAND.

Durability of wooden stave pipe. LVIII,

Enlargement of the Eric Canal. XIV, 112

Flow of water in pipes, XLVII, 224.
Memoir of, LXXI, 420.
On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 461.

HENRY, PHILIP W.

Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV, 85. Depreciation as an element in appraisal. LXXIX, 799.

Engineering education. LXXV, 1125. Gauge of railways. LXXVIII, 424. Pavements. LIX, 356.

Street grades and cross-sections. XLII, 19.

Theory of concrete. XLII, 123.

HENSHAW, GEORGE H.

"The Improvement of Channels in Sedimentary Rivers." XX, 109, 230.

HENTHORN, JOHN T.

"Chimney for the Narrangansett Electric Lighting Company, Providence, R. I." XXV, 1,

HEQUEMBOURG, CHARLES EZRA. Memoir of, LIX, 545,

HERBERT, ARTHUR POWIS.

Memoir of. LXXV, 1154.

HERING, RUDOLPH.

A high-speed gravity filter bed. XXXV,

Adjustment of magnetic bearings of a survey. XV, 344. Albany Filtration Plant. XLIII, 309. Astoria, Oregon, Water-Works. XXXVI,

50. Bacteria and other organisms in water. XXXIII, 446.

"Brick Arches for Large Sewers." VII, 252, 260.

Canals from the Lakes to New York. XLV, 295. Characteristics of the Ravine du Sud and

plan for averting its overflow. XXIV, 478; XXV, 347.
Construction of a water system for onstruction of a water system for placer mining and suggestions for a new method of dam building. XXXV

89. Consumption and waste of water.XLVI,

421.

Control of non-navigable streams, XLIX, 14. meter and weir discharges.

Current

XLVII, 280.
Design of masonry dams. LXXV, 157.
"Disposal of Municipal Refuse: Review of General Practice." LIV, Part E. 265, 338.

Docks and harbors. LXII, 155.

Dredging river channels. LII, 238. Effect of alkali on concrete. LXVII, 592.

utration of valso, LIII, 269, water. XLIV, 399, 443; Filtration

Financial management of water-works. XXXVIII, 21.

XXXVIII, 21.
Flow in sewers. XLVI, 87.
Flow of water in pipes. XIV. 8; also, XXII, 66; also, XXXV, 280; also, XLVII, 237.
Flow of water in wood pipes. XLIX, 154; also, LXXIV, 458.
Flushing in pipe sewers. XL, 15.
Gauging of Cedar River, Washington. XII 16.

Gauging of XLI, 16.

Hydraulics of fire streams. XXI, 479. Hydraulics of the Hemlock Lake Conduit, and restriction of the use and waste of water in Rochester, N. Y. XXVI, 40.

XXVI, 40.
Inland sewage disposal. XXV. 146.
Irrigation studies. XLIV, 176.
Municipal refuse disposal. LX, 434.
Ocean waves. XXXVI, 159.
Precise spirit leveling. XLV, 117.
Pressures resulting from changes

Pressures resulting from changes of velocity of water in pipes. XXXIX,

Pulsations in pipe lines. LXXXII, 244.
Purification of sewage and water by filtration. XXX, 703.
Purification of water for domestic use.
LIV, Part D, 235.
Rainfall and discharge of sewers. XX,

Sanitary disposal of refuse. L, 95, 152. Self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 65.

HERING, RUDOLPH—(Continued).

Sewage clarification by fine screens. LXXVIII, 991.

Sewage disposal. LIV, Part E, 240. Sewage purification. LI, 415. "Sewerage Systems." X, 361. Spirit leveling. XXXIX, 381.

Stability of stone structures. VIII, 254. Stave pipe. XLI, 60. Subsidence of muck and peat soils.

LXXXII, 423.

"The Flow of Water in Small Chan-nels, after Gauguillet and Kutter, with nels, after Ganguillet and Kutter, with Kutter's Diagram Modified, and Graphical Tables with Special Reference to Sewer Calculations," VIII, I. The separate sewer system without automatic flush tanks, XXXIV, 226. The Shone hydro-pneumatic system of sewerage. XXVIII, 70. Water and sewage works, Columbus, Ohio, LXVII, 407. Water-works valuation, XXXVIII, 137.

Water-works valuation, XXXVIII, 137.

HERMANY, CHARLES.

Memoir of. LXV, 525. Presidential Address at the Thirty-sixth Annual Convention, held in the Hall of Congresses, Administration Building, St. Louis, Mo., October 3d, 1904, LIII, 452.

Steam turbines. LIV, Part E, 109. Tests of bridge irons. II, 227.

HERRICK, HENRY AUGUSTUS. Memoir of. LXXXII, 1687.

HERRMANN, F. C.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 179.

HERSCHEL, CLEMENS.

"Address at the Annual Convention, in Pittsburgh, Pa., June 27th, 1916." Pittsburgh, LXXX, 1306.

Beginnings of engineering. XXIV, 382. Bridge accidents, IV, 213. Cape Cod Canal. LXXXII, 144.

Cabe Cod Canal. LXXXII, 144.
Chean freight transportation. IV, 262.
Consumption and waste of water.
XXXIV, 212; also, XLVI, 434.
Distortion of riveted pipe by back-filling. XXXVIII, 105.
Draw-bridges. III, 139; IV, 204.

Durability of wooden stave pipe. LVIII,

Enlargement of the Eric Canal. XIV, 118. Flood waves in sewers. XXVIII, 10. Flow of water in pipes. XXXV, 296. Flow of water in pipes under pressure, and in open channels. VII, 125. Hoisting apparatus of canal head-gates. XXXII, 294.

Hydraulic-fill dams. LVIII, 253, Hydraulic problems. XLVII, 410, Hydraulics of fire streams. XXI, 462,

Hydrometry as an aid in irrigation.

Hydrometry as an aid in irrigation. LXXI, 344.
Induced currents of fluids. LXXX, 897.
Metric system of weights and measures. V, 355.
On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 451.
"On the Principles of the Construction of, and the Calculation of the Strains in, Revolving Drawbridges Having Two Spans or Openings, and Built as Con-

tinuous Girders. More Especially as Continuous Panel Girders." III, 395;

Continuous Panet Graces. 111, 555, 1V, 204.

"On the Work Done for the Preservation of the Dam at Holyoke, Mass., in 1885, and on Some Studies for a New Stone Dam for the Same Place." XV, 543.

"On Waves of Translation that Emanate from a Submerged Orifice, together

ate from a Submerged Orifice, together with an Examination of the Feasibil-ity of the Proposed Baie Verte Canal." IV, 185.

Panama Canal. LVI, 206. Preservation of timber. XI, 358. Pulp mill at Niagara Falls. XXXII,

Rainfall, XIII, 372. Rainfall and river-flow. XXVIII, 342. Rainfall and the flow of streams. X.

Rainfall, flow of streams, and storage. XXVII, 286.

Subaqueous foundations. XXIV, 242. Submerged pipe work, Portland, Ore. LXXVIII, 1328.

Tests of water meters. XLI, 379.
"The Gauging of Streams." VII, 236.
The Holland dikes. XXVI, 684.

"The Problem of the Submerged Weir."
XIV. 189.
"The Venturi Water Meter: An Instrument Making Use of a New Method of
Gauging Water: Applicable to the Gauging Water; Applicable to the Cases of Very Large Tubes, and of a Small Value only, of the Liquid to be Gauged." XVII, 228; XVIII, 133.

Theory of continuous girders. V, 219.

Translation of paper by B. Salbach.

XXX, 293.

"Twenty Years' Run-Off, at Holyoke, Mass. of the Connecticut River." Mass., of LVIII, 29.

Upright arched bridges. III, 286. Verification of Bazin weir formula. LXXXIII, 157.

HERSENT, JEAN.

"Dredges: Their Construction and Per-formance." (Translated from the French by Paul A. Seurot.) LIV, Part C. 327.

HERSEY, G. A.

"Substructure of Piscataquis Bridge, and Analysis of Concrete Work." LXI, 377.

HESS, H. D.

Movable bridges. LX, 304.

HEWES, VIRGIL H.

Earth pressures and bracing. LX, 58, Grouted cut-off for the Estacada Dam. LXXVIII, 509.

Lateral earth pressures. LIII, 306. Legitimate use of water. LV, 435. Sinking a wet shaft. LXXIII, 423. Structural design of bulldings. LIV,

440.

Tunnel construction. LVI, 248.

HEWETT, B. H. M.

"Notes on Tunnel Lining for Soft Ground." LXXXIII, 1822. "The New York Tunnel Extension of the Pennsylvania Railroad. The North River Tunnels." LXVIII, 152.

HEWITT, WILLIAM.

Method of computing cable deflections. LXXXIII, 1399.

HICKENLOOPER, A:

Test of an Edison incandescent electric lighting plant. XVIII, 177.

HICKEY, LOUIS THOMAS FRANKLIN. Memoir of. LXXIX, 1480.

HICKOK, C. E.

"A Study of Economic Conduit Location." LXXVII, 778.

HIDER, ARTHUR.

Erosion of river banks. XXXI, 4. Memoir of. LXXXI, 1715, Natural waterways. LIV, Part D, 465. The discharge of the Mississippi. XXXV, 323.

The Holland dikes. XXVI, 674.

HIGGINS, CHARLES H.

for Agreements building contracts

LXVII, 481.
Appraisal of public service properties.

Appraisal of public service properties. LXXV, 848. Concrete piles. LXV, 491. Engineering education. LXXV, 1126. Preservation of sandy beaches. LXXX, 1809.

Steel sheeting and sheet-piling. LXIV, 457.

The valuation of public service property. LXXII, 184. West Side Manhattan water-front. LXXV,

265.

HIGGINS, GEORGE.

Dredges: Their construction and per-formance. LIV, Part C, 483. Pumping machinery. LIV, Part D, 546.

HIGHAM, Sir THOMAS,

Irrigation. LIV, Part C. 139.

HIGHLEY, LEE.

Repairing bridge piers. LXXIX, 109.

HILDENBRAND, WILHELM.

Engineering ethics. XLIX, 59. Footbridge for building the cables of the New East River Bridge. XLIX, 180. Memoir of. LXXVII, 1867.

Steel and masonry construction. XLIX,

Stiffened suspension bridges. LV, 16. Suspension bridges. XXXVI, 454; also. XLVIII, 434.

HILDER, FRAZER C.

Kinetic effects of crowds, LXXVI, 2127.

HILDRETH, RUSSELL WADSWORTH. Memoir of, XXXVI, 596.

HILGARD, JULIUS E.

Construction and maintenance of roads. VIII, 354. Metric system of weights and measures.

V, 367.

Rainfall and the flow of streams. X, 244 .

HILGARD, K. E.

Deep foundations. LIV, Part E, 136. Filtration of water. XLIV, 425. "Rolling Dams." LIV, Part D, 439, 470. Sandrock sewers of St. Paul. XXXII. 203.

The form of railway excavations and embankments. XXXII, 257.

HILL, A. B.

Construction and maintenance of roads. VIII, 341.

HILL, E. R.

Operation of electric railroad trains and locomotives at New York Terminal, Pennsylvania Railroad. LXIX, 432.

HILL, GEORGE.

Albany Filtration Plant. XLIII, 307. Coal-handling machinery. XLI, 293. Concrete-iron highway bridges. XXXI,

461. Cost keeping. LXIV, 433. Foundations for heavy buildings. XXXV,

Jordan Level, Eric Canal. XLIII, 592. Preservation of materials of construc-tion. L, 301.

Protection of piles from the *Teredo*. XXX1, 234. Protection of steel and aluminum. XLIII,

462

Reinforced concrete floor systems. LVI. 372

Road building. XLI, 117. "Steel Concrete Construction." XXXIX, 617.

"Tests of Fire-Proof Flooring Material." XXXIV, 542; XXXV, 136. Tower of the New City Hall, Philadel-phia. XXXI, 274.

HILL, JAMES JEROME.

Gauge of railways. LXXVIII, 427. Memoir of, LXXXI, 1829.

HILL, JOHN W.

A high-speed gravity filter bed. XXXV, 58.

"A Masonry Dam." XVI, 261,

"A Masonry Dam." Avi, 201. Automatic modules for regulating the speed of filtration. LI, 156, "Pacteria and Other Organisms in

speed of filtration. L1, 156,
"Bacteria and Other Organisms in
Water." XXXIII, 423.
"Comparative Tests of Bituminous Steam
Coals," XLII, 27.
Compound and single engines. IV, 229.
"Cushioning the Reciprocating Parts of
Steam Engines." VII, 183; IX, 115,
Driven wells at Plainfield, N. J. XXXI,

Electric lighting. XXVI, 432. Floods and flood prevention. LXXXI, 1236.

1236,
High masonry dams. XIX, 192,
Modern office buildings. XLVIII, 21.
On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 453.
"Tests of an Edison Incandescent Electric Lighting Plant." XVIII, 142.
"The Accuracy and Durability of Water Meters." XLI, 326.
"The Quality of Water Supplies." XXXII, 130.
The water-works of Syracuse, N. Y.

water-works of Syracuse, N. Y. XXXIV, 63.

HILL, JOHN W .- (Continued).

Water supply of Parkersburg, W. Va. LXXXI, 788.

HILL, NICHOLAS S., Jr.

Sewage and wastes disposal for the U. S. Army. LXXXIII, 355. Water supply of Parkersburg, W. Va. LXXXI, 801.

HILL, WILLIAM R.

Changes at the New Croton Dam. LVI, 45. "The Water-Works of Syracuse, N. Y." XXXIV, 23.

HILLIARD, F. H.

Dredging river channels. LII, 254.

HILLMAN, CHARLES FLETCHER. Memoir of, XLIX, 345.

HILLYER, W. R.

Highway construction. LIV, Part F, 170.

HILTON, CHARLES.

Failure of the Ashtabula Bridge. VI, 205.

HIMES, ALBERT J.

Loadings for railroad bridges. LI, 112.

New facts about eye-bars. LVI, 431.

Stadia topographic surveys. XLIV, 105.

"The Position of the Constructing Engineer, and his Duties in Relation to Inspection and the Enforcement of Contracts." LVI, 104.

Water-proofing railroad bridge floors.

LXXIX, 336.

HIMMELWRIGHT, A. L. A.

Cinder concrete LXXIX, 644. floor construction. Cinder concrete floors. LXXVII, 1813. Effects of San Francisco earthquake on engineering constructions. LIX, 296.

HINCKLEY, HOWARD V.

"Bridging Canons Lengthwise." XXVI,

Concrete and reinforced concrete. LXXXI, 1166.

Connecticut River run-off. LVIII, 34. Driven wells at Plainfield, N. J. XXXI,

"Errors in Railroad Levels." XV, 893.
Flood flows. LXXVII, 622.
Irrigation. XVI, 116.
I'roper relation to each other of the sections of railway wheels and rails. XXI, 291.

Retracement-resurveys. LXXV, 436. Right of way for railroads. XXV, 337. Sibley Bridge. XXI, 608. Water purification at Steelton, Pa. LXVI,

HINCKLEY, JOHN FRANKLIN. Memoir of. LXXIII, 504.

HINDES, S. G.

Effects of San Francisco carthquake on engineering constructions. LIX, 285.

HINDS, FRANKLIN ALLEN.

Canals from the Lakes to New York. XLV, 280. Memoir of. LXXVII, 1870. Shall civil engineering practice be regu-lated by law? XLVI, 137.

HIROL, I.

"On Long-Time Tests of Portland Cement." LXXVI, 1027.
"The Preparation and Use of Concrete Blocks for Harbour Works." LIV, Part A, 211.

HITE-SMITH, VAN DUSEN. Memoir of. LVI, 479.

HITT, HENRY C.

Yale Bowl. LXXXI, 286.

HOAD, WILLIAM C.

Rainfall and run-off in storm-water sewers. LVIII, 491.

HOADLEY, JOSEPH H.

Continuous rope driving. XXXIX, 181.

HOAG, SIDNEY WILLETT, Jr.

Memoir of. LXXXI, 1718. West Side Manhattan water-front. LXXV, 247.

HOAR, ALLEN.

California highway construction. LXXVII, 1769. Preservation of sandy beaches. LXXX, 1811.

HOBBY, ARTHUR STANLEY. Memoir of. XLIX, 347.

HOBBY, ARTHUR STANLEY, Jr. A California irrigation system. LV, 180.

HOBSON, R. P.

Protection of steel and aluminum exposed to sea water. XXXVI, 500.

HODGE, HENRY WILSON.

Elevated railroads. XXXVII, 419. High-alloy steel for bridges. LXXVIII, 41.

"Live Loads for Railroad Bridges." LIV, Part A, 79, 108. Loadings for railroad bridges. LI, 105, "Live

112. Remoir of. LXXXIII, 2224. Railway bridge designing. XXVI, 261. Stiffened suspension bridges. LV, 46.

HODGES, H. F.

Water supply for Panama Canal. LXVII, 96.

HODGKINS, W. C.

"Surveying." LIV, Part B, 399.

HODGKINSON, FRANCIS.

"Some Typical Tests of Steam Turbines." LIV, Part E, 85.

HOECH, THEODOR G.

Canals from the Lakes to New York. XLV, 288. Life of iron railroad bridges. XXXIV, 327.

HOECH, THEODOR G .- (Continued).

Traffic on waterways and on railroads. LIV, Part B, 507.

HOFF, OLAF.

Detroit River Tunnel. LXXIV, 361.

"Final Report of the Special Committee on Concrete and Reinforced Concrete."
LXXXI, 1101.

"Progress Report of Special Committee on Concrete and Reinforced Concrete."

LXVI, 431.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385.
"Specifications and Methods of Tests for Portland Cement." LXXXII, 166.

HOGAN, JOHN P.

Grouting operations. LXXXIII, 1064.
"Siuking a Wet Shaft." LXXIII, 398.
Submerged pipe work, Portland, Ore.
LXXVIII, 1340.

HOGG, JAMES BREADING. Memoir of. LXXV, 1155.

HOLBROOK, FREDERICK WILLIAM DOANE.

Memoir of. LXXX, 2161. Stave pipe. XLI, 65,

HOLBROOK, HENRY RANDOLPH. Memoir of. LXXIII, 506.

HOLDEN, CHARLES A.

Rainfall and stream flow. LIX, 488.

HOLGATE, H.

Hydro-electric power in Canada. LXV, 194

HOLLAND, C. M.

Notes on tunnel lining. LXXXIII, 1898.

HOLLEY, ALEXANDER L.

Cheap freight transportation. IV, 263. Manufacture of rails. IV, 233. Tests and testing machines. IV, 265.

HOLLOWAY, J. F.

Cost of steam power. XII, 432. Proportional water meter. XXIV, 535.

HOLLOWAY, ROGER TIFFT.

Memoir of. LXXVII, 1917.

HOLLYDAY, R. C.

Nagasaki graving dock. LVI, 82.

HOLMAN, M. L.

Pumping machinery. LIV, Part D, 586. Steam turbines. LIV, Part E, 105.

HOLMAN, STEPHEN.

Memoir of, LXXVI, 2262,

HOLMES, EDWIN MERRITT. Memoir of. LXXII, 598.

HOLMES, HOWARD W. Traffieway viaduct, Kansas City, Mo. LXXX, 541.

HOLMES, J. ALBERT.

Hydraulic-fill dams. LXXXIII, 1809.

HOLROYDE, WILLIAM J.

Gunpowder pile-driver. II, 408.

HOMBERGER, HEINRICH.

Hydro-electric power development. LXXVIII, 1553. Hydro-electric power plants. LXXIX, 1041.

HOMFRAY, SAMUEL G.

Passenger elevators. LIV, Part B, 201. Railroad terminals. LIV, Part F, 541.

HONEYMAN, BRUCE RITCHIE.

Memoir of, LXXXIII, 2378.

HONNESS, GEORGE G.

Effect of temperature changes on masonry. LXI, 410.
Long-time tests of Portland cement. LXXVI, 1036.

HOOGENHUYZE, L. F. E. van

"The Improvement of Three Holland Ship Canals." LIV, Part F, 209.

HOOKER, ELON-HUNTINGTON.

"The Suspension of Solids in Flowing XXXVI, 239. Water."

HOOLEY, E. PURNELL.

Highway construction. LIV, Part F, 176.

HOOPER, H. ROSS.

Sewage disposal. LIV, Part E, 230.

HOOVER, C. B.

Water and sewage works, Columbus, Ohio. LXVII, 359.

HOOVER, C. P.

Water and sewage works, Columbus, Ohio. LXVII, 354.

HOPKINS, ALBERT LLOYD.

Memoir of. LXXIX, 1481.

HOPKINS, CHARLES C.

Elevated tanks and stand-pipes. LXIV, 536.

Tuberculation in water pipes. XXVIII, 266.

HOPSON, E. G.

State and national water laws. LXXVI, 712.

"The Automatic Volumeter." LXXX, 572.
"The Economic Aspect of Seepage and Other Losses in Irrigation Systems." LXXVI, 336. "The Tieton Canal." LXXI, 158.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 143.

HORAN, JOHN JOSEPH.

Memoir of. LXVII, 634.

HORN, FRANK CHURCHILL.

Lake Cheesman Dam and Reservoir. LIII, 146. Memoir of. LXXXIII, 2229.

HORNER, W. W.

Determination of storm-water run-off. LXXVIII, 1167.

HORNEY, ODUS C.

"Gun Construction in the United States." LIV, Part B, 209.

HORTON, HORACE EBENEZER.

Elevated rallroads. XXXVII, 375. Memoir of. LXXVI, 2221.

Safe stresses in steel columns. LXI, 178.

Tests of large steel columns. LXXIII, 461.

The Halsted Street Lift-Bridge, XXXIII. 55.

HORTON, ROBERT E.

Action of water under dams. LXXX, 473.

Chemi-hydrometry. LXXX, 1282. Determination of storm-water run-off.

Determination of storm-water run-off. LXXVIII, 1177. Duty of water in the Pacific Northwest. LXXXIII, 218. Evaporation from Lake Conchos, Mexico. LXXX, 1994. Flood flows. LXXVII, 663, Flow of water in pipes. XLVII, 289. Flow of water ver dams. XLVII, 240.

Flow of water over dams. XLIV, 340.
Obstruction to flow by bridge pic LXXXII, 382.

Rainfall and run-off. LXXVII, 369.
Run-off from rainfall and other data.
LXXIX, 1166. Stream administration.

administration. LXXVIII, 659. measurement of stream flow. LXXVII, 1298.
Yield of underground reservoirs.
LXXVIII, 243.

HORTON, THEODORE.

Centrifugal pumps and fans. LI, 244.
"Flow in the Sewers of the North Metropolitan Sewerage System of Massachusetts." XLVI, 78.
Sanitary disposal of refuse. L. 128.
Water filtration at Washington, D. C.

LVII, 430.

HOSKINS, LEANDER M.

"Experiments on the Flow of Water in the Six-Foot Steel and Wood Pipe Line of the Pioneer Electric Power Company, at Ogden, Utah." First Paper, XLI, 471 (1898); Supplementary Paper, XLIV, 34 (1900). "General Criterion for Position of Loads Causing Maximum Stress in any Mon-

Causing Maximum Stress in any Me ber of a Bridge Truss." XLII, 240. Mem-

HOSKOLD, H. D.

"Historical Notes upon Ancient and Modern Surveying and Surveying Instru-ments." XXX, 135.

HOTCHKISS, CHARLES WILCOX.

Memoir of, LXXXI, 1721.

HOUK, IVAN E.

Reservoirs for flood control, LXXXII, 1528.

HOUSTON, G. N.

Classification of irrigable lands, LXXXI, 214 Irrigation. LXII, 45.

Maintenance of macadam and other roads.

LXI, 465.
"The Construction of Gravity Sand Filters at Nyack, N. Y." XLV, 476.
"The Halligan Dam: A Reinforced Masonry Structure." LXXV, 112. Water purification at Steelton, Pa. LXVI, 207.

HOUSTON, JOHN.

"Arching Bergen Tunnel on Eric Rail-road." I, 75. Memoir of. XXXIX, 694.

HOVENDEN, THOMAS, Jr.

Memoir of. LXXX, 2251.

HOVEY, O. E.

Dumbarton Bridge construction. LXXVI, 1616 Reconstruction of Benwood Bridge. LV,

156.

HOWALT, W. J. C.

Notes on bridgework. LXXVI, 249.

HOWARD, C. P.

Impurities in sand for concrete. LXV, 260.

Physical valuation of railroads. LXXVII.

Railroad location. LIV, 149. The valuation of public service property, LXXII, 191.

HOWARD, CONWAY R.

The transition curve. XXVIII, 32.

HOWARD, E. E.

"The Sixth Street Viaduct, Kansas City."

LXV. 42
"The Twelfth Street Trafficway Viaduct,
Kansas City, Missouri." LXXX, 484.

HOWARD, J. W.

Road construction and maintenance: Design of highway systems. LXXVII. 168.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous pave-ments. LXXVII, 201.

Road construction and maintenance: The use of bituminous materials by

mixing methods. LXXIII, 132.
Road construction and maintenance:
Use of bituminous material in penetration and mixing methods. LXXV,

Sampittic surfacing. LXIV, 382.

HOWARD, JAMES E.

Effects of straining steel, LXXX Revision of Niagara Railway Bridge, LXXXIII, 2013. LXXX, 1468 Arch

Bridge, LXXXIII, 2013, "Some Tests of Large Steel Columns." LXXIII, 429.

Stress measurements, Hell Gate Arch. LXXXII, 1085, Tests of cement. LIV, Part F, 43, Tests of timber. LIV, Part F, 95. Wrought-Iron columns, tests and formulæ. XI, 119.

HOWARD, JOEL MANNING.

Memoir of, LXXXII, 1731.

HOWARD, OLIVER ZELL.

Memoir of. LXXXII, 1689.

HOWATSON, ANDREW.

Purification of water for domestic use. LIV, Part D, 191.

HOWE, E. W.

Controverted questions in road construction. XXVIII, 82.

HOWE, HENRY M.

Effects of straining steel. LXXX, 1482. Properties of steel: Its use in structures and heavy guns. XVI, 351.

Specifications for structural steel.

XXXIII, 380.

The manufacture of steel. LIV, Part E,

HOWE, HORACE J.

Earth pressures and bracing. LX, 24. Memoir of. LXXIV, 502. Pile-driving formulas. XLII, 283.

Preservation of materials of construction.

Preservation of railway ties. XLV, 542.
"Notes on the Replacing of the Super-structure of the Harlem Ship Canal Bridge." LXVII, I.

The supporting power of piles. XLVIII, 215.

Timber preservation. XLIV, 201. Transition curves. XLVI, 402. Water-works of Porterville, Cal. LIV,

HOWE, MILTON G.

Memoir of XLIX, 349. Proper relation to each other of the sections of railway wheels and rails. XXI, 276.

HOWE, WALTER C.

Street railway track construction. LXXVI, 466.

HOWE, WILLIAM BELL WHITE.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV,

Memoir of. LXXVI, 2234. Painting of iron structures. XXXIII. 540

Structural design of buildings. LIV, 413.

HOWELL, CHARLES W.

"Improvement of Entrance to Galveston Harbor." VI. 223. Improvement of the mouth of the Missis-sippi River. V. 284. South Pass Jetties. VII, 159.

HOWELL, GEORGE WASHINGTON. Memoir of, XLIX, 351.

HOWELL, JOHN W.

Test of an Edison incandescent electric lighting plant. XVIII, 172.

HOWELL, W. A.

Road construction and maintenance: Fillers for brick and block pavements. LXXV, 539.

HOWELLS, J. M.

Hydraulic-fill dams. LXXXIII, 1754. Recent practice in hydraulic-fill dam construction. LX, 101.

HOWES, BENJAMIN A.

Grouting operations. LXXXIII, 1077.

HOWSON, GEORGE W.

Multiple-arch dams. LXXXI, 900.

HOXIE, R. L.

"Excessive Rainfalls Considered with Especial Reference to their Occurrence in Populous Districts." XXV, 70.

HOYT, HAZEN L., Jr.

Light railways of the battle front. LXXXIII, 1250.

HOYT, JOHN C.

"Comparison Between Rainfall and Run-Off in the Northeastern United States." LIX, 431.

Cup and screw current meters. LXXVI, 848.

Connecticut River run-off. LVIII, 34.
"Surveying." LIV, Part B. 419.
"The Use and Care of the Current Meter.
as Practiced by the United States
Geological Survey." LXVI, 70.

HOYT, W. G.

Flow of water in irrigation channels. LXXX, 1681. Run-off from rainfall and other data. LXXIX, 1173.

HOYT, WILLIAM EDWIN.

American railroad bridges. XXI, 573. Memoir of. LXXX, 2164.

HUBBARD, PREVOST.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 202.

Road construction and maintenance: Surface treatment with tars, heavy oils, LXXIII. 54. etc.

Sampittic surfacing. LXIV, 360.

HUBBELL, CLARENCE W.

"Experiments at Detroit, Mich., on the Effect of Curvature upon the Flow of Water in Pipes." XLVII, 1.

HUDSON, C. W.

"Comparison of Weights of a Three-Hinged and a Two-Hinged Spandrel-Braced Parabolic Arch." XLIII, 20. "Computation of Stresses in Open-Webbed Arches Without Hinges." LXV,

145

"Deflections of Beams with Variable Mo-

"Deflections of Beams with Variable Mo-ments of Inertia." LI, 1.
"Final Report of the Special Committee on Steel Columns and Struts." LXXXIII, 1583.
New principle in the theory of struc-tures. LXXXIII, 639.
Railroad cantilever bridge at Beaver, Pa.

LXXIII, 166,

The Sewickley Cantilever Bridge. LXXVI. 631.

HUERGO, L. A.

Artificial waterways. LIV, Part F, 285.

HUET, A.

"Notes on Projects for the North Sea Canal from 1629-1893." XXX, 416.

HUGHES, D. E.

Buffalo Breakwater. LH, 202.

HUGHES, F. D.

Stress measurements, Hell Gate Arch. LXXXII, 1081.

HUGHES, WILLIAM MACKENZIE.

Memoir of. LXXIX, 1431. Movable bridges. LX, 314. Weights of bridges. XVI, 235. Weights of iron and steel railway bridges. XV, 97.

HULSART, C. RAYMOND.

Laramie-Poudre Tunnel. LXXV, 765. Tunnel construction methods. LXXXI, 487.

HULSE, SHIRLEY C.

Disposal of municipal refuse. LIV, Part E. 327. Grouted cut-off for the Estacada Dam.

LXXVIII, 500.

HUMPHREY, HENRY CYPRIAN.

Memoir of. LXVII, 630.

HUMPHREY, RICHARD L.

Concrete and concrete-steel. LIV, Part E, 551.

Effect of alkali on concrete. LXVII,

"Final Report of the Special Committee on Concrete and Reinforced Concrete." LXXXI, 1101.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV,

Fire-resistant construction of buildings. LXV, 291.

Impurities in sand for concrete. LXV, 260

Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa. XLVIII, 557. Fortland cement concrete. XXXVII,

Portland cement concrete. XXXVII, 517.
"Progress Report of Special Committee
on Concrete and Reinforced Concrete." LXV1, 431.

LXVI, 431.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385.

"Specifications and Methods of Tests for Portland Cement." LXXXII, 166.
Tests of cement. LIV, Part F, 47.
The manufacture of cement. LIV, Part B, 198.

B, 128.

HUMPHREYS, ALEXANDER C.

Depreciation of public utility properties. LXXVII, 827. Physical valuation of railroads. LXXVII,

Principles of valuation. LXXIX, 198.

HUMPHREYS, CHARLES.

Memoir of. LVIII, 534,

HUMPHREYS, D. C.

Consumption and waste of water. XLVI, 429

HUNICKE, WILLIAM AUGUST.

Memoir of. LXXVII, 1871.

HUNT, A. M.

Durability of wooden stave pipe. LVIII,

Effects of San Francisco earthquake on engineering constructions. LIX, 256.

HUNT, ALFRED E.

"A Proposed Method of Testing Structural Steel." XXX, 181, 675.
Comparative tests of electric motor and steam locomotive. XXIII, 207.
Memoir of. XLVI, 557.
Painting of iron structures. XXXIII,

541.

Properties of steel: Its use in structures and heavy guns. XVI, 353.

Specifications for structural steel.

XXXIII, 355.

Treatment of metals for structural purposes. XXX, 657.

HUNT, CHARLES WARREN.

Borings in Broadway, XXVIII, 17. New York.

XXVIII, 17.
Engineering education. LXXV, 1121.
Sweetwater Dam. XIX, 231.
"The Activities of the American Society of Civil Engineers During the Past Twenty-Five Years." LXXXII, 1577.
"The First Fifty Years of the American Society of Civil Engineers: 1852-1902."
Address at the Annual Convention at Washington, D. C., May 20th, 1902. XLVIII. 220. XLVIII, 220.

Translation of paper by H. Despres. XXX, 235.

Uniform practice in pile-driving. XXVII,

HUNT, LOREN EDWARD.

Effects of San Francisco earthquake on engineering constructions. LIX, 285. Memoir of. LXXX, 2252.

HUNT, RALPH H.

Prevention of mosquito breeding. LXXVI, 771.

HUNT, RANDELL.

Foundations for heavy buildings. XXXV, 482 Memoir of. XLV, 629.

HUNT, ROBERT W.

UNT, ROBERT W.
Cylindrical wheels and flat-topped rails for railways. XXI, 198.
"Final Report of Special Committee on Rail Sections." LXX, 456.
Height of buildings. XLIV, 457.
"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
Properties of steel: Its use in structures and heavy guns. XVI. 304.
Recent practice in rails. XLIV, 475.
"Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893). 425 (1893).

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

HUNT, RUFUS CAMERON. Memoir of. LXXXIII, 2232.

HUNTER, JOSEPH W.

Road construction and maintenance: Relative value of three methods of carrying on work. LXXIII, 19.

HUNTER, WALTER.

Filtration of water. XLIV, 430.

HUNTER, WILLIAM.

Memoir of. LXXX, 2167.

HUNTER, WILLIAM HENRY.

"Artificial Waterways in Great Britain."
LIV, Part F, 183.
Canals from the Lakes to New York.
XLV, 284.
Harbors. LIV, Part A, 352.
Memoir of. LXXXI, 1723.

HUNTINGTON, LINN MURDOCH. Memoir of. LXXXIII, 2233.

HURD, HURD CLARENCE. Memoir of. LXXIX, 1433.

HURLBUT, CHARLES C.

Cinder concrete floors. LXXVII, 1803.

HUTCHINGS, JOHN B., Jr.

Cinder concrete LXXIX, 656, floor construction.

HUTCHINSON, A. J.

Street railway track. XXIV, 134.

HUTCHINSON, CARY T.

Electric motive power for suburban traffic. XXXVII, 180.

HUTTON, NATHANIEL HENRY. Memoir of. LX, 581.

HUTTON, WILLIAM R.

Brazos River Harbor Improvement, XXV, 558.

Cements, mortars and concretes. XXV,

Characteristics of the Ravine du Sud and plan for averting its overflow. XXV, 343.

Concrete-iron highway bridges. XXXI,

Croton Water-Works and supply for the future. V, 259. Dunning's Dam, near Scranton, Pa. XXXII, 408.

XXXII, 408.
Excavation and embankment by water power. XV, 356.
Flow of water in pipes. XIV, 16.
Friction rollers. XXXII, 127.
Groined arches. XLIII, 60.
Hudson River Tunnel. 1X, 276.
Improvement of James River, Va.

XXVIII, 446.

Improvement of rivers. X1X, 267. Improvement of the Lower Weser. XXX, 487.

Main relief sewer of Brooklyn, XXVI, 515.

Movable dams. XXXIX, 598.

Neat tests vs. sand tests for Portland cement. XXV, 303.

"On the Determination of the Flood Discharge of Rivers and of the Back-

water Caused by Contractions." XI, 211.

Quicksand in excavation. X, 286. Railway bridge designing. XXVI, 161. Rainfall and river-flow. XXVIII, 338. Rainfall and the flow of streams. X, 241.

Shall civil engineering practice be regulated by law? XLVI, 138.
Tests of cement. IX, 346.
The Holland dikes. XXVI, 691.
The North Sea Canal of Holland. XXX,

714.

Tuberculation in water pipes. XXVIII, 263

Weights of iron bridges. XV, 96. iron and steel railway

HYDE, CHARLES GILMAN.

Effects of San Francisco earthquake on engineering constructions. LIX, 245. "The Lawrenee, Mass., City Filter: A History of Its Installation and Main-LXXXI, 437.

HYDE, WILLIAM HERBERT.

Memoir of. LXXXI, 1802.

IMMEDIATO, G.

Road construction and Maintenance: Bituminous surfaces. LXXV, 567. Temperature changes in mass concrete. LXXIX, 1253.

INGERSOLL, COLIN M.

Physical valuation of railroads. LXXVII, 314.

INGERSOLL, R. R.

Properties of steel: Its use in structures and heavy guns. XVI, 335.

INGRAM, W. T.

Mexico and Pacific Railroad. LXXX, 1610.

IRVING, W. G.

Municipally owned LXXXI, 437, publie utilities.

IRWIN, A. C.

Effects of straining steel. LXXX, 1486.

IRWIN, ROGER BROOKE.

Memoir of. LXXI, 448.

ISAACS, JOHN D.

"Final Report of Special Committee on Rail Sections." LXX, 456.

JACKSON, DUGALD C .

Electricity vs. steam for branch railroads.

XLII, 383.
"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." LXXXI, 1207.

JACKSON, THOMAS MOORE.

Memoir of, LXXVI, 2236.

JACKSON, WILLIAM.

Memoir of, LXXIV, 504.

JACKSON, WILLIAM B.

Depreciation of public utility properties. LXXVII, 822.

JACOBS, CHARLES MATTATHIAS.

Memoir of, LXXXIII, 2236. Nagasaki graving dock. LVI, 80.
"The New York Tunnel Extension of the Pennsylvania Railroad. The North River Division." LXVIII, 32.

JACOBS, JOSEPH.

Designing an earth dam. LXXXI, 59.

JACOBS, JULIUS LILIEN.

Memoir of. LXXXIII, 2244.

JACOBS, ROBERT II.

Subway tunnel work. LXXXI, 397.

JACOBY, HENRY S.

Comparison of weights of hinged arches. XLIII, 31.

Counterstresses in bridges. XLII, 552. Economics of LXXXIII, 70. steel arch bridges.

Steel-concrete construction. XLVI, 101. Stress measurements, Hell Gate Arch. LXXXII, 1100.

JACOMB-HOOD, JOHN WYKEHAM.

Memoir of, LXXIX, 1435.

JAMES, E. W.

Road construction and maintenance: Engineering organizations for highway work, LXXVII, 1085.

Sand-clay mixtures for road surfacing. LXXVII, 1482.

JAMIESON, J. A.

Reinforced concrete buildings. LX, 464.

JANNI, A. C.

Design of concrete bridges. LXXVII, 714.

"Method of Designing a Rectangular Reinforced Concrete Flat Slab, Each Side of Which Rests on Either Rigid or Yielding Supports." LXXX, 1689.

New principle in the theory of structures. LXXXIII, 679.

Stresses in reinforced concrete beams. LXXVII, 763.

Stresses in wedge-shaped reinforced concrete beams. LXXVIII, 734.

JANVRIN, NED HERBERT.

Memoir of, LXXVII, 1872.

JAPP, HENRY.

"Caisson Disease and Its Prevention."

LXV, 1.
"The New York Tunnel Extension of the
Pennsylvania Railroad. Contractors'
Plant for East River Tunnels." LXIX,

JAQUES, W. II.

Properties of steel: Its use in structures and heavy guns. XVI, 307.

JARRETT, EDWIN S.

Preumatic foundations. LXIII, 26.

JARVIS, CLARENCE S.

lt problem of the Zuni Reservoir. LXXXIII, 881. Silt

Weir measurement of stream flow. LXXVII, 1303.

JEME, TIEN YOW.

Memoir of, LXXXIII, 2246.

JENKINS, J. B.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

JENKINS, JAMES EDGAR.

Memoir of. LXXXI, 1725.

JENNINGS, C. A.

Sewage clarification by fine screens. LXXVIII, 974.

JENNINGS, II. C.

Weights of bridges. XVI, 224.

JENNINGS, W. T.

Influence of rails on street pavements. XXXVII, 112.

JERRARD, L. P.

"The Valuation of Land." LXXXI, 582.

JERVIS, JOHN B.

"A Memoir of American Engineering." VI. 39.

Address delivered at the First Annual Convention, held June 16th, 1869. I,

Efficiency of railroads for the transporta-tion of freight. XII, 126.

JEWEL, LINDSEY LOUIN.

Memoir of. LXXX, 2169.
Principles of valuation. LXXIX, 169.
Reconstruction of Kenova Bridge.
LXXIX, 486.

JEWETT, WILLIAM CORNELL.

Brick manufacture and brick pavement, XXVI, 413. Memoir of, LXXX, 2171.

JOHANNESSON, S.

"Manhattan Elevated Railway Improvements." LXXXII, 551.
"Notes on Tunnel Lining for Soft Ground." LXXXIII, 1822.

JOHNSON, A. L.

Concrete and concrete-steel. LIV, Part E, 590.

Fatigue of cement products. LI, 448. Steel and masonry construction. XLIX, 86

Steel-concrete construction, XXXIX, 643; also, XLVI, 110. Timber tests. LI, 90.

JOHNSON, CHAPMAN LOVE. Memoir of, LXXIX, 1436.

JOHNSON, FRANCIS ROBERT,

"South African Irrigation." LII, 1.

JOHNSON, GEORGE A.

Washing rapid sand filters. LXXX, 1421. Washington water filtration plant. LXXII, 368.

Water and sewage works, Columbus, Ohio, LXVII, 415.

LIX, 398.

Water supplies, LIX, 398. Water supply for camps, cantonments, etc. LXXXIII, 532.

JOHNSON, HENRY.

Railway signaling. XXVIII, 295.

JOHNSON, J. B.

American railway liue, Vera Cruz to City of Mexico. XV, 836.

Bridge experiments with moving train-loads. XLI, 465.

"Cast-Iron — Strength, Resilience, Tests and Specifications." XXII, 91. Comparison of water supply systems from a financial point of view. XXIV. 262.

Cylindrical wheels and flat-topped rails for railways. XXI, 203.

Destruction of rails by excessive weights. XX, 129.

Friction rollers. XXXII, 270. Impact testing experiments. XXXIX.

267.
Inspectors and bridge work. XVII, 325.
Memoir of. LI, 454.
Niagara Railway Arch. XL, 164.
Permanent effects of strain in metals.
XXIV, 104; XXV, 19.
Railway bridge designing. XXVI, 135.
Reservoir system of the Great Lakes.
XL, 432.
Spirit leveling. XXXIX, 415.
Steel concrete construction. XXXIX, 642.
The discharge of the Mississippi. XXXV.

The discharge of the Mississippi. XXXV,

The Launhardt formula and bridge specifications. XLI, 187.
The manufacture of brick. XVIII, 307.

Theory of the ideal column. XXXIX, 114.

Three-hinged masonry arches. XL, 77.
Topography on the survey of the Mexico-United States boundary. XXXIV, Three-hinged masonry arches. 283.

Tornadoes and wind bracing for high buildings. XXXVII, 292. Transverse strength of beams as a direct

function of the tensile and crushing stresses of material. XXXV, 504. Working stress for bridges. XLI, 539.

JOHNSON, J. M.

Johnsonville, Tenn., Bridge. XXXIII, 188.

Live loads for railroad bridges. LIV, Part A, 103.

Railway bridge designing. XXVI, 123.

JOHNSON, LEWIS J.

"An Analysis of General Flexure in a

Straight Bar of Uniform Cross-Section." LVI, 169.
"Shearing Strength of Construction
Joints in Stems of Reinforced Concrete
Theory of the Construction of Cons T-Beams, as Shown by Tests." LXXVII, 1499. Structural design of buildings. LIV, 441.

JOHNSON, LUTHER ELMAN.

Memoir of. LXX, 480.

JOHNSON, RAYMOND D.

Air tanks on pipe lines. LXXXII, 267.

Penstock and surge-tank problems.
LXXIX, 277.
Pressures in penstocks. LXXXIII, 754.
Pulsations in pipe lines. LXXXIII, 245.
"Surges in an Open Canal." LXXXI, 112

"The Differential Surge Tank." LXXVIII, 760.

The hydraulic jump. LXXX, 378.

JOHNSON, THEODORE S.

Water supply of Parkersburg, W. Va. LXXXI, 807.

JOHNSON, THOMAS HUMRICKHOUSE.

Cause and prevention of decay of building stone. XV, 711.
Formula for strength of columns. XXVII.

Memoir of.

demoir of. LXXVII, 1876. On the Strength of Columns: Discussing the Experiments which have been Accumulated, and Proposing New Formulas." XV, 517.

Progress report of Special Committee on Steel Columns and Struts. LXVI, 427.

Railway bridge designing. XXVI, 112. Stresses in railway bridges on curves. XXV, 493.

Ventilation of tunnels. LIV, Part C, 569.

JOHNSON, WALLACE C.

Memoir of. LVIII, 538.
"The Pulp Mill of the Cliff Paper Company of Niagara Falls, N. Y." XXXII, 214.

JOHNSON, WILLIAM S.

Sewage disposal. LVII. 117.

JOHNSTON, ANDREW.

Filtration of water. XLIV, 433.

JOHNSTON, CLARENCE T.

Forests, reservoirs, and stream flow. LXII, 454.

LXII, 454.

"Some Principles Relating to the Administration of Streams." LXXVIII, 630.

State and national water laws. LXXVI,

677. Weir measurement of stream LXXVII, 1291.

JOHNSTON, J. A.

Road construction and maintenance: Bituminous surfaces. LXXV, 563. Road construction and maintenance:

Cement-concrete pavements. LXXVII,

Road construction and maintenance: Drainage and foundations. LXXV, 510.
Road construction and maintenance:
Equipment for the construction of
bituminous surfaces and bituminous
pavements. LXXVII, 198.

JOHNSTON, JOHN HOWARD.

Memoir of. LXXX, 2174.

JOHNSTON, ROBERT E.

Nickel steel for bridges. LXIII, 315. Wind pressure upon bridges. X, 151.

JOHNSTON, THOMAS T.

Effect of depth upon artificial waterways. XXXV, 37.

JOLY, A.

"Dry Docks of France." LIV, Part F,

JONAH, FRANK G.

Repairing bridge piers. LXXIX, 114.
"The 'Light Rallways' of the Ba'
Front in France." LXXXIII, 1220. Battle JONES, BASSETT, Jr.

Engineering education. LVII, 171.

JONES, JONATHAN.

Water-proofing railroad bridge floors. LXXIX, 340.

JONES, LEWIS A.

Compensation of civil engineers. LXXXI, +1216.

JONES, WILLIAM A.

Jetty harbors of the Pacific Coast. XXVIII, 377.

JONES, WILLIAM R.

Proper relation to each other of the sections of railway wheels and rails. XXI, 278.

JONSON, ERNST F.

Designing reinforced LXXX, 1702. concrete slabs.

Earth pressures and bracing. LX, 46. Effects of straining steel. LXXX, 1480. Reinforced concrete floor systems. LVI,

Reinforced concrete pipe. LX, 145. Rivet spacing, etc., in plate girders. XLV, 576.

Safe stresses in steel columns. LXI, 198. The arch principle in long-span bridges. LXXI, 267.

The practical column under central or eccentric loads. XLV, 432.
"The Theory of Continuous Columns."

LVI, 92.
"The Theory of Frameworks with Rectangular Panels, and Its Application to Buildings which have to Resist Wind." LV, 413.

JORDAN, E. C.

Purification of sewage and water by filtration. XXX, 708.

JORDAN, EDWIN O.

Purification of water for domestic use. LIV, Part D, 206.

JORDAN, GABRIEL.

"Foundations under Water." II, 309.

JORDAN, LEONARD C.

LXXXI, 428. Municipally public utilities.

JORGENSEN, LARS R.

Air tanks on pipe lines. LXXXII, 276. Arched dams. LXXXIII, 2083.

Evaporation from Lake Conchos, Mexico.

Evaporation from Lake Conchos, Mexico. LXXX, 1931.
Halligan Dam. LXXV, 131.
Huacal Dam, Sonora, Mexico (Concrete arch dam). LXXVIII, 609.
"Improving Arch Action in Arch Dams." LXXXIII, 316.
"Multiple-Arch Dams on Rush Creek, California." LXXXI, 850.
Oil-mixed Portland cement mortar and concrete. LXXIV, 275.
Reconstruction of Stony River Dam. LXXVI, 1070.

LXXXI, 1070. The Constant-Angle Arch Dam." LXXVIII, 685. "The

JOY, JAMES FREDERIC. Memoir of. XXXVII, 575.

JUDAH, THEODORE DEHONE. Memoir of. XXXVIII, 448.

JUDSON, WILLIAM P.

"Kyan Process for Preservation Timber. Its Use and Effect at Fort Ontario, New York, 1839 to 1882." XI,

JUDSON, WILLIAM V.

"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." LXXXI, 1207.

JUNG, G.

Indeterminate frameworks, XLIII, 425.

JUST, GEORGE A.

Cast iron—strength, resilience, tests and specifications. XXII, 121.
Collapse of a building during construction. LIII, 32.
Concrete-iron highway bridges. XXXI,

473. Painting of iron structures. XXXIII,

Preservation

tion. L. 308. lests of fire-proof flooring material. XXXV, 129. Tests

Wind bracing in high buildings. XXVII, 236; also, XXXIII, 205.

JUSTIN, JOEL D.

"Derivation of Run-Off from Rainfall Data." LXXVII, 346.

LXXXIII, 1814. Hydraulic-fill dams. LXXXIII, 1814. Reconstruction of Stony River Dam.

LXXXI, 1082. Run-off from rainfall and other data. LXXIX, 1156.

KAIIN, JULIUS.

"The Coal Hoists of the Calumet ar Hecla Mining Company." XLI. 269.

KASTL, ALEXANDER E.

Brazos River Harbor improvement. XXV. 548.

Origin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 115. Precise spirit leveling. XLV, 120.

KATIGBAK, JOSE PETRONIO. Memoir of, LXXXI, 1803.

KATTE, EDWIN B.

Electric railways and locomotives. LXIX,

Electrification of suburban zone, New York Central & Hudson River R.R. in the vicinity of New York City. LXI. 119.

KATTÉ, WALTER.

Caissons of the East River Bridge. II.

"Description of the Proposed Plan for Erecting the Superstructure of the Illinois and St. Louis Bridge." II,

Influence of rails on street pavements. XXXVII, 125. 11 1 . 101 1.

KATTE, WALTER-(Continued).

Life of trail railroad bridges. XXXIV,

Memoir of, LXXXI 1727.

Proper relation to each other of the sections of rollway wheels and rails.

XXI, 280.

KAUFMAN, GUSTAVE.

Fire-proof construction. XXXIX, 158. Gravity sand filters at Nyack, N. XLV, 492.

Suspension bridges. XXXVI. 469. "The Cantilever Highway Bridge at Cincinnati." XXVII, 173.

KEATING, EDWARD HENRY.

Memoir of. LXXV, 1159.
"On the Removal of Incrustation in Water Mains. A Description of the Operations Performed in Halifax, N. S., Canada." XI, 127.
"Shubenacadie Canal." XII, 436.

KEAYS, FREDERICK L.

Caisson disease and its prevention. LXV, 26,

KEAYS, R. II.

Tunnel construction methods. LXXXI, 474

KECKER, G.

"Railway Signaling." (Translated from the German by George F. Swain.) XXIX, 491.

KEEFER, THOMAS C.

Economic depth for canals. XXXIX, 311.

Enlargement of the Erie Canal. XIV, 124.

Hoisting apparatus of canal head-gates. XXXII, 304.

"The Canadian Pacific Railway." Presidential Address at the Annual Convention at Milwankee, Wisconsin, June 28th, 1888. XIX. 55.

KEITH, HERBERT C.

"A Novel Method of Repairing a Swing Bridge." LXXXIII, 1080. National railroad question of to-day. LXXXIII, 963 Yale Bowl. LXXXI, 285.

KELLER, EDWIN R.

Transverse breaking strain of plate glass. XXV, 635.

KELLEY, FREDERICK M.

Inter-oceanic canal projects. IX, 21.

KELLEY, HOWARD G.

Railroad location. XXXI, 94.
Reconstruction of substructure of the Johnsonville Bridge. XXXI, 597.
"The Removal of a Defective Pivot Pier, and its Reconstruction." XXXI, 277.

KELLOGG, ALBERT VICTOR.

Memoir of. LXXIII, 510.

KELLOGG, R. C.

Astoria Gas Tunnel, LXXX, 684, External corrosion of cast iron pipe. LXXVIII. 866.

Submerged pipe work, Portland, Ore. LXXVIII, 1333.

KELLY, CASSIUS WILLIAM.

Memoir of. LXXXIII, 2259.

KELLY, HUGH A.

Valuation of land. LXXXI, 619.

KEMNA, ADOLPH.

Filtration of water, XLIV, 420. 'Purification of Water for Domestic Use: European Practice." LIV, Part D, 155,

KEMP, J. F.

Geology in its relations to topography. XXXIX, 79.

KEMPEES, A. E.

"The Enlargement and Improvement of the North Sea Canal of Holland (Am-sterdam Ship Canal)." XXX, 386.

KEMPKEY, A., Jr.

"A Concrete Water Tower." LXX, 334.

KENLY, EDWARD MARION.

Memoir of. LXX1V, 506.

KENLY, W. W.

A concrete sewer on piles. XXXI, 579. Preservation of materials of construc-tion. L, 320.

KENNEDY, JAMES II.

Grading contracts. LVIII, 362.

KENNEDY, JOHN.

Dry docks - stone vs. wood. XLI, 587.

KENNEDY, WILLIAM HARLIN.

Memolr of. LXXX, 2176.

KENNISON, KARL R.

"Comprehensive Plotting of Water Tur-bine Characteristics." LXXXIII, 861. of water through contractions. Flow LXXXIII, 1213.

Surges in an open canal. LXXXI, 116, "The Hydraulic Jump, in Open-Channel Flow at High Velocity." LXXX, 338.

KENT, J. D.

Ninety-sixth Street Power Station. XLIV, 147.

KENT, WILLIAM.

Expansion of pipes. LXX, 31. Inspection and maintenance of railway structures. XVII, 313. Tests of bituminous coals. XLII, 86.

KENYON, GEORGE CECIL.

"Dock Improvements at Liverpool." LII, 36.

KERNOT, WILLIAM CHARLES.

Memoir of, LXVI, 499.

KERR, FRANK M.

Atchafalaya River. LVIII, 18.

KERSHAW, G. BERTRAM de B. Chemi-hydrometry, LXXX, 1276.

KERSHAW, G. BERTRAM de B .- (Continued).

Sewage and wastes disposal for the U. S. Army. LXXXIII, 361. Sewage clarification by fine screens. LXXVIII, 954.

KERSHAW, W. H.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 185.

KETCHUM, MILO S.

Earth pressures and bracing. LX, 67. Structural design of buildings. LIV,

Theorem of three moments. LXXVI, 807.

KIEFFER, STEPHEN E.

Control of hydraulic mining in California. LVII, 38.

KIELLAND, S. MUNCH.

Renewal of the channel pier of the C. and M. V. Ry. Bridge over the Scioto River. XXXI, 369.

KIERSTED, W.

Appraisal of public service properties. LXXV, S61.

Depreciation as an element in appraisal. LXXIX, 809.

Depreciation of public utility properties. LXXVII, 872.

Driven wells at Plainfield, N. J.

Filtration of water. LIII, 228.
Financial management of water-works.
XXXVIII. 28.

Principles of valuation. LXXIX, 213. The separate sewer system without automatic flush tanks, XXXIV, 227.
"The Valuation of Water-Works Property." XXXVIII, 115.

KILLEBREW, SAMUEL.

Memoir of. XLI, 639.

KILLON, H. BIRCH.

Sewage disposal. LIV, Part E, 239.

KIMBALL, GEORGE A.

Underground railways. LIV, Part F.

KIMBALL, WILLIAM H.

Subsidence of muck and peat soils, LXXXII, 428.

KIMBERLY, A. ELLIOTT.

Purification of ground-waters. LXIV. 193.

Water and sewage works, Columbus, Ohio. LXVII, 379.

KING, CHARLES CYRUS.

Memoir of, LXXII, 592.

KING, H. W.

Action of water under dams. LXXX, 471. Weir measurement of stream LXXVII, 1296.

KING, PAUL SOURIN.

Memoir of. LXXXIII, 2261.

KING, W. I.

Valuation of land. LXXXI, 618.

KING, W. R.

Improvement of rivers. XXX, 494. Surveys for railway location. XXX, 530.

KING, WILLIAM BYRD.

Memoir of. LXXXI, 1733.

KINGMAN, DAN C.

"Harbors on Lakes Erie and Ontario." LIV, Part A, 237.

KINGMAN, LEWIS.

Availability of the cañons of the Colorado for railway purposes. XXVI, 351.

Brick manufacture and brick pavement.

XXVI, 410.

Compensation for railroad curves. XIII, 192.

"Electric Lighting at Topeka, Kansas." XXVI, 427. Memoir of. LXXV, 1161. Proper relation to each other of the

sections of railway wheels and rails. XXI, 291.

KINGSLEY, E. A.

Road construction and maintenance: Fillers for brick and block pavements. LXXV, 535.

KINGSLEY, WILLIAM C.

Memoir of. XXXVI, 612.

KINIPPLE, WALTER ROBERT.

Manufacture and testing of Portland cement. XXX, 604.

KINNEAR, WILSON SHERMAN.

"The Detroit River Tunnel." LXXIV, 288.

KINNEY, WILLIAM M.

Road construction and maintenance: Cement-concrete pavements. LXXVII.

construction and maintenance: Road Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1147.

KIRBY, OSCAR J.

Height of buildings. XLIV, 468.

KIRKWOOD, JAMES P.

Presidential Address, December 4th, 1867.

KIRSTEIN, PAUL ROBERT.

Memoir of. LXXXIII, 2379.

KITTREDGE, GEORGE W.

National railroad question of to-day. LXXXIII, 948.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

KLAPP, EUGENE.

"Reinforced Concrete Bridge Across the Almendares River, Havana, Cuba.' LXXIV, 216.

"Reinforced Concrete Pier Construction." LXX, 448.

KLEIN, A. C.

Production of toluol from gas plants. LXXXIII, 923,

KLETTE, O.

"The New Railway Stations at Dresden," XXX, 450. XXX, 450.

KNAP, E. D.

Retrogression in tensile strength of cement. LXXIV, 407.
Tufa cement. LXXVI, 554.

KNAP, JOSEPH M.

Eye-bar tests. XXXI, 422. Niagara Railway Arch. XL, 151. Properties of steel: Its use in structures and heavy guns. XVI. 313.
The form of railway excavations and em-

bankments. XXXII, 262.
Tornadoes and wind bracing for high buildings. XXXVII, 290.

KNAPP, G. N.

Concrete and concrete-steel. LIV, Part E, 573.

KNIGHT, AUSTIN M.

Properties of steel: Its use in structures and heavy guns. XVI, 338.

KNIGHT, W. H.

Electric motive power for suburban traffic. XXXVII, 181.

KNOWLES, MORRIS.

Filtration of water. LIII, 238.
"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

Flood flows. LXXVII, 632. Gravity sand filters at Nyack, N. Y. XLV, 493.

Irrigation and river control. LXXVI, 1455.

Pittsburgh flood of March 22d, 1912. LXXVI, 332, Reservoirs for flood control, LXXXII,

1535.

State and national water laws. LXXVI,

698. "The Lawrence, Mass., City Filter: A History of Its Installation and Main-tenance." XLVI, 258.

Washington water filtration plant. LXXII, 373.

Water purification at Steelton, Pa. LXVI, 211.

Water supply for camps, cantonments, etc. LXXXIII, 529. Water supply of Parkersburg, W. Va. LXXXI, 832.

KNOWLES, S. A.

Tunnel construction methods, LXXXI, 485.

KNOWLTON, C. F.

Road construction and maintenance: Preliminary investigations, LXXIII, 10.

KNOWLTON, CHARLES ANDREWS.

Memoir of, LV, 451,

KNOX, STUART K.

Depreciation of public utility properties. LXXVII, 846.
Principles of valuation. LXXIX, 206.

KOBAYASHI, T.

"Crane and Ladder Dredges." LIV, Part C, 335.

KOBER, GEORGE M.

Water filtration at Washington, D. C. LVII, 377.

KOCH, JOHN C.

"An Investigation of Sand-Clay Mix-tures for Road Surfacing." LXXVII, 1454.

KOENIG, ARNOLD C.

"Dams on Sand Foundations: Some Principles Involved in Their Design, and the Law Governing the Depth of Penetration Required for Sheet-Piling." LXXIII, 175.

KÖPCKE, C.

"The New Railway Stations at Dresden." XXX, 450.

KOPS, J. DE BRUYN.

"Notes on Rainfall at Savannah, Geor-gia." LX, 248.

KOYL, C. HERSCHEL.

Municipal refuse disposal. LX, 405.

KREISINGER, HENRY.

Investigations of fuels. LXX, 300.

KRELLWITZ, D. W.

Reinforced concrete bridges. LIX, 206. "Reinforced Concrete Towers." LX, 160. Use of reinforced concrete. LXI, 54.

KREUGER, I.

Reinforced concrete floor systems. LVI. 294.

KROHN, R.

"New Formula for Compression Members." XV, 537. The arch principle in long-span bridges. LXXI, 258.

KRUPP, ALFRED.

Memoir of. XXXVI, 609.

KRUSE, OTTO V.

Pressures in penstocks. LXXXIII, 741.

KUICHLING, EMIL.

Aeration of water. XV, 145. Algæ and the purity of water supplies. XXI, 522.

Consumption and waste of water. XXXIV, 208; also, XLVI, 407. Discharge of a 30-in, stop valve, XXXIV,

243.

Flood flows. LXXVII, 643.

Flow of water in Ogden, Utah, pipe line. XL, 530; XLIV, 55. Flow of water in pipes. XLVII, 266. Flow of water over dams. XLIV, 335.

KUICHLING, EMIL-(Continued).

Forests, reservoirs, and stream flow. LX11, 445.

Going value of water-works. LXXIII,

368. Ground-water in sewers. LXXVI, Ilydraulics of fire streams. XXI, Hydrautics of the Hemlock Lake Conduit,

and restriction of the use and waste of water in Rochester, N. Y. XXVI, 28.

Lake Cheesman Dam and Reservoir. LIII, 153.

Maximum rates of rainfall. LIV, 192. Memoir of. LXXIX, 1438. Modern hydraulic turbines. LXVI, 353 LXVI, 355.

oil-mixed Portland cement mortar and concrete. LXXIV, 284.

"On the Loss of Head Resulting from the Passage of Water through a 24-luch Stop Valve." XXVI, 489.

Purification of ground-waters. LXIV,

Sewage clarification by fine screens. LXXVIII, 1009. Sewage disposal. XVIII, 29; also, LVII,

112. Size of high-pressure water-power pipe.

LIX, 184.
Tests of water meters. XLI, 394.
"The Financial Management of Works." XXXVIII, 1.

"The Relation between the Rainfall and the Discharge of Sewers in Populous Districts." XX, 1. The sewer system of San Francisco. LXV,

The valuation of public service property. LXXII, 244.

cast-iron submerged pipe line. XXXIII, 271.

Use and ca LXVI, 126. care of the current meter.

Water and sewage works, Columbus, Ohio. LXVII, 402. Water meters. XXV, 66.

Water-works valuation, XXXVIII, 172.

KUMMEL, W.

"Some Questions concerning the Filtration of Water." XXX, 330.

KUMMER,- F. A.

"A Proposed Method for the Preserva-tion of Timber." XLIV, 181,

KUNZ, FREDERIC CHARLES.

Counterstresses in bridges. XLII, 553.

Memoir of. LXXX, 2184.

Position of loads causing maximum stress in a bridge truss. XLII, 263.

Tests of large steel columns. LXXIII, 484.

KURTZ, FORD.

Pressures in penstocks. LXXXIII, 765.

LaBACH, PAUL M.

"Progress Report of the Special Com-

mittee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

LABELLE, HENRY FRANCIS.

Flood of March, 1907, in California rivers. LXI, 349.

Forests, reservoirs, and LX1I, 437. Memoir of, LXXIX, 1440. reservoirs, and stream flow.

Necaxa light and power plant. LVIII,

Water filtration at Washington, D. C. LVII, 409.

LA CHICOTTE, H. A.

Rivet spacing, etc., in plate girders. XLV, 571.

Stresses in the continuous XLVIII, 91.

Suspension bridges. XLVIII, 430. The Kinzua Viaduct. XLVI, 48.

LAHMER, J. A.

"River protection Work on the Kansas City Southern Railway, near Braden, Okia." LXVI, 387.

LAKE, ORLOFF.

Memoir of, LXXVII, 1925.

LALLEMAND, CH.

Surveying. LIV, Part B, 462.

LAMB, RICHARD.

Aerial tramway. LXXXI, 743. Effect of depth upon artificial waterways. XXXV, 29. Land reclamation. LIV, 89. Lateral earth pressures. LIII, 314.

Paving practice in Chicago. LXVI, 43. Protection of piles from the Teredo. XXX1, 238. "Steam and Electric Cableways for Log-ging and Canal-Boat Towing." XXXII,

Timber preservation. LXXI, 374.

LAMBERT, B. J.

Nickel steel for bridges. LXIII, 347.

LAMONT, CLARENCE BOOTH. Memoir of. LXXXII, 1691.

LANDRETH, OLIN II. Cylindrical wheels and flat-topped rails for railways. XXI, 200. Designing and erection of the Oakley Arch. XXIII, 180.

Engineering education. LVII, 157.
"On Increasing the Accuracy of a System of Magnetic Bearings of a Survey."

Proper relation to each other of the sections of railway wheels and rails. XXI, 284.

LANDRETH, WILLIAM B.

"Chautauqua, N. Y., Sewage Disposal Works." XXXII, 1.

Cost of sewer construction. XXXV, 118. Flushing in pipe sewers. XL, 29. "Recent Stadia Topographic Surveys: Notes Relating to Methods and Cost." XLIV. 92.

"The Improvement of a Portion of the Jordan Level of the Erie Canal. XLIII, 566.

The separate sewer system without automatic flush tanks, XXXIV, 231.

Topography on the survey of the Mexico-United States boundary, XXXIV,

LANDRETH, WILLIAM B .- (Continued). Topographical surveys. LXXVII, 1027.

LANE, E. W.

"Experiments on the Flow of Water Through Contractions in an Open Channel." LXXXIII, 1149.
Obstruction to flow by bridge piers.

LXXXII, 368.

LANG, P. G., Jr.

Revision of Niagara Railway Arch Bridge, LXXXIII, 2012.

LANGLEY, JOHN W.

Properties of steel: Its use in structures and heavy guns. XVI, 359. Structural steel. XXVII, 385.

LANT, FRANK PARSONS. Memoir of. LXXIX, 1442.

LANZA, GAETANO.

Concrete and mortar beams. L, 483. Tests of steel. LIV, Part F, 71. "Tests of Timber." LIV, Part F, 77. Timber tests. LI, 86.

LARNER, CHESTER W.

"Characteristics of Modern Hydraulic Turbines," LXVI, 306.

LARSEN, ALBERT.

Tests of concrete in sea water. LXXXI, 693.

LARSSON, C. G. E. "Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

LA RUE, E. C.

Designing an earth dam. LXXXI, 43. Floods and flood prevention. LXXXI, 1286

LASSIG, MORITZ.

Memoir of. XLIX, 353.

LATCHA, JACOB ALBERT. Memoir of. LIV, 531.

LATHAM, NORMAN SMITH. Memoir of. LIV, 542.

LATIMER, CHARLES.

English and American railroads compared. XV, 751.
Excessive rainfalls. XXV, 112.
Preservation of forests. XIV, 396.
Preservation of timber. XIV, 377. Railroad accounts and returns.

LAUB, HERMANN.

Memoir of. LXXXIII, 2263,

LAUCHLI, E.

Tunnel construction methods. LXXXI, 471.

LAURIE, JAMES.

Memoir of. XXXVII, 553.

LAVIS, F.

Astoria Gas Tunnel, LXXX, 675. Contracts: "Cost plus" and other forms. LXXXIII, 792.

Depreciation of public utility properties. LXXVII, 823.

EAXVII, 825. Electric railways in the Ohio Valley. LXIII, 91. Grading contracts. LVIII, 364. "Methods of Location on the Choctaw, Oklahoma and Gulf Railroad." LIV.

Mule-back reconnaissances, LXXV, Operation of passenger elevators. LXIV, 242

Physical valuation of railroads. LXXVII, 281.

Principles of valuation. LXXIX, 172. Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 473.

venctuar Tunnel. LXXXIII, 473.
Railroad location. LII, 519.
Railroad surveys. LXV, 133.
Rivers and railroads in the United States. LXXIX, 933.
Rust in a seventeen-story building.
LXXI, 208.

Stereoscopic method of surveylng. LXXIX, 706.

"The Gauge of Railways, with Parti-cular Reference to Those of Southern South America." LXXVIII, 312. "The New York Tunnel Extension of the Pennsylvania Railroad. The Ber-gen Hill Tunnels." LXVIII, 84.

The valuation of public service property. LXXII, 174.

Tunnel construction. LVI, 242. Tunnel construction methods. LXXXI,

476.

Valuation of public utility property. LXXIX, 880. Valuation of railroad properties. LII, 348.

LAVOINNE, E.

Construction and maintenance of roads. VIII, 342.

LAW, ARTHUR PRICE.

Memoir of. LVIII, 547.

LAWLER, JOHN.

"The Railway Pile and Pontoon Bridge across the Mississippi River at Prairie du Chien, Wis." XIII, 67.

LAWLOR, F. D. H.

American railway line, Vera Cruz to City of Mexico. XV, 843.

LAWRENCE, F. E .

"Fountain Flow of Water in Vertical Pipes." LVII, 265.

LAWRENCE, RALPH J.

Water-proofing railroad bridge floors. LXXIX, 352.

LAWS, B. C.

Floating dry docks. LVIII, 170. Pearl Harbor Dry Dock. LXXX, 329.

LAWSON, WILLIAM BATEMAN. Memoir of. XLVI, 560.

LAWTON, WILLIAM II.

Pavements. LIX, 353.

LEA, SAMUEL H.

Railroad construction. LI, 436. Small rock-fill dams. L, 359.

LEASK, H. NORMAN.

Municipal refuse disposal. LX, 410.

LEATHER, BASIL HENRY. Memoir of. LXXIV, 527.

LEAVENWORTH, GEORGE STEVENS. Memoir of. LXXXIII, 2265.

LEAVITT, E. D., Jr.

Pumping engines. IV, 228. Steam engine economy. VII, 194.

LE BARON, J. FRANCIS.

"An Alternative Line for the Nicaragua Canal; and a Proposed New Method of Dam Construction." L. 23.
Availability of the cañons of the Colorado for railway purposes. XXVI, 344.
Brazos River Harbor improvement. XXV,

Forests, re-LXII, 333. reservoirs, and stream flow.

How to huild a stone jetty. LXXV,

1059.
Reaction breakwater. XLIII, 95.
Recent experiments with dynamite on an ocean bar. XXV, 450.
Retracement-resurveys. LIXXV, 424.
South Pass Jetties. XV, 263.
The Holland dikes. XXVI, 677.
"The Reclamation of River Deltas and Salt Marshes." LIV, 51.

LE CHATELIER, HENRY.

Nickel steel for bridges. LXIII, 322.

LE CONTE, JOSEPH N.

Efficiency of centrifugal pumps. LVI,

LE CONTE, L. J.

Air resistances to trains in tunnels. LXXV, 1025.

Atchafalaya River. LVIII, 24.
Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV, 94

Consumption XXXIV, 211. and waste water.

discharges.

Cost of sewer construction. XXXV, 119. Creosoting timber. LVI, 23. Current meter and weir discharges XLVII, 382. Design of masonry dams. LXXV, 216.

Disposal of municipal refuse. LIV, Part E, 331.

Dredges and dredging. XL, 316. Dredges: Their construction and per-formance. LIV, Part C, 482. Dredging river channels. LII, 249.

Dumbarton Bridge construction. LXXVI, 1614

Durability of wooden stave pipe. LVIII,

Economic depth for canals. XXXIX, 308. Effect of depth upon artificial water-ways. XXXV, 35. Filtration of water. LIII, 256.

Filtration works. L, 459. Floating dry docks. LVIII, 179.

Flow of water in Ogden, Utah, pipe line. XL, 548.

Flow of water in pipes. XXXV, 284. Flow of water in 28 to 42-ln. pipes. XXXVI, 212. Flushing in pipe sewers. XL, 29.

Forests, reservoirs, and stream flow.

Foundations of New Croton Dam. XLIII,

Gauging of Cedar River, Washington. XLI, 18. Groined arches. XLIII, 60. Harbors. LIV, Part A, 339. High-alloy steels for bridges. LXXVIII,

49. High masonry dams. XXXIV, 515. How to huild a stone jetty. LXXV, 1067. Irrigation. LIV, Part C, 160. Irrigation and river control. LXXVI,

1454. Jordan Level, Erie Canal. XLIII, 595. Lake Superior compensating works. LIV,

Land reclamation. LIV, 87.

Life of iron railroad bridges. XXXIV, 318.

Liverpool dock improvements. LII, 66. Long-time tests of Portland cement. LXXVI, 1035.

Marine wood-borers. XL, 212 Marine wood-forers. AL, 212.
Maximum rates of rainfall. LIV, 197.
Missouri River improvements. LIV, 342.
Nagasaki graving dock. LVI, 86.
New water-works of Havana, Cuba.
XXXVI, 236.
Nickel steel for bridges. LXIII, 305.
Painting of iron structures. XXXIII, 555

Panama Canal. L, 203. Pier construction in New York Harbor. LXXVII, 546.

Pile-driving formulas. XLII, 284. Pittsburgh flood of March 22d, 1912.

Pittsburgh flood of March 22d, 1912. LXXVI, 326. Ports of the Pacific. LXXVI, 221. Pressures resulting from changes of velocity of water in pipes. XXXIX, 14.

of piles from the Teredo. Protection o XXXI, 242.

AXAI, ²⁴²purification of water for domestic use.
LIV, Part D, 210.
Railroad draw bridges. LXXV, 720.
Rainfall and run-off. LXXVII, 364.

Rainfall and run-off. LXXVII, 364.
Rainfall, and run-off in storm-water sewers. LVIII, 502.
Rainfall, flow of streams, and storage. XXVII, 292.
"Recent Dredging Operations at Oakland Harbor, Callfornia." XIII, 9.
River and harbor outlets. LV, 306.
River hydraulics. XLIII, 230.
Road building. XLI, 134.
Seepage losses in irrigation systems.
LXXVI, 364.
Sewage purification. LI, 422.

Sewage purification. LI, 422. South African irrigation. LII, 30. Standard levee sections. XXXIX, 227. State and national water laws. LXXVI, 689.

Stave plpe. XLI, 66.
Storage for impounding reservoirs.
LXXVII, 1645.
Submerged pipe work, Portland, Ore.
LXXVIII, 1343.
Suspension of solids in rivers. XXXVI,

Swing bridges. LV, 140. Tests of cement. LIV, Part F, 44.

LE CONTE, L. J .- (Continued).

Tests of water meters. XLI, 400.
The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 601.
The separate sewer system without automatic flush tanks. XXXIV, 232.
The Sewickley Cantilever Bridge. LXXVI,

628.

The he Walworth Sewer, Cleveland, Ohio. LV, 407.

water-works of Syracuse, N. Y.

The water-works of Syracuse, N. Y. XXXIV, 64.
Theory and practice of special assessments. XXXVIII, 418.
Theory of concrete. XLII, 135.
Tufa cement. LXXVI, 549.

cast-iron submerged pipe line.

XXXIII, 284.
Water purification. LX, 205.
Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 102. Wind pressure on bridges. LIV, 41.

LEDERLE, GEORGE ANTHONY. Memoir of, LXXI, 423.

LEDLIE, CHARLES H.

The valuation of public service property. LXXII, 206.

LEDOUX, J. W.

"A Mechanism for Metering and Recording the Flow of Fluids Through Venturi Tubes, Orifices, or Conduits, by Integrating the Velocity Head." LXXVI, 1148.
Contracts: "Cost plus" and other forms.

LXXXIII, 854.

Design of masonry dams. LXXV, 213. Evaporation from Lake Conchos, Mexico.

LXXX, 1998. Reconstruction of Stony River Dam. LXXXI, 1024.

LEE, CHARLES H.

Evaporation from Lake Conchos, Mexico. LXXX, 1921.

HAXA, 1921.

Hydraulic phenomena. LXXXII, 826.

Storage of flood-waters for irrigation.

LXXVII, 91.

"Suggested Changes and Extension of the United States Weather Bureau Service in California: Report of a Committee of the Southern California Association of Members." LXXXI, 161.

"The Determination of Safe Yield of Undergraphy Becamping of the Closed

sociation of Members." LXXXI, 161, "The Determination of Safe Yield of Underground Reservoirs of the Closed-Basin 'Type." LXXVIII, 148.

LEE, FRANCIS VALENTINE TOLDERVY. Memoir of. LXXVII, 1880.

LEE, GEORGE WILLIAM.

Memoir of, LXXVII, 1919.

LEE, W. B.

Adjustment of transit and compass surveys. XLV, 474.
"Transition Curves." XLVI, 379.

LEEDS, ALBERT R.

Algæ and the purity of water supplies. XXI, 505.

self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 62. Self-purification

LEEDS, CHARLES T.

Weather Bureau service in California. LXXXI, 173.

LEFFINGWELL, W. H.

Forests, reservoirs, and stream flow. LXII, 377.

LEFFLER, B. R.

"A Few Points in the Design of Reinforced Concrete Arches." LV, 183.
Reinforced concrete floor systems. LVI,

370.

"Specifications for Metal Railroad Bridges Movable in a Vertical Plane." LXXVI, 370.

LEIGHTON, M. O.

Floods and flood prevention. LXXXI, 1241.

Forests, res LXII, 394. reservoirs, and stream flow.

Ice diversion LXXXII, 1152. and hydraulic models.

Rainfall and stream flow. LIX, 504. Sewage disposal. LIV, Part E, 241.

LEISEN, THEODORE A.

Water filtration at Washington, D. C. LVII, 379.

LELONG, R.

"Marine Engineering in France." (Translated from the French by Paul A. Seurot.) LIV, Part C, 243.

LENTILHON, EUGÉNE.

"A Concrete Sewer on Piles." XXXI, 569.

LEOPOLD, F. B.

Purification of water for the production of steam. LIV, Part A, 39.

LE ROND, LOUIS.

Cylindrical wheels and flat-topped rails for railways. XXI, 187.

LESLEY, ROBERT W.

Asphalt and asphalt pavements. XXXVIII, 236.

Bridge painting, XXXIX, 33.

Concrete and concrete-steel. LIV, Part E, 557.

Concrete tunnel lining. XXXI, 307.
Dunning's Dam, near Scranton,
XXXII, 415. "Final Report of the Special Committee

on Concrete and Reinforced Concrete. LXXXI, 1101.

Fire-resistant construction of buildings. LXV, 290.

Hot-bath tests for cements. XXXII, 327. Hot tests for Portland cement. XXVII, 425.

Impervious concrete. LI, 114. Impurities in sand for concrete. LXV,

Manufacture and testing of Portland cement. XXX, 595.
Portland cement concrete. XXXVII, 510.

"Progress Report of Special Committee on Concrete and Reinforced Concrete." LXVI, 431.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385.

LESLEY, ROBERT W .- (Continued).

Reinforced concrete pipe. LX, 146.

concrete construction. XXXIX. Steel 636.

of h. 127. Tests fire-proof flooring material.

XXXV, 127.
"The Manufacture of Coment." LIV,
Part B. 91.

Canal of Holland, XXX.

The North Sea Canal of Holland, XXX, 713.

LESLIE, Sir BRADFORD.

High-alloy steels for bridges. LXXVIII,

LESSEPS, FERDINAND DE.

Inter-oceanic canal projects. IX, 89.

LEUTZE, T. McC.

Road building. XLI, 121.

LE VALLE, M.

Old-time water-wheels of America. XXVIII, 249.

LEVERICH, G.

'An Investigation to Determine the Strains in a Hollow Cast-Iron Disk, Cooled from the Interior.'' XVIII, 43, Brooklyn Elevated R.R. improvement.

Brooklyn Ele XXXII, 383. Crushing strength of American iron. II,

231.

231.
Eve-bar tests. XXXI, 431.
Memoir of. LVI, 469.
"The Cable Railway on the New York and Brooklyn Bridge." XVIII, 67.
Thin floors for bridges. XXVII, 502.
Water meters. XXV. 563.
Wind bracing in high buildings. XXXIII,

222.

LEVERING, W. M.

Wind bracing in high buildings, XXXIII,

LEWERENZ, ALFRED COURTNEY.

Memoir of. LXXIV, 508.

LEWINSON, MAXYMILIAN.

Memoir of. LXXXIII, 2266, Niagara Railway Arch. XL, 155, "The Transverse Strength of Beams as a Direct Function of the Tensile and Crushing Stresses of Material." XXXV,

484. West Side Manhattan water-front. LXXV, 267.

LEWIS, E. W.

Railroad surveys. LXV, 142, Track elevation. LXXVI, 1900.

LEWIS, EUGENE CASTNER,

Memoir of. LXXXI, 1735.

LEWIS, FREDERICK H.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV,

Portland cement concrete. XXXVII, 519. "Some Notes on Hot-Bath Tests for Cements." XXXII, 321. Specifications for structural steel.

XXXIII, 349,

"The Results Obtained from Tests of Full-Sized Steel Eye-Bars" XXVII, 358.

LEWIS, ISAIAH WILLIAM PENN.

Memoir of. XXXVIII, 453.

LEWIS, J. F.

Recent experiments with dynamite on an ocean bar. XXV, 447.

LEWIS, JOHN H.

"State and National Water Laws, with Detailed Statement of the Oregon Sys-tem of Water Titles." LXXVI, 637. Stream administration, LXXVIII, 652.

LEWIS, MYRON II.

Action of frost on cement and cement mortar. LXIV. 348.
The honding of new to old concrete.

LXIV, 276.

LEWIS, NELSON P.

Electrification of suburban zone. New York Central & Hudson River R.R. in the vicinity of New York City. LXI, 112.
"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use" LXXVII 1884

Use" LXXXII, 1384.
"Final Report of the Special Committee to Investigate the Conditions of Em-nloyment of, and Compensation of, Civil Engineers." LXXXI, 1207.

Influence of rails on street pavements.

Maintenance of asphalt streets, XLIX, 201

Maintenance of macadam and other roads. LXI, 463,

Parements. LIX, 362

Paving practice in Chicago, LXVI, 53.
Road building XLI, 99
Road construction and maintenance

ord construction and maintenance; Cost records and reports, LXXVII, 129.

construction and maintenance: Rood Dosign of highway systems. LXXVII.

Bood construction and maintenance:

Engineering organizations for high-way work LXXVII, 1110

Read construction and maintenance:
Relative value of three methods of carrying on work, LXXIII 23.

Stroot traffic in New York City. LVII. 192.

LEWIS, SIDNEY F.

"The Davis (Crevasse) Levee." XVII.

JIBBY, EDMUND DORMAN.

Memoir of, LXXI, 424,

LULLY, GEORGE W.

"Sand-Blast Cleaning Steel," L. 254. of Structural

LILLY, W. E.

"The Strength of Columns." LXXVI. 258.

LINCOLN, W. S.

Inspection and maintenance of railway structures. XVII. 273. Memoir of. LI, 457,

LINDAU, A. E.

"The Semicircular Masonry Arch." LXI, 387.

LINDENBERGER, C. H.

Deflections of beams. LI, 21, Stresses in the continuous girder. XLVIII, "The Continuous Girder as a Tipper."

XXVI, 469.

LINDENTHAL, DOMINIK. Memoir of, XLV, 637.

LINDENTHAL, GUSTAV.

"A Rational Form of Stiffened Sus-pension Bridge," LV, 1. Electricity vs. steam for branch railroads.

XLII, 384. Elevated railroads. XXXVII.

Hell Gate Arch Bridge, LXXXII, 1031. High masonry dams, XXXIV, 505. Indeterminate frameworks, XLIII, 410.

Live loads for railroad bridges. LIV, Part A, 90.
Niagara Cantilever Bridge, XIV, 575.
Niagara Railway Arch. XL, 153.
Nickel-steel eye-bars for Blackwell's Island Bridge, LXIV, 302.
Nickel steel for bridges, LXIII, 316.
Preservation of forests. XIV, 397.
Properties of steel: Its use in structures and heavy guns. XVI, 374.
Railway bridge designing. XXVI, 125.
"Rebuilding of the Monongahela Bridge, at Pittsburgh, Pa." XII, 353.
Steel columns and struts. LXXXIII, 1635.
Stress measurements. Hell Called Structures and strust.

Stress measurements, Hell Gate Arch.

LXXXII, 1089. Suspension bridges. XXXVI, 439. The arch principle in long-span bridges. LXXI, 270.

The creeping of rails. LIII, 479.
The Halsted Street Lift-Bridge, XXXIII, 37.

The Kinzua Viaduct. XLVI, 55. Three-binged masonry arches. XL, 80. Wheel concentrations and fatigue formulas. XLII, 189.

LINDSEY, JOHN B., Jr. Creosoting timber. LVI, 25.

LINE, J. EDW.

Algæ and the purity of water supplies. XXI, 524.

LINK, J. WILLIAM.

Rainfall and run-off. LXXVII, 375.

LINTON, HARVEY.

Railroad location. XXXI, 116; also, LII, 526.

LINVILLE, JACOB HAYS.

Memoir of. LIX, 549.

LION, L. E.

Mississippi River improvement. LX, 342.

LIPPINCOTT, J. B.

"A Method of Determining a Reason-able Service Rate for Municipally Owned Public Utilities." LXXXI, 413. Current meter and weir discharges. XLVII, 383.

"Final Report of the Special Committee on Floods and Flood Prevention."
LXXXI, 1218.
Oil-mixed Portland cement mortar and concrete. LXXIV, 282.

"Tufa Cement, as Manufactured and Used on the Los Angeles Aqueduct." LXXVI, 520.
Weather Bureau service in California. LXXXI, 181.

LITTLE, JAMES E.

Water purification at Steelton, Pa. LXVI, 201.

LLEWELLYN, F. T.

Collapse of a building during construc-tion. LIII, 15.

Earth pressures and bracing. LX. 44. Structural design of buildings. LIV, 430.

LOCKE, AUGUSTUS W.

Preservation of timber. XIV. 379. Ventilation of tunnels, XXIII, 298.

LOCKE, CHARLES ABBOTT. Memoir of. LXXX, 2186.

LOCKE, FRANKLIN BUCHANAN. Memoir of, LXXXII, 1694.

LOCKWOOD, D. W.

"Coast Lighting in the United States." LIV, Part B, 43, 87.

LOCKWOOD, WILLARD D.

Cost keeping. LXIV, 438. Surveying instruments, XLVIII, 120.

LOCKWOOD, WILLIAM FREDERICK. Memoir of. LXXVI, 2238.

LOFLAND, HENRY FIDDEMAN. Memoir of. LXXV, 1164.

LOHSE, F.

"The Rearrangement of Railroad Tracks and Stations in Cologne, Prussia." (Translated from the German by Mansfield Merriman.) XXIX, 277.

LONG, THOMAS J.

Inter-oceanic canal projects, IX, 42.
The Halsted Street Lift-Bridge, XXXIII, 39.

LONGLEY, FRANCIS F.

Washington water filtration plant. LXXII, 386.

Water filtration at Washington, D. C. LVII. 364. Weir discharge experiments. LXXVI, 1086.

LONGWELL, J. S.

"Experiments Weir Discharge." on LXXVI, 1045.

LOOKER, HENRY BRIGHAM. Memoir of. LVIII, 548.

LOOMIS, ALBERT J.

Caisson disease and its prevention. LXV,

LOUNSBURY, WILLIAM C.

Purification of ground-waters. LXIV, 182.

LOVELL, W. D.

The engineer and the inspection of work. LVI, 125.

LOVETT, THOMAS DAVIS.

Memoir of. XL, 571.

LOW, EMILE.

"A Review of the Report of Captain Andrew Talcott, Chief Engineer, Mex-ico and Pacific Railroad, Eastern Divi-sion, from Vera Cruz to Mexico: Ex-plorations, Surveys, Estimates, 1858." LXXX, 1543.

Brooklyn Elevated R. R. Improvement. XXXII, 376.

Concrete-lined LXXX, 716. oil-storage reservoirs.

Cost keeping. LXIV, 416. Grand River Bridge

construction. XXXVI, 356.

Heavy railway construction. XLVI, 17.
Liverpool dock improvements. LII, 67.

New water-works of Havana, Cuba. XXXVI, 234. Railroad construction. LI, 437. Railroad location. LII, 490; also, LIV,

155.

Rivers railroads in the United and States. LXXIX, 902. Stadia topographic surveys. XLIV, 100. "The Breakwater at Buffalo, New York."

LOW, EMILE REED.

Cinder concrete LXXIX, 636. floor construction.

LOW, F. R.

LII, 73.

Steam turbines. LIV, Part E, 118.

LOW, GORHAM P., Jr.

Report of the Committee on "Cost and Work of Pumping Engines." IV, 142 (1875).

LOW, W. A.

Ninety-sixth Street Power Station. XLIV, 145.

LOWE, JESSE.

Memoir of. LXXXII, 1697.

LOWETH, CHARLES F.

"Final Report of the Special Committee

"Final Report Columns and Street on Steel Columns and Street LXXXIII, 1583.
"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." LXXXI, 1207.

Financial management of water-works.

XXXVIII, 30.

"Progress Report of Special Committee on Steel Columns and Strnts." LXVI,

LOWINSON, OSCAR.

Agreements for building contracts. LXVII, 496. Cinder concrete floors. LXXVII, 1810. Collapse of a building during construc-tion. LIII, 26. Concrete and concrete-steel. LIV, Part E. 571.

Impervious concrete. LI, 125.

Preservation of materials of construction. L. 306.

Preservation of railroad tles. XLII, 341. Protection of steel and aluminum. XLIII, 465.

Structural design of buildings. LIV, 458. Tests of fire-proof flooring material. XXXV, 128.

Underpinning buildings. LXVII, 568.

LOWTHORP, F. C.

"On the Use of Cast Iron for Compressive Members of Iron Bridges," I, 228.

LUCIUS, ALBERT.

High-alloy steels for bridges. LXXVIII,

Inspection and maintenance or rallway structures. XVII, 292. Nickel steel for bridges. LXIII, 315.

Railroad cantilever bridge at Beaver, Pa.

LXXIII, 173. Test of a wrought-iron floor beam. XVIII, 125. Tests of large steel columns. LXXIII,

448.

LUEBBERS, HENRY L.

"The Manufacture of Coke from Illinois Coal." II, 163.

LUEDER, A. B.

"Secure Subway Supports." LXXX, 914.

LUIGGI, LUIGI.

Concrete tunnel lining. XXXI, 317. Tufa cement. LXXVI, 567.

LUND, GEORGE A.

Specifications for structural steel. XXXIII, 354.

LUNDIN, A. P.

Properties of balsa wood. LXXXI, 156.

LUNDTEIGEN, ANDREAS.

"Notes on Portland Cement Concrete." XXXVII, 501.

LUQUER, LEA McI.

"The Relative Effects of Frost and the Sulphate of Soda Efforescence Tests on Building Stones." XXXIII, 235.

LUSTER, W. H., Jr.

Adjustment of transit and compass surveys. XLV, 472.

LUTZ, ULYSSES STANISLAUS.

Memoir of. LXXIX, 1444.

LYFORD, OLIVER S., Jr.

"Catenary Trolley Construction." LXII, 157.

LYLE, WILLIAM T.

Buffalo Breakwater. LII, 199.

Flow of water through contractions.

LXXXIII, 1209.

Subgletone of much and post college Subsidence of muck and peat soils. LXXXII, 426.

LYMAN, BENJAMIN SMITH.

Geology in its relations to topography. XXXIX, 92.

LYMAN, RICHARD R.

YMAN, RICHARD R.
Irrigation. LXII, 46.
"Measurement of the Flow of Streams by Approved Forms of Weirs with New Formulas and Diagrams: Details and Summaries of the Results of Experiments by Francis, Bazin. Fteley and Stearns, and at the Hydraulic Laboratories of Cornell University and the University of Utah." LXXVII, 1189. 1189.

LYNCH, ALEXANDER S. Yale Bowl. LXXXI, 290.

LYNCH, H. B.

Cement joints for cast-iron water mains. LXXXIII, 301.

LYNCH, MICHAEL L.

"Railroad Location." XXXI, 81.

LYNCH, T. D.

Effects of straining steel. LXXX, 1467.

LYTE, FRANCIS ASBURY. Memoir of, XXXVIII, 461,

MacCALLUM, ALEXANDER WILLIAM. Memoir of. LXXXI, 1741.

MacCRACKEN, GEORGE GERE. Memoir of. LXXXI, 1806.

MACDONALD, CHARLES.

▲ concrete sewer on piles. XXXI, 576. Apparatus for obtaining borings by direct pressure. II, 38.

Caissons of the East River Bridge. I, 363.

Cause of trade-winds. XXIII, 109. Continuous superstructure of the Mem-

phis Bridge. XXX, 563. Draw-bridges. III, 139; IV, 203. Dunning's Dam, near Scrant XXXII, 415. Scranton, Pa.

Eye-bar tests. XXXI, 420. Flexure of beams. III, 48.

Foundations for heavy buildings. XXXV, 471.

Foundations under water. II, 3 Gunpowder pile-driver. II, 409.

Inter-oceanic canal projects. IX, 142. Jetty harbors of the Pacific Coast.

XXVIII, 381.
Johnsonville, Tenn., Bridge. XXXIII, 186.

New Portage Bridge. V, 235. Niagara Cantilever Bridge. XIV, 556. Ocean waves. XXXVI, 159.

Presidential Address at the 40th Annual Convention, Denver, Colorado, June 23d, 1908. LXI, 544.

"Proportions of the Heads of Eye-Bars."
II, 333.

Protection from corrosion of iron tunnel linings. XXVII, 329.

Protection of piles from the Teredo. Protection of piles from the Teredo. XXXI, 242. Rainfall and river-flow. XXVIII, 337.

Rainfall and river-flow. XXVIII, 337. Red Rock Cantilever Bridge. XXV, 721.

Report of the Committee "On the Means of Averting Bridge Accidents." IV, 122, 215 (1875).

Stability of stone structures. VIII, 252. Subaqueous foundations. XXIV, 236. Tests and testing machines. IV, 269. Tests of bridge irons. II, 225. "The Failure of the Ashtabula Bridge." VI. 74.

"The Ocean Pier at Coney Island." VIII,

"The Six-Hundred Ton Testing Machine at the Works of the Union Bridge Company at Athens, Pa." XVI, 1.

Upright arched bridges. III, 215. Use of steel for bridges. VIII, 278. Van Buren, Arkansas, Bridge. XX, 191. Weights of iron and steel railway bridges. XV, 100.

MACDONALD, H. P.

Collapse of a building during construc-tion. LIII, 30. Structural design of buildings. LIV, 446.

MacDONALD, JAMES H.

Road construction and maintenance: Systems of maintenance. LXXIII, 31.

MACFARLANE, ARTHUR KEDDIE. Memoir of. LXXII, 599.

MacGREGOR, R. A.

Rust in a LXXI, 209. seventeen-story building. Stadia topographic surveys. XLIV, 112.

MACKALL, BENJAMIN FRANKLIN. Memoir of. LXXIV, 511.

MACKAY, ANGUS ROBERT. Memoir of. LXXXIII, 2380.

MacKAY, H. M.

Stress measurements, Hell Gate Arch. LXXXII, 1094.

MACLAY, WILLIAM W.

Cements, mortars and concretes. XXV, 286.

High masonry dams. XIX, 188. Hot-bath tests for cements. XXXII, 344. "Hot Tests for Determining Change of Volume in Portland Cement." XXVII,

A12.
Neat tests vs. sand tests for Portland cement. XXV, 303.
"Notes and Experiments on the Use and Testing of Portland Cement." VI, 311.

Portland cement concrete. XXXVII, 514, "Report of Progress of the Committee on the Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).

"Report of the Committee on a Uniform System for Tests of Cement." Prelim-inary Report, XIII, 53 (1884); Final Report, XIV, 475 (1885). Retaining walls and dams. IV, 310.

MacNAUGHTON, JAMES. Memoir of. LVI, 471.

MacRITCHIE, CHARLES.

Memoir of. LXIV, 587.

MACY, ARTHUR.

Memoir of. XXXVII, 562.

McADIE, A. G.

Rain and run-off near San Francisco. LXI, 535.

MCALPINE, CHARLES L.

Failure in a water main. VII, 16. Memoir of. XXXVII, 563, "Quicksand in Excavation." X, 275. Resistances of railroad curves. VII, 106.

Mealpine, William J.

"Account of the Method Adopted to Re-pair a Breach in the Earthen Dam of the Storing Reservoir of the New Bed-ford Water Works." I, 57.

Back-water in streams as produced by dams. II. 259. Caissons of the East River Bridge. II,

134.

"Corrosion of Iron." I. 23.
Croton Water-Works and supply for the future V. 260.
Detroit River Tunnel. II. 238.

Detroit River Tunnel, 11, 288. Early history of railways, II, 59, "Engineers in Courts of Law." I, Failure in a water main. VII, 16. Failure of the Worcester Dam. V, Flexure of beams. III, 52. Improvement of rivers. IV, 332. Presidential Address, September 1966. I, 226.

Presidential Address, September 2d, 1868. I, 45.
"The Foundations of the New Capitol at Albany, N. Y." II, 287.
Transportation of freight and passengers.

II, 246. Water power of the Falls of the Ohio River. II. 269. "Wayes of Translation in Fresh Water."

I, 333.

McBEAN, DUNCAN D.

Subaqueous highway tunnels. LXXVIII, 307

McBEE, VARDRY ECHOLS, Jr.

Memoir of, LXXI, 449.

McCALLA, R. C.

Dimension stone quarrying, XXV, 516.
"Improvement of the Black Warrior,
Warrior and Tombigbee Rivers, in Ala-hama." XLIX, 212.
Memoir of, LV, 453.

McCANN, THOMAS II.

Comparison of water supply systems from a financial point of view, XXIV,

Compressibility of salt marsh under earth filling, XXXVII, 218. Main relief sewer of Brooklyn, XXVI.

514.

514. Road building. XLI, 128. Translation of paper by L. Franzius. XXIX, 173. 28-in. cast-iron submerged pipe line. XXXIII, 274.

McCANN, W. R.

Valuation of public utilities. LXXXI, 1610.

McCARTY, RICHARD J.

Depreciation as an element in appraisal. LXXIX, 795.

McCAUSTLAND, E. J.

Concrete and mortar beams. L, 477. Physical properties of brick. LI, 65.

McCLINTOCK, J. R.

Tests of concrete in sea water. LXXXI, 682.

McCLINTOCK, WILLIAM E.

"Highway Construction: Methods and General Description of Massachusetts Work." LIV, Part F. 143. Road building. XLI, 89.

McCLURE, HUNTER.

Memoir of. LXXXIII, 2381.

McCOLLOM, THOS. C.

"Report of Progress of the Committee on the Compressive Strength of Ce-ments and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888).

"Report of the Committee on a Uniform System for Tests of Cement." XIV, 475 (1885).

McCOMB, DAVID E.

Construction and maintenance of roads. VIII, 358.

Road construction and maintenance: Fillers for brick and block pavements. LXXV, 539.

McCOOL, DANIEL.

Memoir of. LXXXI, 1744.

McCORMICK, R. S.

Physical valuation of railroads, LXXVII, 330.

McCRICKETT, THOMAS FRANCIS. Memoir of. LXXX, 2188.

McCRORY, S. II.

Subsidence of muck and peat soils. LXXXII, 429.

McCULLOCH, J. A.

Effects of straining steel. LXXX, 1476.

McCULLOH, WALTER.

"The Construction of a Water-Tight Masonry Dam." XXVIII, 185, 351.

McCULLOUGH, ERNEST.

"Engineering Education in its Relation to Training for Engineering Work." LXXV, 1079. Mule-back reconnaissances. LXXV, 20. Theory of reinforced concrete joists. LXXVI, 152.

McCURDY, JOHN EGBERT.

Memoir of. LXXI, 426,

McDONALD, HUNTER.

"Address at the Annual Convention, in Md., June 2d, 1914." Baltimore, M LXXVII, 1737.

Construction of railway tracks. XXV,

Proper relation to each other of the sections of railway wheels and rails. XXI, 288.

The Bridge over the Tennessee River at Johnsonville, Tennessee." XXXIII, 171. The creeping of rails. LIII, 487.

McDONALD, JOHN A.

of piles from the Teredo. Protection XXXI, 240.

Tower of the New City Hall, Philadelphia. XXXI, 275.

McDOWELL, R. F.
Water and sewage works, Columbus,
Ohio. LXVII, 330.

McFARLAND, J. HORACE.

Water supply of the San Francisco-Oak-land Metropolitan District, LXXX, 177.

McFARLAND, WALTER ASHFIELD. .. Memoir of. LXXIX, 1446.

McFETRIDGE, W. S.

"Some Extensive Railroad Surveys, and Their Cost Per Mile." LXV, 105.

McGEE. VAN NORMAN. Memoir of. LIV, 538.

McGILL, A.

Purification of water for the production of steam. LIV, Part A, 35.

McGUIRE, JAMES C.

"The Iron Work for the Dome of the Proposed Government Building, World's Columbian Exposition, Chicago, Ill." XXVI, 1.

McKEAN, REGINALD.

Memoir of. XLIX, 366.

MCKEE, J. R.

High-voltage power transmission. L, 249

McKENZIE. THEODORE HALL.

Momoir of, LXXXI, 1746. "The Water-Works of Southington, Con-necticut." XV. 885. Water-works valuation. LXIV, 85.

McKEOWN, THOMAS.

Memoir of. LXXI, 428.

McKIM, ALEX, RICE.

Reservoirs for flood control. LXXXII, 1497.

McKINSTRY, C. H.

Coos Bay Harbor improvement. XLVI,

"The Delaware, Sandy Bay and San Pedro Breakwaters." LIV, Part A, San 325.

McLAUGHLIN, J. J. Road building. XLI, 110.

McLURE, NORMAN R.

Agreements for building contracts. LXVII, 478. Tests of large steel columns. LXXIII,

467.

McMATH, ROBERT EMMET.

Brazos River Harbor improvement. XXV, 552

"Determination of the Size of Sewers." XVI, 179.

Excessive rainfalls. XXV, 110. Flood discharge of rivers. X XI, 232 Forests, reservoirs, and stream flow. LXII, 430. "Levee Theory Tested by Facts." XIII,

331.

331.
"Mean Velocity of Streams Flowing in Natural Channels." XI, 186.
Memoir of. LXXXIII, 2268.
"Practical Consequences of Variation of the Wet Section of Rivers under General and Special Conditions." IX, 377.
Sewage disposal. XVIII, 35.
South Pass Jetties. XV, 246.

Stream contamination and sewage puri-

fication. XLII, 160.

Theory and practice of special assessments. XXXVIII, 411.

McMILLAN, FRANKLIN R.

Designing re LXXX, 1738. reinforced concrete slabs

McMULLEN, STANLEY HASTINGS. Memoir of, LXXXI, 1808,

McNEAL, JOHN.

"Reinforced Concrete Foundations over Excavations on Paved Streets."

McVEAN, JOHN JAY.

Memoir of. LXXI, 430.

MADDEN, JOHN H. Subway tunnel work. LXXXI, 393.

MADDOCK, GEORGE F.

Morena Rock Fill Dam. LXXV, 53. MAGOR, HENRY B. Stadia topographic surveys. XLIV, 103.

MAGOVERN, EDWARD E.

Electric lighting. XXVI. 433.
"The Theory of Aqua Ammonia Engines, with Results of Tests upon an Engine of this Type Operating an Edison Incandescent Lighting Plant." XIX, 127.

MAGRUDER, G. LLOYD.

Water filtration at Washington, D. C. LVII, 410.

MAGUIRE, JOSEPH T.

Bond-friction-resistance in reinforced concrete. LXXIII, 271.

MAHAN, F. A.

"Inland Transportation." XXIX, 97;

XXX, 474.

MAIGNEN, J. P. A.

Albany Filtration Plant. XLIII, 306. Consumption and waste of water. XLVI,

Decolorization of water. XLVI, 168. Engineering patents. LVII, 88. Filtration of water. LIII, 257. Filtration works. L. 447. Irrigation. LXII, 15.

Purification of water for domestic use. LIV, Part D, 213. Sewage disposal. LVII, 119

Shall civil engineering practice be regulated by law? XLVI, 140.

Stream contamination and sewage purification. XLII, 178. Water filtration at Washington, D. C. LVII, 383.

MAIS, HENRY COATHUPE.

Memoir of. LXXX, 2190.

MALÉZIEUX, ÉMILE.

Memoir of. XXXVI, 524.

MALLET, A.

Locomotives and other rolling stock. LIV, Part D, 348.

MALTBY, F. B.

Dredging river channels. LII, 250. Forests, reservoirs, and stream flow.

Forests, reservoirs, and stream flow. LXII, 332. "Hvdraulic Dredging on the Mississippi River." LIV, Part C, 391, 515. Lake Cheesman Dam and Reservoir, LIII,

Morena Rock Fill Dam. LXXV, 61. Movable dams. XXXIX, 596.

MAN, ALBON P., Jr.

"Data for Flattening the Ends of Rail-road Curves." XV, 359. Proper relation to each other of the sections of railway wheels and rails. XXI, 287.

MANAHAN, E. G.

Washing rapid sand filters. LXXX, 1383,

MANEY, G. A.

New principle in the theory of structures. LXXXIII, 664.

MANLEY, HENRY.

Highway construction. LIV. Part F, 170. Marine wood-horers. XL, 210.

MANSFIELD, M. W.

Dimension stone quarrying. XXV, 515. Memoir of. L/XIII, 431.

MANSON, MARSDEN.

"A Brief History of Road Conditions and Legislation in California." XLVIII,

Effects of San Francisco earthquake on engineering constructions. LIX, 263. Guatemala carthquakes. LXXXIII, 1700.

MANTON, ARTHUR W.

Dipper-dredges on the Panama Canal. LXXXII, 531.

MARBURG, EDGAR.

Cinder concrete floors. LXXVII, 1818. Engineering education. LVII, 155. Faults in the theory of flexure. LXXV,

Memoir of. LXXXIII, 2272 The Launhardt formula and bridge speci-

fleations. XLI, 221.
Wheel concentrations and fatigue formulas. XLII, 237.

MARICHAL, ARTHUR.

Hot tests for Portland cement. XXVII, 438.

MARINDIN, HENRY L.

Reaction breakwater, XLII, 509.

MARINKELLE, A. B.

"A Review of the Development of Nat-ural Waterways in the Netherlands." LIV, Part D, 401.

MARKWART, A. II.

A concrete water tower. LXX. 349. Philosophy of engineering. LXXVII, 55. Railroad draw bridges. LXXV, 720.

MARPLE, WILLIAM McKELVEY.

Memoir of, LXXXII, 1699.

MARR, GEORGE ANSON. Memoir of. LV, 455.

MARR, WILLIAM WALTER.

Memoir of, LXXXII, 1701. Paying practice in Chicago, LXVI, 48.

MARRIAN, RALPH RICHARDSON. Memoir of. LXXXIII, 2421.

MARRIOTT, WILLIAM.

Nickel steel for bridges. LXIII, 348.

MARSH, CHARLES F.

Concrete and reinforced concrete. LXXXII, 1564. Designing reinforced concrete slahs. LXXX, 1736.

Earth pressures and bracing. LX, 72.

MARSH, F. B.

Storage for Impounding reservoirs. LXXVII, 1644.

MARSH, J. B.

Concrete and concrete-steel. LIV, Part E, 580.

MARSHALL, CHARLES A.

"Compressive Strength of Steel and Iron." XVII. 53.

Inspection and maintenance of railway structures. XVII, 296. Niagara Cantilever Bridge. XIV, 550. Properties of steel: Its use in structures and heavy guns. XVI, 343.

MARSHALL, HORACE M.

Brick manufacture and brick pavement. XXVI, 412.

Erosion of river banks. XXXI, 20. Precise spirit leveling. XLV, 117. Rainfall and river-flow. XXVIII, 340. Spirit leveling. XXXIX, 399.

MARSHALL, HORACE M .- (Continued).

Standard levee sections. XXXIX, 221. Use of long steel tapes for measuring base lines. XXX, 642.

MARSHALL, ROBERT A.

Sinking bridge piers. LXII, 123.

MARSHALL, U. S.

Irrigation and river control. LXXVI, 1555.

MARSTON, A.

"Friction Rollers." XXXII, 99, 273. Rainfall, and run-off in storm-water sewers. LVIII, 498. Theory of the ideal column. XXXIX, 108.

MARSTRAND, O. J.

Coal-handling machinery, XLI, 295. Transverse strength of beams as a direct function of the tensile and crusbing stresses of material. XXXV, 492.

MARTIN, C. C.

Construction and maintenance of 'roads. VIII, 368.

Pneumatic foundations, II, 422.

MARTIN, CHARLES W.

Temperature stresses in a series of spans. LXXX, 1642.

MARTIN, E. S.

Concrete and reinforced concrete. LXXXII, 1553.

MARTIN, W. F.

"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." LXI, 281.

MARVIN, FRANK O.

Engineering education. LIV, Part A. 500.

MARX, CHARLES D.

Durability of wooden stave pipe. LVIII, 92.

Effects of San Francisco earthquake on engineering constructions. LIX, 208, 245.

Efficiency of centrifugal pumps. LVI, 155.

155.

"Experiments on the Flow of Water in the Six-Foot Steel and Wood Pipe Line of the Pioneer Electric Power Company, at Ogden, Utah." First Paper, XL, 471 (1898); Supplementary Paper, XLIV, 34 (1900).

"Idealism and Art in Engineering." Address at the Annual Convention, in San Francisco, Cal., September 16th, 1915. LXXIX, 1329.

Size of high-pressure water-power pipe. LIX, 188.

MASON, ARTHUR J.

Brazos River Harbor improvement. XXV, 540.

MASON, FRANCIS.

"The New York Tunnel Extension of the Pennsylvania Railroad. The Cross-Town Tunnels." LXVIII, 391. "The New York Tunnel Extension of the Pennsylvania Railroad. The East River Tunnels." LXVIII, 419.

MASON, WILLIAM P.

Albany Filtration Plant. XLIII, 310. Quality of water supplies. XXXII, 164. Water supply for camps, cantonments, etc. LXXXIII, 522.

MASURY, A. F.

Road construction and maintenance: Equipment and methods for maintaining bituminous surfaces and bituminous pavements, LXXVII, 1181.

MATCHAM, CHARLES ARTHUR.

Memoir of. LXXIV, 513.

MATHEWSON, T. K.

Evaporation from Lake Conchos, Mexico. LXXX, 1902. Mexico and Pacific Railroad. LXXX, 1609.

MATSON, JESSE SIDWELL.

Memoir of. LXXIX, 1483.

MATTHES, GERARD II.

Floods and flood prevention. LXXXI, 1278.

Surveying instruments. XLVIII, 105. Use and care of the current meter. LXVI, 128.

MATTHEWS, ERNEST R.

"The Action of Frost on Cement and Cement Mortar, Together with Other Experiments on These Materials. LXIV, 320.

MATTHEWS, THOMAS.

"Coast Lighting in Great Britain." LIV, Part B, 25, 85.

MATTHEWS, WILLIAM,

"Harbours of Great Britain." LIV, Part A, 159, 384.

MAURICE, C. S.

"An Account of the Erection of a Draw-Bridge without False Works." II, 330.

MAURY, DABNEY II.

"Water Supply for the Camps, Cantonments, and Other Projects Built by the Construction Division of the United States Army." LXXXIII, 481.

MAXIMOFF, S. P.

"A Desirable Method of Dredging Channels through River Bars." LII, 215. Virtual grades for railroads. L, 12.

MAXWELL, GEORGE H.

Irrigation works, XLIX, 32.

MAXWELL, JAMES R.

Railroad location. XXXI, 115.

MAXWELL, W. D.

Design of concrete bridges, LXXVII. 731.

MAYELL, A. J.

Grouting operations. LXXXIII, 1072.

MAYER, JOSEPH.

"A New Suspension for the Contact Wires of Electric Railways Using Sliding Bows." LXI, 1.
"Canals between the Lakes and New York." XLV, 207, 308.
Catenary trolley construction. LXII, 175.
Centrifugal pumps and fans. LI, 232.
Depreciation as an element in augmental Depreciation as an element in appraisal.

LXXIX, 782.

testing experiments. XXX1X, Impact

264. Overhead construction for electric trac-tion or transmission. LX, 539. Principles of valuation. LXXIX, 177.

Prospective competitor method of valuation. LXXXIII, 1372.

Railroad bridge accidents. XLV, 451.
'Steam Locomotive and Electric Operation for Trunk-Line Traffic: A Comparison of Costs and Earnings." LVII, Railroad bridge accidents. 455.

Stiffened suspension bridges. LV, 21. Suspension bridges. XXXVI, 420.

Suspension bridges. XXXVI, 420.
Tensile strength and composition of structural steel. XXXVIII, 85.
"The Economic Depth for Canals of Large Traffic." XXXIX, 273.
"The Just Value of Monopolies, and the Regulation of the Prices of Their Products." LXXV, 455.
The practical communication of the Prices of Their Products."

Troducts. LXXV, 433.

The practical column under central or eccentric loads. XLV, 437.

"The Stiffening System of Long-Span Suspension Bridges for Railway Trains." XLVIII, 371.

Valuation of public utilities. LXXXI,

1597.

Varuation of public utility property. LXXIX, 889.

MAYHEW, ALFRED BOARDMAN.

Memoir of. LXXXII, 1703.

"Temperature Changes in Mass Concrete." LXXIX, 1225.

MAYO, FRANKLIN F.

Valuation of land. LXXXI, 638.

MEAD, DANIEL W.

Bacteria and other organisms in water. XXXIII, 453.

Consumption and waste of water, XXXIV, 215.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

Modern hydraulic turbines. LXVI, 357. a reaction turbine.

l'erformance of LXXVIII, 1298. "The Manufacture and Use of Paving Brick," XXIX, 653; XXX, 585. Underground water. supply. XXX, 696.

MEAD, ELWOOD.

Irrigation. XVI, 111.
Irrigation and river control. LXXVI, 1506.

"Irrigation in the United States." LIV, Part C, 83.

"Irrigation Studies." XLIV, 149.

Irrigation works. XLIX, 24.
Silt problem of the Zuni Reservoir.
LXXXIII, 879.

MEANS, THOMAS II.

Duty of water in the Pacific Northwest. LXXXIII, 2114.

Effect of alkali on concrete, LXVII, 606.

Irrigation, LXII, 42.

Prevention of mosquito breeding. LXXVI,

MEEKER, ROBERT A.

Road construction and maintenance: Engineering organizations for highway work. LXXVII, 1103.

construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1143.

construction and maintenance: Road Surface treatment with tars, heavy oils, etc. LXXIII, 71. oad construction and maintenance:

Road Systems of maintenance. LXXIII, 30. Road construction and maintenance:

The use of bituminous materials by mixing methods. LXXIII, 128.
Road construction and maintenance:

The use of bituminous materials by penetration methods. LXXIII, 94. Road construction and maintenance: The use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIII, 42.

MEEM, JAMES COWAN.

Design of masonry dams. LXXV, 202. Experiments on retaining walls, etc. LXXII, 451. Flow of water in Ogden, Utah, pipe line. XLIV, 60.

Geology in its relations to topography. XXXIX, 82. Impact testing experiments, XXXIX.

266.

Notes on tunnel lining. LXXXIII, 1856. Preumatic foundations for buildings. LXI, 233.

"Pressure, Resistance, and Stability of Earth." LXX, 352. Questions in reinforced concrete design.

LXX, 82. Stave pipe. XLI, 63.

Steel sheeting and sheet-piling. LXIV, 460.

Suspension bridges. XXXVI, 470.

The Bracing of Trenches and Tunnels, with Practical Formulas for Earth Pressures." LX, 1.

Underpinning buildings. LXVII, 569. Underpinning Trinity Vestry Building. LXXXI, 162. Water-bound macadam roads. LXXVI,

MEEM, J. L.

"A Suggested Improvement in Building Water-Bound Macadam Roads." LXXVI, 988.

MEHRTENS, GEORGE C.

"The Use of Mild Steel for Engineering Structures." XXX, 204.

MEIER, E. D.

Cost of steam power. XII, 432.

MEIGS. M.

Panama Canal. L, 185.
"The Use of Canvas in Water-Tight Bulk-heads." XXXI, 524.

MEIK, P. W.

Harbors. LIV, Part A, 355.

MEINZER, O. E.

Yield of underground reservoirs. LXXVIII, 234.

MELAN, J.

Stiffened suspension bridges. LV, 50.

MELCHER, FRANK OTIS. Memoir of. LXXV, 1166.

MELLISS, DAVID ERNEST. Memoir of. LXXIX, 1447.

MELVILLE, GEORGE W.

Dry docks - stone vs. wood. XLI, 565.

MELVIN, DAVID NEILSON.

Memoir of. LXXVII, 1882. Painting of iron structures. XXXIII, 562.

MENDELL, GEORGE H.

Brazos River Harbor improvement. XXV, 537.

of the Potomac Basin. Hydrography

Hydrography of the Potomac Basin. XXVII, 33.

Jetty harbors of the Pacific Coast. XXVIII, 374.

Memoir of. LI, 459.

"Report of the Committee on the Preservation of Timber." Preliminary Report, XI, 325 (1882); Final Report, XIV, 247 (1885).

Single jetty harbor improvement. XXXVI, 127.

127.

Straits of Juan de Fuca and Government improvements on the Pacific Coast. XXV, 434.

MENDENHALL, T. C.

"Fundamental Units of Measure." XXX,

MENEFEE, F. N.

Earth pressures. LXXXI, 218.

MENKE, WILLIAM.

Memoir of. LXXXIII, 2383.

MENOCAL, A. G.

"Inter-Oceanic Canal Projects." VIII, 311; IX, 429. "Sub-Aqueous Underpinning." XI, 181. The Bohio Dam. XLVIII, 290. "The Panama Canal." LVI, 197.

MENSCH, L. J.

A concrete water tower. LXX, 348.
Almendares River Reinforced Concrete
Bridge. LXXIV, 241.
Concrete and reinforced concrete.
LXXXII, 1541.
Concrete piles. LXV, 489.
Design of concrete bridges. LXXVII,

726.

126.
Designing reinforced concrete slabs.
LXXX, 1731.
Halligan Dam. LXXV, 135.
Huacal Dam, Sonora, Mexico (Concrete arch dam). LXXVIII, 610.
New principle in the theory of structures. LXXXIII, 654.
Questions in reinforced concrete design.
LXX 76.

LXX, 76. Reinforced concrete buildings. LX, 494. Reinforced concrete flat slab floors. LXXVII, 1682.

Shear tests on joints in T-beam stems. LXXVII, 1523.

Steel centering LXXIV, 10. for concrete bridges.

Steel columns and struts. LXXXIII, 1667.

Steel stresses in flat slabs. LXXVII, 1400.

Stresses in reinforced concrete beams. LXXVII, 767. Traffieway viaduct, Kansas City, Mo.

LXXX, 534.

MERCER, CHARLES H.

Movable railroad bridges. LXXVI, 406.

MERIWETHER, M.

Construction and maintenance of roads. VIII, 353.

MERIWETHER, NILES. Memoir of. XLV, 632.

MERRICK, HORACE GUY. Memoir of. LXXVII, 1920.

MERRILL, GEORGE P.

Strength and weathering qualities of rooting slates. XXVII, 685; also, XXXII, 540.

MERRILL, O. C.

State and national water laws. LXXVI,

MERRILL, OGDEN.

Memoir of. LXXXIII, 2385. Underpinning buildings. LXVII, 567.

MERRILL, WILLIAM E.

A masonry dam. XVI, 280. Aeration of water. XV, 142. American irrigation engineering. XXV,

Beginnings of engineering. XXIV, 382. Characteristics of the Ravine du Sud and plan for averting its overflow. XXIV,

Enlargement of the Eric Canal. XIV, 103. Flexure of beams. III, 51. Inter-oceanic canal projects. IX, 142. Iron hulls for Western river steamboats.

II. 286.

Report of the Committee on "Nomenclature of Building Stones and of Stone Masoury." VI, 297 (1877).
South Pass Jetties. XV, 223.

MERRIMAN, MANSFIELD.

Deflections of beams. LI, 20.
Flow of water in pipes. XXII, 72.
Flow of water in streams. XXI, 563.
Flow of water in streams. XXI, 563.
Flow of water in wood pipes. XLIX, 152.
Hydraulics of fire streams. XXI, 462.
Irrigation studies. XLIV, 176.
New facts about eye-bars. LVI, 429.
Obstruction to flow by bridge piers.
LXXXII, 378.
Over-loaded bridges. LVII, 258.
Proper relation to each other of the sections of railway wheels and rails.
XXI, 288.
Railway bridge designing. XXVI, 151.

Railway bridge designing. XXVI, 151. Rainfall, flow of streams, and storage. XXVII, 295.

Reinforced concrete floor systems. LVI, 376.

MERRIMAN, MANSFIELD-(Continued).

Specifications for strength of iron bridges. XV, 455.

Steel concrete construction, XXXIX.

The hydraulic jump. LXXX, 383.
The Launhardt formula and bridge speci-

fications. XLI, 170.

"The Strength and Weathering Qualities of Roofing Slates." First Paper, of Roofing Slates." F XXVII, 331 (1892); St Paper, XXXII, 529 (1894). Supplementary

Translation of paper by F. Lohse. XXIX,

Tuberculation in water pipes. XXVIII, 267.

201.
"Typhoid Mortality in South Bethlehem, Pa." LVIII, 511.
Verturi water meter. XVIII, 139.
Working stress for bridges. XLI, 537.
Wrought-iron columns, tests and formular VI 115. læ. XI, 115.

MERRIMAN, THADDEUS.

Effect of temperature changes on mason-ry. LX1, 413.

Rainfall and stream flow, LIX, 491.

MERRITT, J. S.

Steel concrete construction. XXXIX. 637.

MERZ, FREDERICK W.

Memoir of. XXXVI, 615.

METCALF, LEONARD.

Depreciation of public utility properties. LXXVII, 819.

"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Property and Other Public Utilities." 1311.

Sewage and wastes dispose for the U.S. Army. LXXXIII, 353

"The Antecedents of the Septic Tank." XLVI, 456.
"The Going Value of Water-Works."

"The Going Value of Water-Works."
LXXIII, 326.
"The Groined Arch as a Covering for Reservoirs and Sand Filters: Its Strength and Volume." XLIII, 37.
The valuation of public service property. LXXII, 252.
"Water-Works Valuation and Fair Rates, in the Light of the Maine Supreme

in the Light of the Maine Supreme Court Decisions in the Waterville and Brunswick Cases." LXIV, 1.

METCALF, WILLIAM.

Bridge accidents. IV, 212.
Bridge painting. XXXIX, 31.
Comparison of water supply systems from a financial point of view. XXIV, 263.

Eye-bar tests. XXXI, 426,
Manufacture of rails. IV, 235.
Memoir of. LXXIV, 490.
Permanent effects of strain in metals.
XXIV, 177; XXV, 17.
Presidential Address at the Annual Convention at Chicago 1893. XXVIII, 391, Chicago, Ill., August 4th,

"Qualities of Iron and Steel." V, 323. Steel bridge pins. XXXVI, 100. "Steel: Its Properties; Its Use in Struc-tures and in Heavy Guns." XVI, 283.

"Steel Production in the United States." LIV, Part E, 349, 414. Structural steel. XXVII, 382. Tensile strength and composition of structural steel. XXXVIII, 84; XL,

Tests and testing machines. 1V, 272. Tuberculation in water pipes. XXVIII, 261.

Use of mild steel. XXX, 684.

MEYER, ADOLPH F.

"Computing Run-Off from Rainfall and Other Physical Data." LXXIX, 1056. Evaporation from Lake Conchos, Mexico. LXXX, 1932.
Reservoirs for flood control. LXXXII,

MEYER, RUDOLF.

Monterrey w LXXII, 576, water-works and sewerage.

MICHAELIS, O. E.

"A Note on the Cost of Concrete." XV, 873.

"A Peculiar Phase of Metallic Behavior." XI, 429.

American railroad bridges. XXI, 574.

American railroad bridges. XXI, 574. English and American railroads compared. XV, 749.

"Lime Sulphite Fiber Manufacture in the United States." XX, 263.

"Metrological Investigations." XIII, 1.

Properties of steel: Its use in structures and heavy guns. XVI, 305.

Strength of wrought-iron struke and of

and heavy guns. XVI, 305.

Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 294.

"The Heavy Gun Question." XIII, 215.

MICHAELIS, W.

Portland cement concrete. XXXVII, 516.

MICHAELSON, J. M.

"A Simple Diagram, Glving, by Inspec-tion, the Dimension of Wooden Beams, for a Given Span and Load." XXV,

MICHIE, WILLIAM ROBERTS.

Memoir of. XLI, 647.

MILLARD, CURTISS.

Memoir of. LXXX, 2258.

MILLARD, WILLIAM J.

"Mule-Back Reconnaissances." LXXV. 12.

MILLER, A. M.

Albany Filtration Plant. XLIII, 309.

MILLER, A. N.

Wood stave pipe design. LXXXII, 512.

MILLER, CHARLES H.

rrection of LXXXIII, 1310. Correction foundation troubles.

Cup and screw current meters. LXXVI, 846.

urrent meter and weir discharges. XLVII, 379. Current

Remedies for landslides and slips. LXXI,

MILLER, CHARLES H .- (Continued).

River protection work. LXVI, 395. The discharge of the Mississippi. XXXV, 316

MILLER, CLEMENT H.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 150.

MILLER, FRED J.

Purification of water for the production of steam. LIV, Part A, 52.

MILLER, JAMES BLAINE.

Memoir of. LXXX, 2253.

MILLER, MAX M.

The arch principle in long-span bridges. LXXI, 249.

MILLER, RUDOLPH P.

Concrete and concrete-steel. LIV, Part

Preservation of materials of construction. L, 297.

Translation of paper by F. A. Gelbcke. XXIX, 429.

Use of reinforced concrete. LXI, 63.

MILLER, SILVANUS, Jr.

Memoir of, XXXIX, 696.

MILLER, SPENCER.

"A Problem in Continuous Rope Driving." XXXIX, 165,
"Cableways." XXXI, 397.
Electric rock blasting. XXVIII, 144.
Hydro-electric power development.

LXXVIII, 1566.

LXXVI, 759.
Sanitation of construction camps.
LXXVI, 510. "Prevention

Steam and electric cableways for logging and canal-boat towing. XXXII, 52.

MILLER, STANLEY ALFRED.

Memoir of. LXXXI, 1749.

MILLHOLLAND, JAMES A.

Proper relation to each other of the sections of railway wheels and rails. XXI, 289.

MILLIKEN, FOSTER.

Wind bracing in high buildings. XXVII, 229.

MILLS, ADELBERT PHILO.

Memoir of. LXXXIII, 2387.

MILLS, CHARLES M.

Impurities in sand for concrete, LXV, 262

MILLS, HIBAM F.

Flow of water in pipes. XLVII, 203; also, LI, 314.

"Purification of Sewage and of Water by Filtration." XXX, 350.

Storage for LXXVII, 1641. impounding reservoirs.

"The Pacific Mills Chimney at Lawrence, Mass., U. S. A." XIV, 171.

MILNE, PETER.

Stream contamination and sewage purification. XLII, 168. Water-works valuation. XXXVIII. 155.

MITCHELL, EDWIN.

Controverted questions in road construction. XXVIII, 110.

Influence of rails on street pavements. XXXVII, 115.

MITCHELL, LOUIS A.

Street railway LXXVI, 474. track construction.

MITCHELL, S. P.

"Tests of the Efficiency of Hoisting Tackle." LI, 161.

MITCHELL, STEPHEN ARNOLD.

Memoir of. LXII, 552.

MITCHELL, W. E.

Hydro-electric power development. LAAVIII, 1569.

MITCHELL, W. S.

Dredges and dredging. XL, 321.

MODJESKI, RALPH.

"Final Report of the Special Committee on Steel Columns and Struts." on Steel Co

LAXAIII, 1583.
Letters relating to repair of foundations of the piers of the Little Rock Junction Bridge. LXXIX, 103.
Movable bridges. LAX, 308.
"Progress Report of Special Committee on Steel Columns and Struts." LXVI,

401.

MOELLER, H. C. V.

"A New Swing Bridge at Copenhagen, Denmark." LV, 129.

MOGENSEN, O. E.

Deep foundations. LIV, Part E, 135. Elevated railroads. XXXVII, 378. Sixth Street Viaduct, Kansas City. LXV, 98. Tufa cement. LXXVI, 556.

MOHUN, EDWARD.

Dry docks — stone vs. wood. XLI, 594. Memoir of. LXXVI, 2239.

MOISSEIFF, LEON S.

Hell Gate Arch Bridge. LXXXII, 1006. High-alloy steels for bridges. LXXVIII,

Nickel steel for bridges. LXIII, 358. Nickel-concrete construction. XLVI, 97. Stiffened suspension bridges. LV, 56. Suspension bridges. XLVIII, 422. Tests of large steel columns. LXXIII,

449. The arch principle in long-span bridges. LXXI, 252.

The Kinzua Viaduct. XLVI, 44.

"Theory and Formulas for the Analytical Computation of a Three-Span Suspension Bridge with Braced Cable."

LV, 94.

MOLITOR, DAVID A.

Economics of LXXXIII, 79. steel arch bridges.

Effects of straining steel. LXXX, 1493. High-alloy steels for bridges. LXXVIII,

Obstruction to flow by bridge piers. LXXXII, 385.

EXXXII. 389.
Stress measurements, Hell Gate Arch.
LXXXII, 1109.
Stresses in lock-gates. LXXXII, 1469.
"The Theory and Practice of Precise
Spirit Leveling." XLV, 1.
"Three-Hinged Masonry Arches; Long
Spans Especially Considered." XL, 31.
Verification of Bazin weir formula.
LXXXIII, 164.

MOLITOR, F. A.

Physical valuation of railroads. LXXVII,

MOLLER, H. C. V.

"Harbor Works at Copenhagen, Den-mark." XIV, 212.

MONCRIEFF, J. M.

Niagara Railway Arch. XL, 162. "The Practical Column under Central or Eccentric Loads." XLV, 334. Working stress for bridges, XLI, 534.

MONCURE, WILLIAM.

Timber preservation, XLIV, 202,

MONCURE, WILLIAM AUGUSTUS. Memoir of, LXXXIII, 2282.

MONRO, THOMAS.

Canals from the Lakes to New York. XLV, 279.

MONROE, J. ALBERT.

"An Account of the Removal of Some Broken Piles from the Bed of the Connecticut River." I, 275 "Method Pursued in Replacing a Stone Pier on a Pile Foundation." III, 58. Tests of cement. XIII, 65.

MONTFORT, RICHARD.

"Final Report of Special Committee on Rail Sections," LXX, 456, Life of iron railroad bridges, XXXIV,

Painting of iron structures. XXXIII. 539

"Protecting Piles against the Navalis on the Louisville and ville Railroad Company's Nash-Lines.

XXXI, 221.
Railway tie renewals. XXVII, 650.
Timber preservation. XLIV, 208.

MONTGOMERY, CHARLES M.

Designing reinforced concrete slabs. LXXX, 1712.

MONTONY, L. G.

"The Ninety-Sixth Street Power Station of the Metropolitan Street Railway Company, of New York City." XLIV, 119,

MOODY, LEWIS F.

Modern hydraulic turbines. LXVI, 347.

MOORE, C. E.

Detroit Union Depot Viaduct. XXVIII, 317

Effects of San Francisco earthquake on engineering constructions. LIX,

Railroad location. XXXI, 91.

MOORE, CHARLES.

Water filtration at Washington, D. C. LVII, 399.

MOORE, DeWITT V.

Agreements for building contracts. LXVII, 515.

MOORE, ERNEST C.

West Side Manhattan water-front. LXXV,

MOORE, ERNEST CURTISS.

"Moving Two 36-In. Water Mains without Shutting off the Water."

MOORE, FRED F.

Reconstruction of Stony River Dam. LXXXI, 1035,

MOORE, HERBERT F.

Effects of straining steel. LXXX, 1472.
"Tests of Built-Up Steel and WroughtIron Compression Pieces." LXV, 202.

MOORE, J. S.

Flow of water in wood pipe. LXXIV, 463

MOORE, ROBERT.

American irrigation engineering. XXV.

American railway line. V City of Mexico. XV, 830. Vera Cruz to

Continuous superstructure of the Memphis Bridge, XXX, 562. Electricity vs. steam for branch railroads. XLII, 384.

Free railway construction vs. ment controlled and owned railways, XXV, 634.

XXV, 634.
Inspection and maintenance of raitway structures. XVII, 316.
"Landing Arrangements for a Car Ferry on the Mississippi River" XIII. 247.
Live loads for railroad bridges. LIV, Part A, 92.
Marine wood-borers, XL, 211.
Painting of iron structures, XXXIII.

560

Purification of sewage and water by filtration, XXX, 707, Railroad terminals, LIV, Part F, 542.

Railway bridge designing, XXVI, 150, Rainfall, XIII, 374 Right of way for railroads, XXV, 332, Sewage disposal, XVIII, 28, The American railroad viaduct, XXV,

360.

360.
"The Engineer of the Twentleth Century." Presidential Address at the Annual Convention at Washington, D. C., May 20th, 1902. XLVIII, 227.
The manufacture of brick. XVIII, 307.
"The Merchants' Bridge Terminal Railway Viaduct at St. Louis, Mo." XXXI, 500.

Underground railways. LIV, Part F, 367.

MOORE, ROBERT—(Continued).

Use of long steel tapes for measuring base lines. XXX, 638.
Use of mild steel. XXX, 683.

XXXVIII, 151. Water-works valuation.

MOORE, WILLIAM EDWIN.

Memoir of. LXXIX, 1449. State and national water laws. LXXVI,

MORAN, D. E.

Freezing as an aid to excavation. LII,

MORAN, H. P.

Earth pressures and bracing. LX, 49.

MORDECAI, AUGUSTUS.

Memoir of. LXXXIII, 2284. The valuation of public service property. LXXII, 285.

MORDECAI, GRATZ.

"Notes on the Classification of Rail-road Accounts and the Analysis of Railroad Rates." XVIII, 62.

MORGAN, ARTHUR E.

Flood flows. LXXVII, 618. Hydraulic-fill dams. LXXXIII, 1780. Reservoirs for flood control. LXXXII,

Subsidence of muck and peat soils. LXXXII, 420.

MORGAN, CHARLES L.

Railroad terminals. LIV, Part F, 543.

MORGAN, JOHN T.

Properties of steel: Its use in structures and heavy guns. XVI, 359.

MORISON, GEORGE S.

"American Engineering at the Paris Exposition of 1878." (Report of the "American Engineering at the Paris Exnosition of 1878." (Report of the
Committee on the Exhibition made by
this Society.) VII, 317.
Commercial cities: The law of their
birth and growth. XIV, 30.
Cylindrical wheels and flat-topped rails
for railways. XXI, 195.
Economic depth for canals. XXXIX,

285. Effect of freezing on cement-mortar. XVI, 82.

Eye-bar tests, XXXI, 425. Life of iron railroad bridges. XXXIV, 308.

Memoir of. LIV, 513.

Niagara Cantilever Bridge, XIV, 552. Painting of iron structures, XXXIII,

532.
Presidential Address at the Annual Convention at the Hotel Pemberton, Hull, Mass.. June 19th, 1895. XXXIII, 467.
Proposed method of testing structural steel. XXX, 666.
"Report of the Committee on Standard Rail Sections." Progress Report, XXIV. 1 (1891); Final Report, XXVIII, 425 (1892) (1893).

"Report of the Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails." Pre-liminary Report, XIX, 1 (1888); Final Report, XXI, 223 (1889).

Screw steamship and tow-barge effi-ciency. XXV, 386. Steel bridge plus. XXXVI, 102. Substructure, Lonesome Valley Viaduct. XXXIV, 252.

"Suspension Bridges - A Study." XXXVI, 359.

Testing machines. XVI, 13.
Tests of bridge members. XXXVIII, 69.
The American railroad viaduct. XXV, 360.

"The Bohio Dam." XLVIII, 235.
"The Continuous Superstructure of the Memphis Bridge." XXIX, 573; XXX, 564.

564.

The Kinzua Viaduct. XLVI, 38.

The Launhardt formula and bridge specifications, XLI, 181.

"The Marent Gulch Viaduct." XXV, 305,

"The New Portage Bridge." V, 1, 237.

"The Panama Canal." L. 155.

The strength of pillars. XXXV, 418.

Thin floors for bridges. XXVII, 500.

Tornadoes and wind bracing for high buildings. XXXVII, 290.

Use of mild steel. XXX, 682.

Wheel concentrations and fatigue formulas. XLII, 192.

las. XLII, 192.

MORITZ, E. A.

"Experiments on the Flow of Water in Wood Stave Pipes." LXXIV, 411. Saturation and strength of concrete. LXXVII, 446.

Weir measurement of stream LXXVII, 1282. Wood stave pipe design. LXXXII, 511.

MORLEY, WILLIAM R.

"The Proper Compensation for Railroad Curves." XIII, 181.

MORRIS, CHARLES JOHN AUGUSTUS. Memoir of. LXXXIII, 2286.

MORRIS, CLYDE T.

Revision of Niagara Bridge, LXXXIII, 2015, Railway Arch

MORRIS, GOUVERNEUR.

Memoir of. XXXIX, 698.

MORRIS, HENRY GURNEY.

Apparatus for obtaining borings by direct pressure, II, 39.
Memoir of, LXXX, 2193.

MORRIS, MARSHALL.

Asphalt and asphalt pavements. XXXVIII, 245.

MORRIS, S. FISHER.

Proper relation to each other of the sections of railway wheels and rails. XXI, 289.

MORRIS, WILLIAM CULLEN. Astoria Gas Tunnel. LXXX, 687.

MORRISON, HENRY PRENTICE. Memoir of, LXXXIII, 2289.

MORRISON, R. L.

Railway development, in the United States, LXXIV, 139.

MORROW, BEN S.

Submerged pipe work, Portland, Ore. LXXVIII, 1326.

MORSE, BENJAMIN FRANKLIN.

Construction and maintenance of roads. VIII, 346. Memoir of. LXXVII, 1884.

MORSE, CHARLES A.

National railroad question of to-day. LXXXIII, 971. Railway curves. XLVIII, 365.

MORSE, CHARLES J.

Weights of bridges. XVI, 222,

MORSE, GEORGE F.

Effect of alkali on concrete. LXVII, 601.

MORSE, JAMES O.

Apparatus for obtaining borings by direct pressure. II, 38.

MORSE, WILLIAM F.

Municipal refuse disposal. LX, 428. Sanitary disposal of refuse. L, 113.

MORTIMER, JAMES D.

Depreciation as an element in appraisal. LXXIX, 780.

MOSES, J. C.

Tests of bridge members. XXXVIII, 75. Tests of compression pieces. LXV, 246. Swing bridges. LV, 139.

MOSS, LINCOLN.

"Comparative Tests of an Electric Motor and a Steam Locomotive on the Manhattan (Elevated) Railway, New York." XXIII, 193.

MOTT, BASIL.

"Underground Railways in Great Brit-ain," LIV, Part F, 325.

MOULTON, H. G.

Cement joints for cast-iron water mains. LXXXIII, 299. Secure subway supports. LXXX, 95 Subway tunnel work. LXXXI, 400. LXXX. 939.

MOULTON, MACE.

Fire-proof construction. XXXIX, 161. New facts about eye-hars. LVI, 439. Specifications for strength of iron bridges, XV, 449. "The Kentucky and Indiana Bridge." XVII, 111, 189.

The Launhardt formula and bridge specifications. XLI, 199.

MUCKLESTON, H. B.

Action of water under dams. LXXX, 453. Flow of water in irrigation channels. LXXX, 1662. Hydraulic-fill dams. LXXXIII, 1772. The hydraulic jump. LXXX, 363,

MUELLER, OTTO H.

Pumping machinery. LIV, Part D. 588.

MUESER, WILLIAM.

reinforced concrete stand-pipe. LXXIV, 392.

MUIRHEAD, J. H. H.

Reinforced concrete docks. LXXVIII. 1112.

MULLER, GEORG A. G.

"The Stereoscopic Method of Surveying, and a First Trial of Its Application to a Railway Survey in China." LXXIX. 665.

MURPHY, EDWARD C.

"Current Meter and Weir Discharge.
Comparisons." XLVII, 370.
Flow of water in pipes. XLVII, 197.
Hydraulic problems. XLVII, 418.
Rain and run-off near San Francisco.
LXI, 516.

LXI, 516.
Rainfall and stream flow. LIX, 484.
Surveying. LIV, Part B, 450.
"The Flood of March, 1907, in the Sacramento and San Joaquin River Basins, California." LXI, 281.
Use and care of the current meter. se and ca LXVI, 107.

MURPHY, MARTIN.

"Bridge Substructure and Foundations in Nova Scotia." XXIX, 620; XXX, 576.

MURRAY, JAMES POWELL.

Memoir of. LXXXIII, 2389.

MURRAY, R.

Movable bridges. LX, 329.

MURRAY, W. S.

Catenary trolley construction. LXII, 191. Electrification of suburban zone. New York Central & Hudson River R.R. in the vicinity of New York City. LXI, 124

Overhead construction for electric traction or transmission, LX, 561.

MYERS, C. H.

Cements, mortars and concretes. XXV, 281.

MYERS, E. T. D.

Cylindrical wheels and flat-topped rails

for railways. XXI, 170.

"Report of the Committee on Standard Rail Sections," Progress Report, XXIV, (1891); Final Report, XXVIII, 425 (1893).

MYERS, E. T. D., Jr.

Steel and masonry construction. XLIX, 83.

MYERS, E. W.

Size of high-pressure water-power pipe. LIX, 191.

MYERS, GEORGE HIGGINS.

Memoir of. LXXI, 454. Questions in reinforced concrete design. LXX, 84.

MYERS, JOHN HAYS.

Subway construction problems, LXXXII, 320. Subway tunnel work. LXXXI, 399.

MVERS, WILLIAM MADISON. Memoir of. LXXVI, 2256.

MYERS-BESWICK, WILLIAM BESWICK. Memoir of. LIV, 534.

NAGLER, FLOYD A.

"Obstruction of Bridge Piers to the Flow of Water." LXXXII, 334. "Verification of the Bazin Weir Formula

by Hydro-Chemical Gaugings. LXXXIII, 105.

NASH, LEWIS II.

Proportional water meter. XXIV, 532.

NEELY, WILLIAM RIDLEY. Memoir of. LXXXI, 1752.

NEHER, CLARENCE RUFUS. Memoir of, LXXXIII, 2291,

NEHLS, CHR.

"The Development of Quay-Cranes in the Port of Hamburg." XXX, 258.

NEILSON, ROBERT. Memoir of. XXXVII, 564.

NELLES, GEORGE T.

Cost of sewer construction. XXXV, 1 Flow of water over dams. XLIV, 359. Improvement of rivers. XLIX, 284. Memoir of. LX, 586.

NELSON, GEORGE ALFRED. Memoir of. LXXVII, 1886.

NEUKIRCH, FR.

"Improved Method of Constructing Foundations under Water by Forcing Cement into Loose Sand or Gravel by Menns of Air Pressure." XXIX, 639; XXX, 579.

NEWBERRY, S. B.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV. 665.

NEWBROUGH, WILLIAM.

Memoir of, LXXXIII, 2293, Retracement-resurveys, LXXV, 420,

NEWELL, F. H.

Cost keeping. LXIV, 423. Hydrography of the Potomac Basin. XXVII, 35

AXVII, 50 Irrigation. LXII, 10. Irrigation in India. XXIII, 256. Irrigation works. XLIX, 29. Rainfall and river-flow. XXVIII, 344. Rainfall and stream flow. LIX, 508.

NEWELL, J. P. Principles of valuation. LXXIX, 195.

NEWELL, JOHN.

Proper relation to each other of the sections of railway wheels and rails. XXI, 289.

NEWMAN, E.

Hydro-electric power plants. 1039.

NEWTON, E. B. B. Municipal refuse disposal. LX, 432. NEWTON, JAMES DYNAN. Memoir of. LXXVII, 1921.

NEWTON, S. D.

Oil-mixed Portland cement mortar and concrete. LXXIV, 271. The valuation of public service property.

LXXII, 189.

NICHOLS, ALLEN EUGENE. Memoir of. LXXXIII, 2391.

NICHOLS, JOHN R.

"Shearing Strength of Construction Joints in Stems of Reinforced Concrete T-Beams, as Shown by Tests." LXXVII, 1499.

"Statical Limitations Upon the Steel Requirement in Reinforced Concrete Flat Slab Floors." LXXVII, 1670.

NICHOLS, LEWIS ABEL, Memoir of. LXXXIII, 2295.

NICHOLS, NORMAN JAMES. Memoir of, XXXVI, 559.

NICHOLS, OTHNIEL, F.

Availability of the cañons of the Colorado for railway purposes. XXVI, 339, Concrete tunnel lining, XXXI, 316, Cost of operating cable railways. XXVIII,

457.

Distortion of riveted pipe by back-filling. XXXVIII, 103

Earth pressures and bracing. LX, 65. Elevated railroads. XXXVII, 361. Main relief sewer of Brooklyn. XXVI,

510

Memoir of. LXI, 564. Methods of tunnel alignment. XXVII,

Old-time water-wheels of America. XXVIII, 248 Painting of iron structures. XXXIII,

546

240.
Railway bridge designing. XXVI. 225.
Railway signaling. XXVIII, 278.
Rivet spacing, etc., in plate girders.
XLV, 574.
"The Location of the Chimbote Tunnels."
IX. 365.
"The Myrtle Avenue Improvement on the
Brooklyn Elevated Railroad." XXXII,

Tunnel surveying. XXIII, 34.

NICHOLSON, GEORGE BENSON.

Memoir of LIX, 556. Right of way for railroads. XXV, 333. Sections and mechanical conditions of car wheels. XXV, 39. car wheels. XXV, 39. Surveys for railway location. XXX, 526. Uniform practice in pile-driving. XXVII, 170.

NICKERSON, LOUIS.

"Record of Experiments Showing the Character and Position of Neutral Axes, as Seen by Polarized Light." III, 31; IV, 277.

Upright arched bridges. III, 224.

NICOLAYSEN, ALBIN G.

Physical valuation of railroads, LXXVII. 249.

NIMMO, W. H. R.

Arch action in arch dams, LXXXIII, 333.

Wood stave pipe design. LXXXII, 509.

NIPHER, FRANCIS E.

Tornadoes and wind bracing for high buildings. XXXVII, 300.

NISHKIAN, L. H.

Multiple-arch dams. LXXXI, 898. Stresses in reinforced concrete beams. LXXVII, 768.

NOBLE, ALFRED.

Bank revetment on the Lower Mississippi, XXXV, 230, Canals from the Lakes to New York, XLV, 289,

"Experiments with Appliances for Testing Cement." IX, 186.
"Final Report of the Special Committee on Uniform Tests of Cement." LXXV,

665.
Liverpool dock improvements. LII, 65.
Memoir of. LXXIX, 1352.
Nicaragua Canal. L. 39.
"Report of the Committee on a Uniform System for Tests of Cement." Preliminary Report. XIII, 53 (1884); Final Report, XIV, 475 (1885).
"Specifications and Methods of Tests for Portland Cement." LXXXII, 166.
"The Development of the Commerce of the Great Lakes." Presidential Address at the Annual Convention at Asheville, N. C., June 9th, 1903. L, 327.
"The Effect of Freezing on Cement—Mortar." XVI, 79.
"The New York Tunnel Extension of the Pennsylvanial Advances in Vivilla." The East

Pennsylvania Railroad. The East River Division." LXVIII, 62. Underpinning of heavy buildings. XXXVII, 49.

NOBLE, CLARENCE W.

Progress report of Special Committee on Concrete and Reinforced Concrete. LXVI, 473.

Reinforced concrete buildings. LX, 467.
Reinforced concrete floor systems. LVI. Reinforced concrete floor systems. 291.

NOBLE, FREDERICK C.

"Notes on a Tunnel Survey." LXXV, 68.

NOBLE, THERON A.

Flow of water in Ogden, Utah, pipe line. XL, 546.

"Gauging of Cedar River, Washington." XLL L

Pressures resulting from changes of velo-city of water in pipes. XXXIX, 9. "The Flow of Water in Wood Pipes." XL1X, 112.

NORCROSS, P. H.

Physical valuation of railroads, LXXVII,

Water supply for camps, cantonments, etc. LXXXIII, 518.

NORRIS, ALEXANDER JOSEPH. Memoir of. LXXXIII, 2297.

NORRIS, GEORGE L.

High-alloy steels for bridges. LXXVIII,

NORTH, EDWARD PAYSON.

"American Engineering at the Paris Exposition of 1878." (Report of the Committee on the Exhibition made by this Society.) VII, 317.

Asphalt and asphalt pavements. XXXVIII,

Blasting with Nitro-Glycerine." I, 13.
Brick manufacture and brick pavement.
XXVI, 404.

Canals from the Lakes to New York. XLV, 257.

Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV, 85. Construction of railway tracks. XXV,

248.

Controverted questions in road construc-tion, XXVII, 622; XXVIII, 124. Economic depth for canals, XXXIX, 280. Effect of depth upon artificial water-ways, XXXV, 6.

Electric rock blasting. XXVIII, 148.

English and American railroads compared. XV, 745.
Enlargement of the Eric Canal. XIV,

50. reservoirs, and stream

Forests, res LXII, 336. Improvement of rivers. XLIX, 295.
Inland transportation. XXX, 467.
Inter-oceanic canal projects. IX, 45.
Jordan Level, Erie Canal. XLIII, 587.
Lake front improvements, Chicago, III.
XXXVIII, 335.

Mean horse-power of a stream. XXII,

403.

403.
Memoir of. LXXV, 1167.
Nicaragua Canal. L, 53.
Nomenclature of building stones and of stone masonry. VII, 286.
"On Blasting. Memoranda of Two Blasts Fired April, 1869, on the Union Pacific Railroad." I, 214.
Payements LIX 364.

Pavements. LIX, 364.
Preservation of forests. XIV, 395.
Preservation of materials of construc-

tion. L, 315.

Preservation of timber. XIV, 379. Railroad construction. VIII, 309. Railroad freight differentials. XLVI, 222.

Railroad levels. XV, 900. Resistances of railroad curves. VII.

106

Right of way for railroads. XXV, 325. Road building, XLI, 118, Sewage disposal. XVIII, 87, South Pass Jetties, XV, 241, Street grades and cross-sections. XLII,

Street railway track. XXIV, 129. Subaqueous foundations. XXIV, 240. Temperature of water at various depths in lakes and oceans. XIII, 78.

The Bohio Dam. XLVIII, 280.
"The Concurrent Development of Traffic on Improved Waterways and on
Railroads." LIV, Part B, 475.

"The Construction and Maintenance of Roads." VIII, 95, 345. The Holland dikes. XXVI, 689.

"The Influence of Rails on Street Pave-ments." XXXVII, 70.

The proposed Lake Eric and Ohio River Canal, XXV, 416.

NORTH, EDWARD PAYSON—(Continued). The water-works of Denver, Colorado. XXXI, 169.
Theory and practice of special assessments. XXXVIII, 405.

Use of asphaltum in building sea walls. XXIV, 228.

Water-proof coverings. IX, 351.
"Wing Dams in the Mississippl above the Falls of St. Anthony." VI, 268.

NORTHRUP, HERBERT FRANKLIN. Memoir of. LX, 588.

NORTON, F. O. "American Natural Cement." IX, 278, 345.

"Report of the Committee on a Uniform System for Tests of Cement." Pre-liminary Report, XIII, 53 (1884); Final Report, XIV, 475 (1885).

NOURSE, EDWIN GREEN. Memoir of. XXXIX, 699.

NOYES, ALBERT FRANKLIN. Memoir of. XXXVI, 560.

NOYES, GEORGE W.

Preservation of railroad tles. XLII, 349.

NUGENT, PAUL C.

Nomographic solutions for formulas. LXXVIII, 1386.

OAKES, JOHN C.

Action of water under dams. LXXX, 466. Designing an earth dam. LXXXI, 28.

OAKLEY, F. T.

Railroad location. LIV, 158.

OASTLER, W. C.

Controverted questions in road construction. XXVIII, 94.

OBERNDORF, PAUL ERNEST.

Memoir of. LX, 595.

O'BRIEN, JOSEPH H.

Collapse of a building during construction. LIII, 31.

Structural design of bulldings. LIV, 420.
Structural design of bulldings. LIV, 420.
"The New York Tunnel Extension of the Pennsylvania Railroad. Certain Engineering Structures of the New York Terminal Area." LXIX, 152.

O'BRIEN, WILLIAM ARTHUR.

Memoir of. LXXXIII, 2393.

OCKERSON, JOHN A.

"Address at the 44th Annual Convention, Seattle, Washington, June 25th, 1912." LXXV, 1030. Colorado River and Salton Basin. LIX,

Control of the Colorado River. LXXXI, 333.

333.
"Dredges and Dredging on the Mississippi River." XL, 215.
Engineering ethics, XLIX, 54.
"Eroslon of River Banks on the Mississippi and Missouri Rivers." XXVIII, 396; XXXI, 26.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

Invar (nickel-steel) tapes. LX, 243. Levee theory tested by facts. XIV, 219. Levees of the Mississlppi River. L1,

"New Method of Making Conventional Signs on Original Topographical Maps." X1V, 399.

Overflow of the Mississippi River. XI,

Precise spirit leveling. XLV, 179. Screw steamship and tow-barge effi-ciency. XXV, 386. "The Atchafalaya River: Some of its

Peculiar Physical Characteristics.

LVIII, 1.
Use of long steel tapes for measuring base lines. XXX, 639.

ODELL, FREDERICK S.

Stability of bench marks. XX, 75.

"The Separate Sewer System without Automatic Flush Tanks." XXXIV, 223.

"The Sewerage of Memphis." X, 23.

"The Water Supply, Drainage and Sewerage of the Lawrenceville School." erage o XVI, 66.

O'DONNELL, JOHN PATRICK.

Memoir of. LXXXIII, 2299.
"Railroad Signaling — The Block System." XXXII, 421.
"Railway Signaling as Applied to Large Installations." XXVII, 515; XXVIII,

OESTREICH, HENRY LEWIS.

Memoir of. LXXIX, 1451. Sixth Avenue Subway, Hudson & Man-hattan R.R. LXXVI, 71.

OGDEN, HAROLD COE.

Memoir of. LXXXIII, 2395.

OGDEN, HENRY N.

Engineering education. LIV, Part A, 501. "Flushing in Pipe Sewers." XL, 1. Sewage disposal. LIV, Part E, 237. Theory and practice of special assessments. XXXVIII, 414.

OGDEN, HERBERT G.

"Topographic Surveys." XXX, 62, 632.

O'HANLY, J. L. POWER.

Foundations of New Croton Dam. XLIII, 555.

Working stress for bridges. XLI, 521.

O'HARA, J. M.

"Retrogression in the Tensile Strength of Cement." LXXIV, 398. Tufa cement. LXXVI, 548.

O'HERN, EDWARD P.

"Seacoast Gun-Carrlage Design and Con-struction." LIV, Part B, 257.

OKEY, CHARLES W.

"The Subsidence of Muck and Peat Soils in Southern Louisiana and Florida." LXXXII, 396.

OLCOTT, E. E.

The water-works of Denver, Colorado. XXXI, 170.

OLDHAM, JOSEPH R.

"Screw Steamship and Tow-Barge Effi-ciency on the Northwestern Lakes of America." XXV, 373.

OLIVER, ALBERT.

inder concrete LXXIX, 631. floor construction.

OLNEY, La FAYETTE.

Memoir of. LXXV, 1177.

OLNEY, ROBERT BLUM. Memoir of. L. 510.

OLSSON, G. O. M.

Pumping machinery. LIV, Part D, 587. Steam turblnes. LIV, Part E, 106.

OMORI, F.

"Experiments on Vibration of the Jap-anese Torpedo-Boat Destroyers, Harnsame and Hayatori." LIV, Part D, 89.

OPDYCKE, HENRY GORTON.

Underpinning buildings. LXVII, 565.

ORBECK, M. J.

Flow of water in irrigation channels. LXXX, 1685.

O'ROURKE, JOHN F.

Asphaltum for reservoir linings. XXVIII, 141.

Concrete-iron highway bridges. XXXI, 475.

445.
Controverted questions in road construction. XXVIII, 120.
Earth pressures and bracing. LX, 64.
Hoisting apparatus of canal head-gates.
XXXII, 308.
Johnsoutille, Tenn., Bridge, XXXIII, 186.
Methods of tunnel alignment, XXVII.

459 Proposed New York and New Jersey Ve-hicular Tunnel. LXXXIII, 443. Stave plne. XLI, 62.

Steel and masoury construction. XLIX, 91.

Steel concrete construction. XXXIX, 638. "The Chignecto Ship Railway." XXIV,

"The Construction of the Poughkeepsle Bridge." XVIII, 199. Underninning of heavy buildings.

Underninning XXXVII, 47.

ORROK, GEORGE A.

Water-works pumping engines. LXXIV, 36.

OSBORN, FRANK C.

Elevated railroads. XXXVII, 384.
"Progress Report of Special Committee
on Steel Columns and Struts." LXVI, 401.

Railway bridge designing. XXVI, 212. River spans of the Cincinnati and Cov-Ington Elevated Railway, Transfer and Bridge Company. XXIII, 94.
Shall civil engineering practice be regulated by law? XLVI, 135.
"The Cantilover Highway Bridge at Cinciples," XVVIII 172.

cinnati." XXVII, 173.

OSBORNE, G. F. F.

Gauge of rallways. LXXVIII, 433.

OSGOOD, FARLEY,

Overhead construction for electric traction or transmission. LX, 560.

OSGOOD, JOSEPH O.

Timber preservation. XLIV, 198.

O'SHAUGHNESSY, M. M.

"Construction of the Morena Rock Fill
Dam. San Diego County, California."
LXXV. 27.
Huacal Dam. Sonora, Mexico (Concrete
arch dam), LXXVIII, 808
Hydraulic-fill dams, LXXXIII, 1778.

Hawailan Islands."

"Irrigation in the LIV, Part C, 129. Reconstruction of Stony River Dam.

LXXXI, 1081.

Water supply of the San Francisco-Oakland Metropolitan District, LXXX, 115.

OSTROM, JOHN N.

Subaqueous foundations. XXIV. 238.

OSTRUP, J. C.

Elevated railroads. XXXVII. 381. Memoir of LXXXIII, 2301.
Nickel steel for bridges. LXIII, 308
Questions in reinforced concrete design. LXX, 105.

OTAGAWA, M.

Nagasaki graving dock, LVI, 80.

OTTEWELL, ALFRED D.

"Combination Bridge Building on the Pacific Coast." XXVII, 466 Continuous superstructure of the Memphls Bridge, XXX, 565.

OWEN, JAMES.

Bridge substructure, and concrete work. LXI, 384 "Car Tracks and Pavements." XXXVII.

Cements, mortars and concretes, XXV,

279.

Concrete tunnel lining, XXXI, 314. Construction of railway tracks, XXV. 248

Consumption and waste of water. XLVI, 428.

Dunning's Dam, near Scranton, XXXII. 410. Early in bridge building.

arly practice XXXVII, 11.

Engineers as patentees. XLVIII, 323
Failure of a masonry pier and a rock
foundation. XXXI, 584.

Financial management of water-works, XXXVIII, 21

"Highway Bridges." XI, 277.
"Highway Bridges." XI, 277.
"Highway Construction in the United States." LIV, Part F, 101, 177.
Jordan Level, Erle Canal. XLIII, 591.
Legitlmate use of water. LV, 443.
Maintenance of macadam and other roads.

LXI, 461 Moving two 36-in, water mains, XXXIV,

Road building. XLI, 85, 139, Road conditions in California, XLVIII, 354,

OWEN, JAMES-(Continued).

Road construction and maintenance: Bituminous surfaces. LXXV, 565.

Road construction and maintenance: Cement-concrete pavements. LXXVII, 127.

oad construction and maintenance: Design of highway systems. LXXVII, Road 164

oad construction and maintenance: Drainage and foundations. LXXV, Road

Surface treatment with tars, heavy oils, etc. LXXIII, 71.
Sand-clay mixtures for road surfacing.
LXXIII, 489.

Steel and masonry construction. XLIX, 83.

Stream contamination and sewage purification. XLII, 176.

Street grades and cross-sections. XLII,

Tests of cement. XIII, 62.
"The Controverted Questions in Road
Construction." XXVII, 603, 624: XXVIII, 127.

The laying out of cities. XXX. 591.
The relative effects of frost and the sulphate of soda tests on building stones. XXXIII. 248.
The septic tauk. XLVI, 477.
The water-works of Denver, Colorado.

XXXI, 168.

Theory and practice of special assessments. XXXVIII, 401.
Tidal phenomena in New York Harbor. LXXVI, 2008.
Yield of underground reservoirs.

LXXVIII, 219.

OWENS, HENRY KINDER.

Memoir of. LXXXIII, 2303.

OXHOLM, T. S.

Oil-mixed Portland cement mortar and concrete. LXXIV, 272. oad construction and

Drainage and foundations. LXXV, 509. Road construction and maintenance: Fillers for brick and block pavements. LXXV, 534. maintenance:

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 610.

OXTOBY, JAMES V.

Appraisal of public service properties. LXXV, 846.

PABLO, SOLIS.

Water supplies. LIX, 392.

PACKARD, R. G.

Dry docks - stone vs. wood. XLI, 581.

PAGE. LOGAN WALLER.

Memoir of, LXXXIII, 2305. Oil-mixed mortars and concretes. LXXVI, 1103.

Road construction and maintenance: Preliminary investigations. LXXIII, 2. Road construction and maintenance: Sys-

tems of maintenance. LXXIII, 31.
Sampittic surfacing. LXIV, 359.
"Some of the Properties of Oil-Mixed
Portland Cement Mortar and Concrete." LXXIV, 255.

PAGON, W. WATTERS.

"Maximum Stresses in Bascule Trusses." LXXVI, 73.

Tests of concrete in sea water. LXXXI, 699.

PAIGE, JASON.

Earth pressures and bracing. LX, 74.

PAINE, CHARLES.

Designing and erection of the Oakley Arch. XXIII. 181. Efficiency of railroads for the transporta-tion of freight. XII, 130. "History of the Iron Rails upon the

Misory of the fron Rains upon the Michigan Southern and Northern Indiana Railway." I. 249.
June 1. XIII, 451.
Memoir of. LX, 575.
Railway signals. IV, 239.

PAINE, PAUL M.

"The Use of Cement for Excluding Water from Oil Sands in Drilling Wells." LXXVI, 1644.

PAINE, WILLIAM H.

Failure in a water main. VII. 15. Hudson River Tunnel. XI, 323 Inclined planes for railroads. VII, 220. Journal friction. XIII, 474. Resistances of railroad curves. VII, 108. Water power with high pressures and wrought-iron water pipe. XIII, 32.

PALMER, C.

Emergencies on railroads XXVII, 49. floor-beams ine stringers and bridges. XXIII, 276. Water-works valuation. XXXVIII. 157.

PALMER, PHILIP II.

Filtration of water. XLIV. 431.

PALMER, RICHARD JETER, Jr.

Memoir of, LXXXIII, 2422,

PARCEL, JOHN L.

New principle in the theory of structures. LXXXIII, 653.

Stress measurements, Hell Gate Arch. LXXXII, 1090.

PARET, MILNOR P.

Recent experiments with dynamite on an ocean bar. XXV, 448.

PARKER, A. F.

Ice diversion and hydraulic models.
LXXXII. 1162.
"The East Canyon Creek Dam."
LXXXIII, 574.

PARKER, A. McC.

A new safety explosive. L. 393.
Bridge painting. XXXIX, 30.
Electric rock blasting. XXVIII, 147.
Main relief sewer of Brooklyn. XXVI. Methods of tunnel alignment. XXVII.

Old-time water-wheels of America. XXVIII, 249. Protection of piles from the Teredo. XXXI, 235,

PARKER, F. H.

Testing machines. XVI, 9.

PARKER, HAROLD.

Memoir of. LXXXI, 1755.

Road construction and maintenance: Bituminous surfaces. LXXV, 562.

Road construction and maintenance: Cement-concrete pavements. LXXVII, 126.
Road construction and maintenance:
Relative value of three methods of
carrying on work. LXXIII, 13.
Road construction and maintenance:
Surface treatment with tars, heavy
oils, etc. LXXIII, 67.

PARKER, JOHN C.

Canadian Niagara power plant. LXII, LXVI.

hydraulie turbines. Modern 352,

PARKER, MAURICE S.

"Black Eagle Falls Dam, Great Falls, Montana." XXVII, 56.
"Governing of Water Power Under Variable Loads." XXXVII, 17.
Grading contracts. LVIII, 355.
High masonry dams. XXXIV, 515.

PARKER, WILLIAM.

Steel-concrete construction. XLVI, 126.

PARKER, WILLIAM P.

Notes on bridgework. LXXVI, 250.

PARMLEY, WALTER C.

Flow of water over dams. XLIV, 346. Notes on tunnel lining. LXXXIII, 1880. Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 459. Stream contamination and sewage purification by M. [1, 139].

fication. XLf1, 162.
"The Walworth Sewer, Cleveland, Ohio."
LV, 341.

PARSONS, A. T.

Redemption of the Great Valley of California. LXVI, 268. Retracement-resurveys. LXXV, 439.

PARSONS, GEORGE W.

Railroad terminals. LIV, Part F, 539. Underground railways. LIV, Part F, 373.

PARSONS, H. de B.

A new type of masoury dam. XLIX, 103. "A Small Rock-Fill Dam." L, 351. "Disposal of Municipal Refuse, and Rubbish Incineration." LVII, 45. Height of buildings. XLIV, 462. Hydraulic-fill dams. LXXXIII, 1785.

Laws of proportioning concrete. LIX,

New facts about eye-bars. LVI, 443. Oil-mixed Portland cement mortar and concrete. LXXIV, 276.
Sanitary disposal of refuse. L, 105.

"The Collapse of a Building During Construction." LIII, 1.

"Tidal Phenomena in the Harbor of New York." LXXVI, 1979. "Underpinning Trinity Vestry Building for Subway Construction." LXXXI, 74.

PARSONS, MAURICE G.

Halligan Dam. LXXV, 129. Oil-mixed Portland cement mortar and conercte. LXXIV, 280. Physical valuation of railroads. LXXVII,

Metrogression in tensile strength of cement. LXXIV, 403.

"The Analytical Determination of the Dimensions of the Gravity Resisting Parts of Masonry Dams." LXXV, 877.

"The Philosophy of Engineering." LXXVII, 38.
Value of measure.

Value of monopolies. LXXV, 474.

PARSONS, WM. BARCLAY.

A concrete sewer on piles. XXXI, 577. Almendares River Reinforced Concrete Bridge, LXXIV, 253.

Asphaltum for reservoir linings, XXVIII, 139.

"Borings Broadway, New York." Borings in XXVIII, 13.

Concrete tunnel lining. XXXI, 314. Elevated railroads. XXXVII, 397. "Failure of a Masonry Pier and a Rock Foundation." XXXI, 580. "Mountain Railroad Construction." XXV,

119.

Pennsylvania Avenue Subway and Tunnet, Philadelphia, Pa. XLVIII, 554. Preservation of materials of construction.

L, 293.

Protection of steel and aluminum exposed to sea water. XXXVI, 495. "Railways of Mexico." XXII, 233; XXIII, 287

Substructure, Lonesome Valley Viaduet. XXXIV, 254.

"The Cape Cod Canal." LXXXII, 1. The nozzie as an accurate water meter. XXIV, 513.

The Santa Ana Canal of the Bear Valley Irrigation Company, XXXIII, 588.
The Shone hydro-pneumatic system of sewerage, XXVIII, 63.

Train loadings for bridges. XXXI, 210. Tuberculation in water pipes. XXVIII,

260.

"Underground Railways in the United States." LIV, Part F, 349.

PARTHESIUS, PHILIP HENRY. Memoir of, LXXXI, 1810.

PARTIOT, LEON.

Suspension of solids in rivers. XXXVI,

PARTRIDGE, J. F.

"Modern Practice in Wood Stave Pipe Design and Suggestions for Standard Specifications." LXXXII, 433.

PASCAL, S. V.

"Study upon Railroads to Connect Guadalajara with the Pacific Ocean." (Translated from the Spanish by Foster Crowell.) XXIX, 373.

PASCHKE, THEODORE.

Nicaragua Canal. L, 56. Panama Canal. L, 187; also, LVI, 205. Sand-blast cleaning of steel. L. 284. The Bohio Dam. XLVIII, 284. Water supply for Panama Canal. LXVII, 106.

PATTEN, HENRY B. Stave pipe. XLI, 65.

PATTERSON, WILLIAM RODNEY. Memoir of. LXXXI, 1757.

PATTON, W. M.

Report on the foundations of the piers of the Little Rock Junction Bridge. LXXIX, 77.

PAUL, CHARLES H.

Grouted cut-off for the Estacada Dam. LXXVIII, 535. Hydraulic-fill dams. LXXXIII, 1790. "Temperature Changes in Mass Concrete." LXXIX, 1225.
Tufa cement. LXXVI, 560.

PAXSON, JOSEPH S.

Efficiency of railroads for the transportation of freight. XII, 134.

PAYNE, WILLIAM ARTHUR.

Reinforced concrete pier construction. LXX, 455.

PAYROW, HARRY G.

Sanitation of construction camps. LXXVI, 515.

PEABODY, CECIL H.

Floating dry docks. LVIII, 155.

PEABODY, E. II.

Purification of water for the produc-tion of steam. LIV, Part A, 38.

PEARL, WALTER.

Cement joints for cast-iron water mains.
LXXXIII, 296.

Use and care of the current meter. LXVI, 130.

PEARSALL, H. D.

Irrigation. LIV, Part C, 158.

PEARSE, LANGDON.

Effects of San Francisco earthquake ou engineering constructions. LIX, 310. Filtration works. L, 456.

Purification of ground-waters. LXIV, 201. Reinforced concrete floor systems. LVI, 387.

Sewage clarification by fine screens. LXXVIII, 996. Water and sewage works, Columbus, Ohio. LXVII, 406.

PEARSON, F. S.

"The Necaxa Plant of the Mexican Light and Power Company." LVIII, 37.

PEARSON, WILLIAM ANSON, Jr.

Memoir of. LXXI, 431.

PEARSONS, GALEN W.

Croton Water-Works and supply for the future, V, 264, Croton v. V. 201.
future. V. 201.
Friction, waste an mains. XIX, 118. and loss of water in Inter-oceanic canal projects. IX, 50. Sedimentation. LIII, 72. "Syphons of the Kansas City Water-Works." XVIII, 130. Water-works valuation. XXXVIII, 168.

PEARY, R. E. "Ship Canals in 1889." XXI, 59.

PEASE, H. T.

Designing an earth dam. LXXXI, 37. Rivers and railroads in the United States. LXXIX, 943.

PEASLEE, W. D.

Chemi-hydrometry. LXXX, 1277.

PECK, MYRON HALL.

Memoir of. LXXXIII, 2310.

PEGRAM, GEORGE H.

A new type of masonry dam. XLIX,

"Address at the Annual Meeting, January 16th, 1918." LXXXII, 158.

Air resistances to trains in tunnels. LXXV, 1021.

American railroad bridges. XXI, 575.

Elevated railroads. XXXVII, 438.

Elevated railway improvements. LXXXII, 746.

"Formulas for the Weights of Iron and Steel Railway Bridges under Standard Specifications." XV, 85.
Inspection and maintenance of railway structures. XVII, 269.
Life of iron railroad bridges. XXXIV,

320.

Power plant at Ogden, Utah. XXXVIII, 309.

"Progress Report of Special Committee on Steel Columns and Struts." LXVI, 401.

Sixth Street Vladuct, Kansas City. LXV, 101.

Specifications for strength of iron bridges. XV, 474. Strength of wrough-iron struts and of structural steel in the form of beams and struts. XIII, 273.

and struts. XIII, 273.
Substructure, Lonesome Valley Viaduct.
XXXIV, 255.
Weights of bridges. XVI, 236.

PEMOFF, JOEL J.

Reinforced concrete docks. LXXVIII, 1116.

PENCE, W. D.

Concrete and concrete-steel. LIV, Part E, 595.

PENNINK, J. M. K.

"Investigations for Ground-Water Supplies," LIV, Part D, 169.

PENNYPACKER, LEVIS PASSMORE. Memoir of. XLVI, 570.

PENROSE, R. A. F., Jr.

Geology in its relations to topography. XXXIX, 86.

PEREZ CASTRO, L.

Mexico and Pacific Railroad. LXXX, 1612.

PERKINS, A. H.

Reinforced concrete floor systems. LVI, 385.

PERRETT, E.

Filtration of water. XLIV, 433.

PERRINE, GEORGE.

"Construction Problems of the Manhattan-Bronx and Lexington Avenue Subway Junction and Queensborough Tun-nel Connections," LXXXII, 278. Contracts: "Cost plus" and other forms.

LXXXIII, 821.

PERRINE, HAROLD.

"Cinder Concrete Floor Construction Be-tween Steel Beams." LXXIX, 523.

PERROT, EMILE G.

Effects of San Francisco earthquake on engineering constructions. LIX, 270.

PERRY, FRANCIS W.

Earth pressure and stability. LXX, 392, Light railways of the battle front. LXXXIII, 1273.

PERRY, J. P. H.

Contracts: "Cost plus" and other forms. LXXXIII, 808,

PERRY, LYNN E.

Sewage and wastes disposal for the U. S. Army. LXXXIII, 386. Water supply for camps, cantonments. etc. LXXXIII, 543.

PERRY, VICTOR PRITTIE,

Nickel steel for bridges. LXIII, 328.

PETERS, F. H.

"A Complete Method for the Classifica-tion of Irrigable Lands." LXXXI, 222.

PETERSON. O. W.

Tufa cement. LXXVI, 565. Water supply of the San Francisco-Oakland Metropolitan District. LXXX,

PETERSON, PETER ALEXANDER.

Memoir of. LXXVII, 1888.

PETINOT, N.

High-alloy steels for bridges. LXXVIII,

PETTERSON, II. A.

Designing an earth dam. LXXXI, 47 Reservoirs for flood control. LXXXII,

PETTIGREW, WILLIAM F.

Nickel steel for bridges. LXIII, 379.

PEW, ARTHUR.

Calculation of cross-sections of roads and railroads. XXX, 533. Surveys for railway location. XXX, 526.

"The Cheapest Railroad in the World." XXIII, 111.

PEYTON, JOHN HOWE.

Memoir of. LXXXIII, 2313.

PFAU, ARNOLD.

Hydro-electric power plants. LXXIX, 1046.

PHARR, H. N.

The Bohio Dam. XLVIII, 292.

PHELAN, FRANK J.

Oil-mixed Portland cement mortar and concrete, LXXIV, 276.

PHELPS, EARLE E.

"The Absorption of Oxygen by De-Aerated Water." LXXVI, 1624.

PHILBRICK, EDWARD S.

Failure of the Ashtabula Bridge. VI, 85, 196.

Inspection and maintenance of railway

Inspection and maintenance of railway structures. XVII, 284.

Memoir of. XXXVIII, 454.

Sewerage of Memphis. X, 32.

"The Improvement of the South Boston Flats by the Harbor Commissioners of the State of Mesophysistics", VIII. of the State of Massachusetts." 17.

PHILLIPS, ARTHUR LOUIS.

Memoir of. LXXIX, 1453.

PHILLIPS, ASA E.

Maximum rates of rainfall, L1V, 185.
"Specifications and Methods of Tests for Portland Cement." LXXXII, 166. Water supply for camps, cantonments, etc. LXXXIII, 545.

PHILLIPS, II. C.

Effects of San Francisco earthquake on engineering constructions. LIX, 258.

PHILLIPS, HIRAM.

The relative effects of frost and the sulphate of soda tests on building stones. XXXIII, 254.

PHILLIPS, W. R.

Failure of grain elevator. LXXX, 834. Submerged pipe work, Portland, Ore. LXXVIII, 1344.

PHINNEY, HENRY WARD BEECHER, Memoir of. XXXVI, 563.

PICKETT, WILLIAM DOUGLAS.

Forests, reservoirs, and stream flow. LXII, 423. Memoir of. LXXXI, 1671.

emoir of. LXXXI, 1671. The Floods of the Mississlppl Delta: Their Causes, and Suggestions as to Their Control." LXIII, 53.

PIERCE, C. H.

Weir discharge experiments. LXXVI, 1078.

PIERCE, WILLIAM THOMAS.

Memoir of. LVII, 525.

PHIL, OLAF RIDLEY.

Memoir of. LXXX, 2195.

PIKE, RALPH ASHUR.

Memoir of. LXXIX, 1485.

PILLSBURY, F. C.

Road construction and maIntenance: Drainage and foundations. LXXV, 510. Road construction and maintenance: The use of bituminous materials by mixing methods. LXXIII, 106.

PILLSBURY, F. C .- (Continued).

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV, 586.

PILLSBURY, GEORGE B.

Engineering education. LXXV, 1093. Flood flows. LXXVII, 670. Klondike pipe line. LXXVIII, 560.

PIMENTAL, FREDERICO AUGUSTO.

"Common Roads, Railways and River Communications in Portugal." XX1X, 299.

PINCHOT, GIFFORD.

Forests, reservoirs, and stream flow. LXII, 456.

PINNER, GUY.

Repairing a swing bridge, LXXXIII,

PIRNIE, II. MALCOLM.

Washing rapid sand filters. LXXX, 1392.

PITKETHLY, DAVID T.

Monterrey water-works and sewerage. LXXII, 559.

Sewage purification by fine LXXVIII, 1018. screens.

PITTS, THOMAS D.

Buffalo Breakwater. LII, 198.

Origin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 106. Protection of steel and aluminum. XLIII,

Reaction breakwater, XLII, 526.

PLATT, JAMES.

Cranes as labor-saving machines. XV,

PLATT, JOSEPH C.

Moving two 36-in, water mains, XXXIV,

PLIMPTON, ARTHUR L.

Influence of rails on street pavements. XXXVII, 118.

PLYMPTON, G. W.

"Some Experiments on the Transverse Breaking Strain of Plate Glass." XXV, 223, 227, 637.

POE, O. M.

Enlargement of the Erie Canal. XIV,

Subaqueous rock excavation. XXX, 478.

POHL, CHARLES A.

Physiography of water-sheds and channels. LXXXIII, 1135.

POLAND, W. B.

Light railways LXXXIII, 1254. of the battle front.

POLK, A. C.

"A Brief Description of a Modern Street Railway Track Construction." LXXVI, 455.

"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." LXXVIII, 1545.

POLK, WILLIAM ANDERSON.

Sand-blast cleaning of steel. L, 278.

POLLEYS, WILLIAM V.

Agreements for building contracts. LXVII, 479.

The valuation of public service property. LXXII, 190.

POMEROY, LEWIS ROBERTS.

Memoir of, LXXXI, 1811.

PONTZEN, ERNEST.

Cylindrical wheels and flat-topped rails for railways, XXI, 179. "French Railroad Terminals," (Trans-lated from the French by Paul A.

lated from the French by Faut 28. Seurot.) LIV, Part F, 493.
Memoir of, LXXVII, 1829.
Niagara Cantilever Bridge, XIV, 597.
Proper relation to each other of the continuous of relivery wheels and rails. sections of railway wheels and rails. XXI, 289.

Protection of piles from the Teredo. XXXI, 244.

POOLE, H. S.

Bridge substructure and foundations in Nova Scotia, XXX, 576.

POORE, H. C.

Road construction and maintenance: Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 180. ments.

Road construction and maintenance: The use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIII, 40.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV, maintenance: 609

POPE, MACY STANTON.

Memoir of. LIV, 540.

POPE, WILLARD S.

Enlargement of the Eric Canal. XIV,

Inspection and maintenance of railway structures. XVII, 264. Memoir of. XXXVI, 565. Upright arched bridges. III, 216. Wind pressure upon bridges. X, 158.

PORTER, HARRY F.

Questions in reinforced concrete design. LXX, 111.

PORTER, HORACE C.

Production of toluol from gas plants. LXXXIII, 925.

PORTER, J. MADISON.

Elevated tanks and stand-pipes. LXIV, 540.

PORTER, SAM G.

Economic canal location. LXXIV, 192.

POST, GEORGE BROWNE.

Foundations for heavy buildings. XXXV, 471.

Memoir of. LXXVII, 1891. Wind bracing in high buildings, XXXIII, 210

POST, GEORGE M.

The Silt problem of the Zuni Reservoir. LXXXIII, 885.

POST, HENRY W.

Structural design of buildings. LIV, 433.

POST, J. C.

Memoir of. XXXVI, 569. South Pass Jetties. XV, 235.

POST, J. W.

"Maintenance — Expenses of Track on Wooden and Metal Ties." XVIII, 253.

POST, WILLIAM SCHUYLER.

Evaporation from Lake Conchos, Mexico. LXXX. 1906.

Hydraulic power plants. LV, 250. Water supply of the San Francisco-Oak-land Metropolitan District, LXXX, LXXX. 115. Weather Bureau service in Callfornia.

POTTER, ALEXANDER.

LXXXI, 172.

Dams on sand foundations. LXXIII, 191. Dunning's Dam. near Scranton, Pa. Dunning's D XXXII, 416.

Legitimate use of water. LV, 434, Pumping plant, Morenci Water Pumping plant, Morenci LXXIX, 1319. Co.

Purification of ground-waters. LXIV,

Reinforced concrete reservoir. LXXVII,

1063.clarification by fine screens.

LXXVIII. 986. Sewer flushing system in the City of Mexico, LV, 283.

Water supply of Parkersburg, W. Va.

POTTER, EDWIN JAMES. Memoir of. LXXXIII, 2396.

POTTER, Rt. Rev. II. C. Dedicatory prayer at opening of New Society House, XXXVIII, 423.

POTTER, W. B.

LXXXI, 792.

Electrification of suburban zone, New York Central & Hudson River R.R. in the vicinity of New York City. LXI, 134.

High-voltage power transmission. 247.

POTTS, CLYDE.

Efficiency of centrifugal pumps. LVI, Sewage disposal, LVII, 122.

POWELL, A. O.

Ports of the Pacific. LXXVI, 155.

POWELL, CHARLES FRANCIS. Memoir of. LXI, 567.

POWELL, H. J. BINGHAM.

Stress measurements, Hell Gate Arch. LXXXII, 1077.

POWELL, T. J.

"Street Paving Crowns, Washington, D. C." LXXIII, 225.

POWERS, C. V. V.

Subway construction problems. LXXXII, 331. Subway tunnel work. LXXXI, 405.

POWERS, JOSEPH A.

A reinforced concrete stand-pipe. LXXIV, 396.

PRACY, GEORGE W.

Cement joints for cast-iron water mains. LXXXIII, 303.

PRATT, CAREY SIMON.

Memoir of. LXXXIII, 2398.

PRATT, MASON D.

Influence of rails on street pavements. XXXVII, 84. Sinking a wet shaft. LXXIII, 414.

PRATT, ROBERT WINTHROP.

Memoir of. LXXXIII. 2317. Sewage disposal. LVII, 123.

PRATT, T. WILLIS.

"Some Observations on Trussed Arches." I, 346. Trusses and

PRATT. WM. ARTHUR.

Elevated railroads. XXXVII, 386.

PRENDERGAST, FRANCIS ENSOR. Memoir of. XXXIX, 701.

PRESTON, CHARLES HENRY. Memoir of, LXXX, 2199.

PRESTON, GEORGE B.

Electric railways in the Ohio Valley. LXIII, 96.

PRESTON, J. O.

Materials for road construction, LXXXII, 1467.

PRETTY, W. H.

Floating dry docks. LVIII, 181, Pearl Harbor Dry Dock. LXXX, 320.

PRICE, W. G.

Bank revetment on the Lower Missis-sippi. XXXV, 228. Colorado River and Salton Basin. LIX,

Cup and screw current meters. LXXVI, S41.

Dams on sand foundations. LXXIII, 190. Influence of rails on street pavements. XXXVII, 108,

"Note on the Improvement of the Mississippi River." LX, 339.
The discharge of the Mississippi, XXXV.

314.

PRICHARD, HENRY S.

"Faults in the Theory of Flexure, and an

Epitome of Certain I-Beam Tests made at Ambridge, Pa." LXXV, 895.

Fire-proof construction. XXXIX, 147.

"Insufficient Provision for Counterstresses in Railroad Bridges." XLII, 547.

Nickel steel for bridges. LXIII, 317. Railroad cantilever bridge at Beaver, Pa. LXXIII, 167.

Safe stresses in steel columns. LXI. 165.

Steel columns and struts. LXXXIII, 1634. Strength of columns. LXXVI, 283. "The Effects of Straining Structural Steel and Wrought Iron." LXXX, 1429. The strength of pillars. XXXV, 415. Theory of the ideal column. XXXIX,

115.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 500. Wheel concentrations and fatigue formulas. XLII, 234.

Working stress for bridges. XLI, 503.

PRINCE, EDWARD.

Controverted questions in road construction. XXVIII, 76. Water purification. LX, 199.

PRITCHARD, PHILIP MORRIS.

Liberation of air in siphons. LIX, 65. Memoir of, LXXIX, 1487.

PROBASCO, SAMUEL R.

"An Account of the Operation of the Gunpowder Pile-Driver." II, 403.

PROSSER, THOMAS.

Memoir of XXXVI, 564. "On the Application of a New System

Distillation with Conservation of Heat." I, 79.

PROSSER, THOMAS, & SON.

Proper relation to each other of the sections of railway wheels and rails. XXI, 290,

PROUT, HENRY G.

Construction of railway tracks. XXV, 244.

Electric motive power for suburban traf-fic. XXXVII, 177.

Electricity rs. steam for branch railroads.

XLII. 377.

"Final Report of Special Committee on Rail Sections." LXX, 456.
Gauges of railway track. XXX, 537.
Railroad signaling—the block system. XXXII, 456.

Railway signaling. XXVIII, 277.
Relation of wheels to frog points and to guard rails. XXXI, 520.
Timber preservation. XLIV, 194.

PRUYN, FRANCIS L.

Earth pressure and stability. LXX, 398. Earth pressures and bracing. LX, 47. Foreshore protection. L, 87.

PUENTE, G.

Electric generating stations and transmission. LIV, Part D, 397.

PUFFER, WILLIAM HASELTON. Memoir of. LXXVI, 2241.

PUGH, MARSHALL R.

"External Corrosion of Cast-Iron Pipe." LXXVIII, 806.

Ground-water in sewers. LXXVI, 1932. Light railways of the battle front LXXXIII, 1254. front.

Railway development States. LXXIV, 135. in the United

PULLAR, H. B.

Road construction and maintenance: Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1161.

construction and maintenance: Fillers for brick and block pavements. LXXV, 543.

Road construction and maintenance: Relative value of three methods of carrying on work. LXXIII, 22.

PULLIGNY, JEAN de.

Pittsburgh flood of March 22d, 1912. LXXVI, 331. oad construction

oad construction and maintenance: Design of highway systems. LXXVII, Road

PUMPHREY, MORRIS E.

Light railways of the battle front. LXXXIII, 1249.

PURDON, C. D.

Bridge painting. XXXIX, 43. "Comparison of Modern Engine Loading,

with Standard Specifications for Spans from 10 to 200 Feet." XXIX, 426; XXX, 523.
Life of iron railroad bridges. XXXIV,

314. Live loads for railroad bridges. LIV, Part A, 96.

Locomotive performance on LXX, 329.

Railroad location. XXXI, 98. Repairing bridge piers. LXXIX, 114. Right of way for railroads. XXV, 339.

"The Construction of the Bridge over the Arkansas River, at Van Buren, Arkansas." XX, 151.

The valuation of public service property.

LXXII, 285.

Virtual grades for railroads. L, 18.

PURDY, CORYDON T.

Bridge painting. XXXIX, 35.
"Can Buildings be Made Fire-Proof?"
XXXIX, 121. Concrete-iron highway bridges. XXXI,

458

Foundations for heavy buildings. XXXV, 475.

XLIV, Height of buildings.

Lake front improvements, Chicago, III. XXXVIII, 334. Painting of iron structures. XXXIII,

560. The practical column under central or eccentric loads. XLV, 435.
Wind bracing in high buildings. XXXIII,

204.

PURDY, S. M.

ust in a LXXI, 209. Rust seventeen-story building. Tunnel surveying. LXXV, 97.

PURINGTON, D. V.

"Brick Manufacture XVIII, 291. near Chicago."

PURVER, GEORGE M.

External corrosion of cast-iron pipe. LXXVIII, 869.

PURVIS, F. P.

"Experiments on Vibration of the Japanese Torpedo-Boat Destroyers, Haru-same and Hayatori." LIV, Part D, 89.

PUTNAM, J. W.

"Renewal of the Foundation, and Transfer of a Light-House in Pascagoula Harbor." X, 14.
"Report of the Committee on the Pre-

servation of Timber." Preliminary Report, XI, 325 (1882); Final Report, XIV, 247 (1885). XIV, 247 (1885). "The Preservation of Timber." IX, 206.

QUIMBY, HENRY H.

Contracts: "Cost plus" and other forms. LXXXIII, 806. Design of concrete bridges. LXXVII,

711

Errection of arch bridges. LXI, 274.
Hell Gate Arch Bridge. LXXXII, 1018.
Kinetic effects of crowds. LXXVI, 2127.
Railway bridge designing. XXVI, 198.
"Red Rock Bridge Superstructure." XXV, 704.

Repairing bridge piers. LIX, 203.
Repairing bridge piers. LXXIX, 107.
Saturation and strength of concrete.
LXXVII, 451.
Subvey condi-

Subway construction problems. LXXXII,

The Sewickley Cantilever Bridge, LXXVI, 631.

"Walnut L LXV, 423. Lane Bridge, Philadelphia." Water-proofing railroad bridge floors.

LXXIX, 351.

"Wind Bracing in High Buildings." XXVII, 221.

QUINETTE de ROCHEMONT, Baron E. T. "Maritime Ports of France." (Translated from the French by Foster Crowell.) LIV, Part A, 199.

RABLIN, JOHN R.

Maintenance of macadam and other roads. LXI, 456.

Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 61.

RADENHURST, WILLIAM NAPIER.

Hydraulics of the Hemlock Lake Conduit, and restriction of the use and waste of water in Rochester, N. Y. XXVI, 54.

Memoir of, LXXVII, 1893,

RAFF, HENRY G.

Shear tests on joints in T-beam stems. LXXVII, 1527.

RAFTER, GEORGE W.

Albany Filtration Plant. XLIII, 324. Bacteria and other organisms in water. XXXIII, 450.

Brick manufacture and brick pavement.

XXVI, 415.
Canals from the Lakes to New York.
XLV, 296.

Engineering education. LVII, 154.

Flow of water in Ogden, Utah, pipe line, XLIV, 67. Flow of water in pipes. XXXV, 291. Foundations of New Croton Dam. XLIII, 551.

Gauging of Cedar River, Washington, XLI, 19.

Improvement of rivers. XLIX, 310. Inland sewage disposal. XXV, 149. Jordan Level. Eric Canal. XLIII, 585. Memoir of. LXII, 554.

Memoir of. LXII, 554.

"Note on the Consolidation of Mortar."
XLVIII, 96.

"On the Flow of Water over Dams."
XLIV, 220.

"On the Fresh Water Algae and their Relation to the Purity of Public Water
Supplies." XXI, 483.
"On the Hydraulies of the Hemlack Lake."

"On the Hydraulics of the Hemlock Lake

"On the Hydraulies of the Hemlock Lake Conduit of the Rochester, N. Y., Water-Works." XXVI, 13, 56.

On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 460.

"On the Measures for Restricting the Use and Waste of Water, in Force in the City of Rochester, N. Y." XXVI, 23.

"On the Theory of Concrete." XLII, 104. 104.

Railroad freight differentials. XLVI, 246. Reservoir system of the Great Lakes.

Reservoir system of the Great Lakes, XL, 436.
River hydraulics. XLIII, 235.
Self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 70.
Sewage disposal. LVII, 116.
Sewage purification. LI, 416.
Stadie topergraphs surveys. XIIV, 118.

Stadia topographic surveys. XLIV, 116. Tests of water meters. XLI, 397. The Holland dikes. XXVI, 681.

The Holland dikes. XXVI, The septic tank. XLVI, 477.

RALSTON, J. C.

Durability of wooden stave pipe. LVIII, 90. Wood stave pipe design. LXXXII, 484.

RAMSBOTHAM, JOSHUA FIELDEN.

"Fremantle Graving Dock: Steel Dam Construction for North Wall," LXXVI. 1942

cut-off for the Estacada Dam. Grouted LXXVIII, 519.
Reinforced concrete docks. LXXVIII,

1119.

RAMSEY, JOSEPH, Jr.

Comparison of water supply systems from a financial point of view. XXIV, 263.

Memoir of, LXXXI, 1759. Railroad signaling—the block system. XXXII, 460.

RANDLETT, F. M.

Cement joints for cast-iron water mains.

LXXXIII, 292. Submerged pipe LXXVIII, 1324. work, Portland Ore.

RANDOLPH, BEVERLY S.

"Locomotive Performance on Grades of Various Lengths." LXX, 321, Virtual grades for railroads. L, 12,

RANDOLPH, ISHAM.

Canals from the Lakes to New York. XLV, 248.

RANDOLPH, JAMES L.

"Vibration, or the Effect of Passing Trains on Iron Bridges, Masonry and Other Structures." XII, 444.

RANDOLPH, L. S.

Painting of iron structures. XXXIII, 542.

RANDOLPII, ORRIN.

Subsidence of muck and peat soils. LXXXII, 421.

RANDORF, C. A.

Stress measurements, Hell Gate Arch. LXXXII, 1108.

RANDS, HAROLD A.

"Grouted Cut-Off for the Estacada Dam." LXXVIII. 447.

RANKIN, EDWARD S.

Ground-water in sewers. LXXVI, 1917. Valuation of land. LXXXI, 626,

RASINSKY, CHARLES EZEKIEL. Memoir of, LXXIX, 1488.

RAY, D. H. Engineering education. LIV, Part A.

RAY, G. J.

National railroad question of to-day.

National railroad question of to-day. LXXXIII. 961.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII. 1191.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII. 1409.

Weter-profing railroad bridge floors

Water-proofing railroad bridge floors. LXXIX, 344.

RAYMER, ALBERT R.

"The Pittsburgh and Lake Eric Rail-road Cantilever Bridge Over the Ohio River at Beaver, Pa." LXXIII, 136.

RAYMOND, CHARLES WALKER.

Inland transportation. XXX, 457.
Memoir of. LXXVII, 1894.
Suspension bridges. XXXVI, 458.
"The New York Tunnel Extension of the
Pennsylvania Railroad." LXVIII, 1.

RAYMOND, CHARLES WARD.

"Submarine Telephoning." VII, 310.

RAYMOND, G. II.

Buffalo Breakwater. LII, 203.

RAYMOND, R. R.

Economic improvement of rivers. L, 380.

RAYMOND, THOMAS LAIDLAW.

Memoir of. XLIX, 354. Origin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 116.

RAYMOND, WILLIAM G.

"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Property and Other Public Utilities." LXXXI. 1311.

Railroad freight differentials. XLVI, 227. Railroad location. LII, 517. Review of mathematical tables. LXXXII,

The valuation of public service property. LXXII, 214.

Virtual grades for railroads. Water-works valuation. XXXVIII, 164.

REA, SAMUEL.

"Report of the Committee on Standard Rail Sections" Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).

"Report of the Committee on the Proper Relation to Each Other of the Sec-tions of Railway Wheels and Rails." Preliminary Report, XIX. 1 (1888); Final Report, XXI, 223 (1889).

READ, R. J. GIFFORD.

Concrete and concrete-steel. LIV, Part E. 548. Height of buildings. XLIV, 468.

READ, ROBERT LELAND. Memoir of, LXXIX, 1455.

REAM, WARD HALL. Memoir of. LXXXIII, 2400.

REECE, BENJAMIN.

"Management of Forces Engaged in Railway Track Repairs." XIII, 396.

The form of railway excavations and embankments. XXXII, 260.
"The Increasing Cost of Railway Tie Renewals." XXVII. 640.

Uniform practice in pile-driving. XXVII, 169.

REED, P. L.

Contracts: "Cost plus" and other forms. LXXXIII, 823. Cost keeping. LXIV, 410. Pearl Harbor Dry Dock. LXXX, 302. Value of monopolies. LXXV, 472.

REED, RALPH J.

Concrete-lined oil-storage reservoirs. LXXX, 719. Tufa cement. LXXVI, 550.

REED, S. A.

ecent experiments with dynamite on an ocean bar. XXV, 453. Recent experiments

REED, W. BOARDMAN.

Cost keeping. LXIV. 432.
Electricity vs. steam for branch railroads. XLII, 380.
Influence of rails on street pavements.
XXXVII, 88.

Maintenance of asphalt streets. XLIX,

207 Preservation of railway ties. XLV, 531.

REED, WILLIAM WARD, Memoir of. LII, 558.

REES, WILLIAM MARSHALL. Memoir of. LVI, 473.

REEVE, SIDNEY A.

"The Flow of Water in Cylindrical Conduits." LXXIV, 206,

REEVES, DAVID.

"Experiments upon Phænix Columns." X1, 1.

REHBOCK, THEODOR.

Improvement of the Lower Weser. XXX, 483. The North Sea Canal of Holland. XXX,

713. REICH, P. J.

Movable railroad bridges. LXXVI, 413.

REICHMANN, ALBERT F.

Live loads for railroad bridges. LIV, Part A, 103.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

REID, HOMER A.

Concrete piles. LXV, 503.

REILLY, CHARLES GILBERT. Memoir of, LXXXIII, 2423.

REINHOLDT, KENNETH OAKE PLUM-MER.

Memoir of. XLIX, 368.

REISEGER, MARC JOHN. Memoir of. XLV, 634.

REISERT, HANS.

Purification of water for the production of steam. LIV, Part A, 43.

RENNIE, GEORGE B.

Floating dry docks. LVIII, 151.

RENO, JAMES HART.

Memoir of. XXXVII, 566.

REPLOGLE, MARK A.

Governing of water power under variable loads, XXXVII, 26.

REYNOLDS, IRVING H.

"Municipal Water-Works Pumping En-LIV, Part D, 513, 596.

RHETT, ALBERT H.

Concrete and reinforced concrete. LXXXI, 1153. Tests of concrete in sea water. LXXXI,

688. Water-proofing LXXIX, 369. railroad bridge floors.

RHODES, BENJAMIN,

"Electrical Transmission from Niagara." XIV, 205.

RHODES, F. D.

Rivet spacing, etc., in plate girders. XLV, 575.

RHODIN, CARL J.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX. 147.

RIBEIRO, FRANCISCO DA SILVA.

"A New Method of Calculating Cross-Sections of Roads and Railroads." (Translated from the French by Foster Crowell.) XXIX, 447; XXX, 534.

RIBIERE, C.

"The Lighting of the Coasts of France." (Translated from the French.) LIV, Part B, 3, 85.

RICE, EDWARD CURTIS.

Memoir of. XXXIX, 703.

RICE, GEORGE S.

Changes at the New Croton Dam. LVI, 63. Excessive rainfalls. XXV, 111. Ventilation of tunnels. LVII, 240.

RICE, L. FREDERICK.

Consumption and waste of water, XXXIV, 204.

RICH, ISAAC.

Memoir of, LXXX, 2200.

RICH, W. W.

Destruction of rails by excessive weights. XX, 123. Memoir of. L, 501.

RICHARDS, C. B.

"Experiments on the Resistance of Stones to Crushing." II, 187. "Experiments on the Tensile Strength of Bar-Iron and Boiler-Plate." II, 339.

RICHARDS, H. De C.

Control of hydraulic mining in California. LVII, 36.

RICHARDS, J.

Efficiency of centrifugal pumps. LVI, 150.

RICHARDS, J. T.

Cylindrical wheels and flat-topped rails for railways. XXI, 162.

RICHARDS, J. W.

High-alloy steels for bridges. LXXVIII,

RICHARDS, JOSEPH RUGGLES.

Memoir of. XLV, 640.

RICHARDS, JOSEPH T.

"Final Report of Special Committee on Rail Sections." LXX, 456.

RICHARDSON, CLIFFORD.

Cohesion in earth. LXXX, 1326.
"Plnal Report of the Special Committee on Uniform Tests of Cement." LXXV, Jordan Level, Erie Canai. XLIII, 596.

RICHARDSON, CLIFFORD—(Continued).

Oil-mixed Portland cement mortar and concrete. LXXIV. 278.
Pavements. LIX, 342.
Retrogression in tensile strength of cement. LXXIV, 404. ment. LXXIV, 404. Road construction and

maintenance: Bituminous surfaces. LXXV, 561, oad construction and maintenance: Road

Drainage and foundations. LXXV, 512. Road construction and maintenance: Preliminary investigations. LXXIII, 9. Road construction and maintenance: The use of bituminous materials by

mixing methods. LXXIII, 131.

Road construction and maintenance:
Use of bituminous material in penetration and mixing methods. LXXV,
576

Sampittic surfacing. LXIV, 384.
Saturation and strength of concrete.
LXXVII, 448.

"Specifications and Methods of Tests for Portland Cement." LXXXII, 166. "Street Traffic in New York City, 1885 and 1904." LVII, 181.

Timber preservation. LXXI, 399. Tufa cement. LXXVI, 551.

RICHARDSON, HENRY B.

Atchafalaya River. LVIII, 12. Erosion of river banks. XXXI, 14. Levees of the Mississippi River. LI, 385.

Memoir of. LXVI, 501

The Holland dikes. XXVI, 670.

RICHARDSON, THOMAS FRANKLIN.

Impurities in sand for concrete. LXV, 265.

Memoir of, LXXXI, 1761.

RICHARDSON, WM.

Street railway track. XXIV, 150.

RICHMOND; HENRY A.

Memoir of. LXXVII, 1926.

RICHMOND, W. S.

Chemi-hydrometry. LXXX, 1287.

RICKER, GEORGE A.

Road construction and maintenance: Engineering organizations for high-way work. LXXVII, 1115. oad construction and maintenance:

Road maintenance: Factors limiting the selection of materials and of methods in highway construction, LXXVII, 1150,

RICKETTS, PALMER C.

American railroad bridges. XXI, 583. Kentucky and Indiana Bridge. XVII, 173,

Permanent effects of strain in metals. XXIV, 178.
Railway bridge designing. XXVI, 171.
"Some Constants of Structural Steel."
XVI, 138.

Standard levee sections. XXXIX, 226.

Stream contamination and sewage purification. XLII, 183.

The Launhardt formula and bridge specifications. XLI, 202.
Weights of bridges. XVI, 220.
Wheel concentrations and fatigue formulas. XLII, 192.

RIDEAL, SAMUEL.

Filtration of water. XLIV, 417. Sewage disposal. LIV, Part E, 209. Water and sewage Ohio. LXVII, 388. works, Columbus, Water

ater purification LXVI. 206. at Steelton. Pa.

RIDGWAY, ROBERT.

Grouting operations. LXXXIII, 1058. High masonry dams. XXXIV, 505. Subway construction problems. LXXXII,

Subway tunnel work. LXXXI, 404. Tests of concrete in sea water. LXXXI, 684.

Tunnel surveying. LXXV, 91.

RIEDEL, J. C.

Sewage clarification by fine screens. LXXVIII, 1018.

RIEGEL, ROSS M.

Reconstruction of Stony River Dam. LXXXI, 1086.

RIEGNER, WALLACE BERKLEY.

Memoir of, LXXVII, 1902.

RIEPPEL, A.

Stiffened suspension bridges. LV, 56.

RIFFLE, ALBERT S.

"A Line of 28-In. Cast-Iron Submerged Pipes across the Williamette River, at Portland, Ore." XXXIII, 257.

Bacteria and other organisms in water.

XXXIII, 452.

Memoir of. LXVI, 504.

Painting of iron structures. XXXIII, 543.

RIFFLE, FRANKLIN.

"A Line of 28-In. Cast-Iron Submerged Pipes across the Williamette River, at Portland, Ore." XXXIII, 257. Astoria, Oregon, Water-Works. XXXVI,

56.

Control of hydraulic mining in California. LVII, 33.

Effects of San Francisco earthquake engineering constructions. LIX, 208, 245, 266.

Preservation of materials of construction. L, 313.
The Santa Ana Canal of the

Valley Irrigation Company. XXXIII, 590.

RIGGS, HENRY EARLE.

"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Prop-erty and Other Public Utilities." erty and Other Public Utilities."
LXXXI, 1311.
"The Valuation of Public Service Corporation Property." LXXII, 1.

RIGHTS, LEWIS D.

Dumbarton Bridge construction. LXXVI, 1619.

"Erection of the Bellows Falls Arch Bridge." LXI, 253. "Final Report of the Special Committee on Steel Columns and Struts." on Steel Co LXXXIII, 1583.

RIGHTS, LEWIS D .- (Continued).

Painting structural steel. LXXVII, 977.
"Progress Report of Special Committee
on Steel Columns and Struts." LXVI. 401.

Safe stresses in steel columns. LXI. 189

Tests of large steel columns. LXXIII, 458

RIKER, C. L., Jr.

Grouting operations. LXXXIII, 1076.

RILEY, L. A., 2d.

Maximum weights of slow freight trains. LXIV, 312.

RILEY, W. E.

Height of buildings, XLIV, 458.

RINECKER, FRANCIS.

Construction and maintenance of roads. VIII, 362. Memoir of, XL11, 569.

RIPLEY, HENRY C.

Brazos River XXV, 542. Harbor improvement.

Coos Bay Harbor improvement. XLVI, 530.

"How to Build a Stone Jetty on a Sand Bottom in the Open Sea," LXXV, 1040.

Littoral movements of the New Jersey coast. XXIII, 152. Origin of Gulf Stream, and circulation

of waters in Gulf of Mexico. Reaction breakwater. XLII, 520.

RIPLEY, THERON M.

Improvement of the Ohio River. LXIII, 426.

Irrigation works. XLIX, 27.

RIPPEY, S. HOWARD.

Grouted cut-off for the Estacada Dam. LXXVIII, 483.

RITCHIE, JAMES.

Cherry Street Bridge, Toledo, Ohio. LXXX, 794.

Dry docks—stone vs. wood. XLI, 590.
"The Construction of the Lorain Dry
Dock and Shipyard of the Cleveland
Ship-Building Company." XXXIX, 323.

RITTER, C. W.

Indeterminate frameworks, XLIII, 417.

RITTER, HOMER PETER.

Memoir of, LXXXIII, 2319.

RIX, E. A.

Effects of San Francisco earthquake on engineering constructions. LIX, 283.

ROBBINS, F. M.

Wood stave pipe design. LXXXII, 480.

ROBERTS, EVELYN PIERREPONT. Memoir of, LXXII, 593.

ROBERTS, NATHANIEL.

Collapse of a building during construction. LIII, 10.

ROBERTS, PERCIVAL, Jr.

Cause and prevention of decay of building stone, XV, 707.
Destruction of rails by excessive weights.

XX, 126.

Eye-bar tests. XXXI, 417.
"Final Report of Special Committee on Rail Sections." LXX, 456.
Inspection and maintenance of railway structures. XVII, 306.
Niagara Cantilever Bridge. XIV, 565.

Properties of steel: Its use in structures and heavy guns. XVI, 367.

Strength of wrought-fron struts and of structural steel in the form of beams and struts. XIII, 288.

and struts, XIII, 288, Structural steel, XXVII, 374.

ROBERTS, THOMAS P.

Forests, reservoirs, and stream flow. LXII, 321.

Reservoir system of the Great Lakes. XL, 433.

ROBERTS, W. J.

Design of a drift barrier. LXXX, 2085.

ROBERTS, W. MILNOR.

Brick arches for large sewers. VII. 259.

239.
Cheap freight transportation. IV, 257.
"Description of the 'Plenum Pneumatic
Process' as Applied in Founding the
Piers of the Illinois and St. Louis
Bridge, at St. Louis, Mo." I, 259.
"Engineering." II, 69.
Failure of the Ashtabula Bridge, VI,

231.

Memoir of. XXXVI, 531.
"Notes on the Improvement of the Mouth of the Mississippi." 1V, 321; V. 289.

Railroad accounts and returns. V, 339. Railway systems contrasted. IV, 264. Rainfall, resulting water supply and gauging of streams. IV, 302.

gauging of streams, IV, a02.

"Reminiscences and Experiences of Early Engineering Operations on Railroads, with Especial Reference to Steep Inclines." VII, 197.

Report of the Committee on "Cost and Work of Pumping Engines." IV, 142,

223 (1875). River mouths. IV, 290.

ROBERTS, WILLIAM. Memoir of, LX, 593.

ROBERTS, WILLIAM J.

Size of high-pressure water-power pipe. LIX, 187.

ROBERTSON, F. E.

Effect of alkali on concrete. LXVII, 608.

ROBERTSON, LESLIE S.

Marine engineering. LIV, Part C, 268. The manufacture of cement. LIV, Part B, 127.

ROBERTSON, MARSHALL POPE.

Memoir of, LXXXII, 1705.

ROBESON, H. B.

Properties of steel: Its use in struc-tures and heavy guns. XVI, 303.

ROBINSON, A. A.

Compensation for railroad curves. XIII, 188

Proper relation to each other of the sections of railway wheels and rails. XXI, 291.

ROBINSON, A. F.

Live loads for railroad bridges. LIV,

Part A, 103.
Painting of iron structures. XXXIII, 545.

"Thin Floors for Bridges." XXVII, 483, 680.

ROBINSON, A. W.

Dipper-dredges on the Panama Canal. LXXXII, 533.

Dredges and dredging. XL, 345. "Dredges and dredging. AL, 516.
"Dredges: Their Construction and Performance." LIV, Part C, 271, 479.
Dredging river channels. LII, 247.

Dredging river channels. LII, 247. West Slde Manhattan water-front. LXXV, 300.

ROBINSON, ALBERT ALONZO. Memoir of. LXXXIII, 2322.

ROBINSON, H. F.

"The Silt Problem of the Zuni Reservoir." LXXXIII, 868,

ROBINSON, MONCURE.

"Early Surveys and Reports in Reference to the Transmission of Trade across the Allegheny Mountains in the State of Pennsylvania, known as the Allegheny Portage." XV, 181.

ROBINSON, R. B.

Weir measurement of stream LXXVII, 1294. flow.

ROBINSON, S. W.

Memoir of. LXXI, 433.

Proper relation to each other of the sections of rallway wheels and rails. XXI, 291.

"Red Rock Bridge; General Specifications and Proportions." XXV, 697. Specifications for strength of iron bridges. XV, 432.

"Vibration of Brldges." XVI, 42.

ROBSON, F. T.

Irrigation and river control. LXXVI, 1516.

Sewage clarification by fine screens. LXXVIII, 981. Water supply of the San Francisco-Oak-

land Metropolitan District. LXXX, 88.

ROCKENBACH, S. D.

"The Water-Works Cuba." XLVII, 426. of Guantanamo,

ROCKWELL, JAMES VINCENT.

Memoir of. LXXX, 2202.

ROCKWELL, SAMUEL.

Anthracite coal trade and labor question. I, 372.

ROCKWELL, W. L.

Determination of duty of water, LXXXIII, 251.

RODD, THOMAS.

Destruction of rails by excessive weights. XX, 124.

Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII,

425 (1893). "Report of the Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails." Pre-liminary Report, XIX, 1 (1888); Final Report, XXI, 223 (1889).

ROECHLING, H. ALFRED.

Filtration of water. XLIV, 436.

ROGERS, E. H.

Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 89.

ROGERS, MERRITT HARRISON.

Memoir of. LIX, 562.

ROGERS, W. A.

"The Reconstruction of Grand River Bridge." XXXVI, 341.

ROGGE, JOHN C. L.

Engineering education. LXXV, 1126.

ROHNERT, BENNO.

Memoir of. LVIII, 557.

ROHRER, GRANT.

Memoir of. LXXXII, 1706.

ROHWER, HENRY.

Memoir of. LXXX, 2205. Nickel steel for bridges. LXIII, 348.

ROOD, HENRY MARTYN.

Memoir of. LXXIX, 1457.

ROSENTHAL, J. J.

revention of LXXVI, 770. Prevention mosquito breeding.

ROSEWATER, ANDREW.

Cost of sewer construction. XXXV, 119. Disposal of municipal refuse. LIV, Part E, 327. Sewage disposal. LIV, Part E, 234.

ROSEWATER, WILLIAM M.

Dipper-dredges on the Panama Canal. LXXXII, 538.

ROSS, ALEXANDER.

Live loads for railroad bridges. LIV, Part A, 87. Nickel steel for bridges. LXIII, 324.

ROSS, CHARLES W.

Road construction and maintenance: Surface treatment with tars, heavy oils, etc. LXXIII, 44, 73.

The use of bituminous materials by

Road penetration methods. LXXIII, 77.

ROSS, CHARLES W .- (Continued).

Road construction and maintenance: The use of water, calcium chloride, light oils, etc., as dust palliatives. LXXIII, 41.

ROTCH, WILLIAM.

Rainfall, resulting water supply and gauging of streams. IV, 303.

ROTHWELL, R. P.

Transportation of freight and passengers.

ROULLIER, G. A.

Road building. XLI, 106.

ROUSSEAU, H. H.

Elevated railroads, XXXVII, 374.

ROWE, ROBERT DELOS. Memoir of. XLII, 571.

ROWE, SAMUEL M.

Availability of the canons of the Colorado for railway purposes. XXVI, 342. Elevated railroads. XXXVII, 442. Emergencies on railroads, XXVII, 48. Memoir of, LXXII, 594. Preservation of railroad ties. XLII, 358; also, XLV, 534.

"Red Rock Cantilever Bridge Foundations." XXV, 662.

The Halsted Street Lift-Bridge. XXXIII, 46

ROWLAND, THOMAS FITCH, Memoir of. LXII, 547.

ROY, ROBERT MAITLAND. Memoir of. LXXXI, 1765.

RUDLOFF, HENRY FREDERICK.

Memoir of, XXXVI, 570, RUGGLES, CHARLES A.

Agreements for building contracts. LXVII, 493.

RUGGLES, W. B.

Docks and harbors. LXII, 149. Rainfail, and run-off in storm-water sewers. LVIII, 500. The valuation of public service property.

LXXII, 290. RUMBLE, WILLIAM.

Excessive rainfalls, XXV, 109,

RUNDALL, F. H.

Irrigation. LIV, Part C, 150.

RUNDLETT, LEONARD WARREN. Memoir of. LXXXI, 1766.

RUSSELL, NATHANIEL EDWARDS. Memoir of, XLIX, 355.

RUSSELL, S. BENT.

A high-speed gravity filter bed. XXXV, 55.

water-tight masonry dam. XXVIII, 350.

Astoria, Oregon, Water-Works. XXXVI,

"Experiments with a New Machine for Testing Materials by Impact." XXXIX,

Hot tests for Portland cement. XXVII, 441.

"Impact Tests of Structural Steel."

XLIII, 1.
"Neat Tests vs. Sand Tests for Portland Cement." XXV, 295.
Progress report of Special Committee on Concrete and Reinforced Concrete. LXVI, 477.

Questions in reinforced concrete design. LXX, 73.

Separate versus general contracts. XLIX,

Tests of bridge members. XXXVIII, 68. The engineer and the inspection of work. LVI, 128.
Timber tests. LI, 97.
Use of canvas in water-tight bulkheads.

XXXI, 536.

Water supplies. LIX, 394.

RUST, HENRY P.

Wood stave pipe design. LXXXII, 476.

RUTENBERG, P. P.

Reconstruction of Stony River Dam. LXXXI, 1029.

RUTHERFURD, ROBERT A.

Prevention of mosquito breeding. LXXVI, 775.

RYDER, E. M. T.

Pavements. LIX, 351.

SAABYE, OSCAR.

"Construction of a Cheap Dam across the Roanoke River, near Salem, Va." XX 711, 565.

Controverted questions in road construc-tion. XXVIII, 117.

SABIN, A. H.

Bridge painting, XXXIX, 27. "Experiments on the Protection of Steel and Aluminum Exposed to Sea Water."
First Paper, XXXVI. 483 (1896); Supplementary Paper, XLIII. 444 (1900).
Painting of iron structures. XXXIII.

"Painting Structural Steel: The Present Situation." LXXVII, 952. Sand-blast cleaning of steel. L, 286.

SABIN, L. C.

Effect of depth upon artificial water-ways. XXXV, 31.
"Final Report of the Special Committee on Uniform Tests of Cement." LXXV,

Hot-bath tests for cements. XXXII, 340. Surveying Instruments. XLVIII, 122.

SACKETT, A. J.

Grouting operations, LXXXIII, 1071.

SACKETT, JOHN WARREN. Memoir of, LXXXIII, 2325.

SAFFORD, ARTHUR T.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

SAFFORD, H. R.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

ST. JOHN, I. M.

Memoir of. XXXVI, 571. Report of the Committee "On the Form, Weight, Manufacture and Life of Rails." First Report, III, 87 (1874); Second Report, IV, 136 (1875); Final Report, V, 327 (1876).

SALAZAR, L.

"On the Distribution of Water in the City of Mexico." XXX, 336.

SALBACH, B.

Experiences had during the Last Twenty-Five Years with Water-Works having an Underground Source of Sup-"Experiences ply." (Translated from the German by Clemens Herschel.) XXX, 293, 701.

SALE, J. W.

Water and sewage works, Columbus, Ohio. LXVII, 345.

SALES, II. S.

Economies of LXXXIII, 73. ofsteel areh bridges.

SALVADOR, PAUL LEVY.

Trrigation and Hydraulic Motors used in Irrigation in France." (Translated from the French by Paul A. Seurot.) LIV, Part C. 111, 176.

SAMPLE, JOHN HENDERSON.

Memoir of. LXX, 474.

SANBORN, JAMES F.

Astoria Gas Tnnnel. LXXX, 682. "Grouting Operations, Catskill Water Supply," LXXXIII, 980. Tunnel construction methods, LXXXI,

478.

SANBORN, MORTON F.

"A Theory of the Water Wave." LXXI, 284.

SANBORN, THOMAS.

"Some Experiments with Mortars Concretes Mixed with Asphaltic Oils. LXXVI, 1094.

SANDBERG, C. P.

Cylindrical wheels and flat-topped rails for railways. XXI, 166. Proper relation to each other of the sec-

tions of railway wheels and rails, XXI, 294.

SANDERSON, J. GARDNER.

Efficiency of railroads for the transporta-tion of freight. X11, 135.

SANFORD, J. C.

"Dredging Ocean Bars." LIV, Part C, 303, 520,

SAPH, AUGUSTUS V.

"An Experimental Study of the Resistances to the Flow of Water in Pipes."

LI, 253.
Flow of water in pipes. XLVII, 295.
Flow of water in wood pipes. XLIX, 149.

SARGENT, JOSEPH A.

Water purification at Steelton, Pa. LXVI,

SARGENT, PAUL D.

construction and maintenance: Drainage and foundations. LXXV, 508. Dramage and foundations. LXXV, 508.
Road construction and maintenance:
Engineering organizations for highway work. LXXVII, 1104.
Road construction and maintenance:
Relative value of three methods of
carrying on work. LXXIII, 20.
Road construction and maintenance:
The use of bituminous materials by
mixing methods. LXXIII 129.

mixing methods. LXXIII, 132.
Road construction and maintenance:
The use of bituminous materials by
penetration methods. LXXIII, 93.

SAUCEDO, VICENTE.

Monterrey water-works and sewerage. LXXII, 563.

SAUNDERS, WILLIAM L.

Caisson disease and its prevention, LXV, 30

30.

"Dimension Stone Quarrying: The Blasting Process." XXV, 501.

"Electric Rock Blasting — The American Method." XXVII, 529.

Laramie-Poudre Tunuel. LXXV, 751.

The Shone hydro-pneumatic system of sewerage, XXVIII, 59.
Underpinning of heavy buildings, XXXVII, 58.

SAURBREY, ALEXIS.

Engineering education. LXXV, 1103. Shear tests on joints in T-beam stems. LXXVII, 1532.

SAUVAGE, EDOUARD.

"Rolling Stock in France." LIV, Part D, 319.

SAUVEUR, ALBERT.

The manufacture of steel. LIV, Part E, 408.

SAVAGE, A. C.

Wire Rope Tramways." "Notes on XXXII, 38. South Pass Jetties. XV, 249.

SAVILLE, CALEB MILLS.

"Hydrology of the Panama Canal." LXXVI, 871. The hydraulic jump. LXXX, 405.

Water supply for Panama Canal, LXVII, 112.

SAVILLE, CHARLES.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

SAYERS, EDWARD L.

Halligan Dam. LXXV, 137.
"The Lock 12 Development of the Alabama Power Company, Coosa River, Alabama." LXXVIII, 1545.

SCARBOROUGH, FRANCIS WINTHROP. Memoir of. LXXX, 2209.

SCHAEFER, HERMANN.

Sewage clarification by fine screens, LXXVIII, 976.

SCHAEFFER, AMOS.

Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 476. Road construction and maintenance: Bituminous surfaces. LXXV, 569.

Road construction and maintenance: Design of highway systems. LXXVII,

SCHARFF, MAURICE R.

Water supply for camps, cantonments, etc. LXXXIII, 537.

SCHAUB, J. W.

Impervious concrete. LI, 123, Kentucky and Indiana Bridge, XVII,

Loadings for railroad bridges. LI, 109.

Loadings for railroad bridges. L1, 109.

Movable bridges. LX, 321.

New facts about eye-bars. LVI, 442.

Niagara Railway Arch. XL, 151.

Rivet spacing, etc., in plate girders.

XLV, 568.

"The Detroit Union Depot Viaduct."

XXVIII, 309.

The Launhardt formula and bridge specifications. XLI, 188.

SCHEIDENHELM, F. W.

Multiple-arch dams. LXXXI, 885. "The Reconstruction of the Stony River Dam." LXXXI, 907.

SCHENCK, ARCHIBALD A.

Canals from the Lakes to New York, XLV, 248.

ALV, 248.
Influence of rails on street pavements.
XXXVII, 127.
"The Relation of Wheels to Frog Points
and to Guard Rails." XXXI, 509.
Underpinning of heavy buildings. XXXVII, 50.

SCHERZER, ALBERT JOHN.

Memoir of. LXXIV, 515.

SCHERZER, WILLIAM.

Sibley Bridge. XXI, 130. Stresses in railway bridges on curves. XXV, 492.

SCHICK, H. S.

Compensation of civil engineers, LXXXI, 1216.

SCHILLING, ALEXANDER CHARLES. Memoir of. LXXXIII, 2402.

SCHIMPFF, GUSTAV.

The substitution of electricity for steam as a motive power. LIV, Part E, 59.

SCHMIDT, MAX E.

Inter-oceanic canal projects. IX, 39, "Notes on the South Pass Jetties." 290

Railways of Mexico. XXIII, 285. Tests of eement. IX, 345. "The South Pass Jetties. Notes Notes on the Consolidation and Durability of the Works, with a Description of the Concrete Blocks and Other Constructions of the Last Year." (1878.) VIII, 189.

SCHMITT, E.

"A Direct Method of Spacing Rivets and Finding the Position, etc., of Stiffeners in Plate Girders." XLV, 550.
"Theory of the Spherical Dome with a Homogeneous Surface, and of the Framed Dome; also Notes on the Construction of Masonry and Metal struction of Ma Domes." LII, 262. Masonry and Metal

SCHMITT, F. E.

Revision of Niagara I Bridge, LXXXIII, 2006. Railway Arch

SCHNEIDER, CHARLES C.

Collapse of a building during construc-tion, LIII, 24. Life of iron railroad bridges. XXXIV, 328.

Memoir of. LXXXI,

"Movable Bridges." LX, 258.
"Progress Report of Special Committee
on Concrete and Reinforced Concrete." LXVI, 431.

pecifications for bridges. XV, 481. Specifications strength

Stiffened suspension bridges. LV, 37.
Strength of wrought-iron struts and of
structural steel in the form of beams
and struts. XIII, 288.

"The Cantilever Bridge at Niagara Falls."

XIV, 499. "The Evolution of the Practice of Amer-

iean Bridge Building." Presidential Address at the Annual Convention at Cleveland, Ohio, June 20th, 1905. LIV, 213.

The Launhardt formula and bridge specifications, XLI, 172.
"The Structural Design of Buildings." LIV, 371.

SCHNEIDER, E. J.

"Construction Problems, Dumbarton Bridge, Central California Railway. LXXVI, 1572.

SCHOBINGER, GEORGE.

"Colorado River Siphon." LXXVII, 1.

SCHODER, ERNEST W.

"An Experimental Study of the Resistances to the Flow of Water in Pipes."

"Curve Resistance in Water Pipes."
LXII, 67.
Flow of water in pipes. XLVII, 295.
Flow of water in wood pipes. XLIX,

Fountain flow of water in vertical pipes. LVII, 305.

SCHOFIELD, MARK WILLIAM. Memoir of. LXIII, 432.

SCHOLTZ, H. F.

Aerial tramway. LXXXI, 745.

SCHOTT, CHARLES A.

"Terrestrial Magnetism in North America." XXX, 108, 654.

SCHREIBER, J. MARTIN.

Appraisal of public service properties.
LXXV, 853.
Electric railways in the Ohio Valley.
LXIII, 96.

The valuation of public service property. LXXII, 265.

Timber preservation. LXXI, 382.

SCHÜLE, F.

Concrete and concrete-steel. LIV, Part

Concrete and concrete-steet. Liv, 12rt E, 549.
Stiffened suspension bridges. LV, 48.
Tests of cement. LIV, Part F, 43.
Tests of steel. LIV, Part F, 72.
The manufacture of cement. LIV, Part B, 128.

SCHUMACHER, H. J.

"Experimental Determination of the Rolling Friction in Operating the Draw of the Thames River Bridge, together with Method for Determining Power to Operate Draw-Bridges." XXV, 638.

SCHURMAN, J. G.

Address at opening of New Society House. XXXVIII, 436.

SCHUSSLER, HERMANN FREDERICK AUGUST.

Memoir of. LXXXIII, 2329.

SCHUYLER, HOWARD.

Memoir of. XXXVI, 572.

SCHUYLER, JAMES DIX.

A phenomenal land slide. LIII, 405.
Earth dams. LXXIV, 87.
Memoir of. LXXVI, 2243.
Monterrey water-works and sewerage.
LXXII, 557.
"Recent Practice in Hydraulic-Fill Dam
Construction." LVIII, 196; LX, 105.
Stave pipe. XLI, 79.

"The Construction of the Sweetwater Dam." XIX, 201.

The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 593.

"The Use of Asphaltum for Reservoir Linings." XXVII, 629.

"The Water-Works of Denver, Colorado." XXXI, 135.
28-in. cast-iron submerged pipe line. XXXIII, 286.

Water-works valuation. XXXVIII, 161.

SCHWIERS, F. WILLIAM.

Preservation of sandy beaches. LXXX, 1814.

SCOFIELD, E. M.

Concrete and concrete-steel. LIV, Part E, 601.

Wheel concentrations and fatigue formulas. XLII, 208.

SCOTT, ADDISON M.

"General Notes on the Great Kanawha Improvement, Tripping Bars and Im-proved Hurters on Chanoine Wicket Dams, etc." XXXI, 539.

SCOTT, DUNBAR D.

"Recent Improvements in Leveling Instruments." LXXVI, 1172.

SCOTT, R. D.

Water and sewage works, Columbus, Ohio. LXVII, 330.

SCOTT, WILLIAM FRY.

"A reinforced concrete stand-pipe." LXXIV, 392. "Bond-Friction-Resistance in Reinforced

Concrete." LXXIII, 230. Concrete and reinforced concrete. LXXXI, 1159.

SCOTT, WILLIAM ULYSSES. Memoir of. XLII, 572,

SEABURY, GEORGE T.

Temperature changes in mass concrete. LXXIX, 1247.

SEAMAN, HENRY B.

American railroad bridges. XXI, 583. Bridge experiments with moving train-loads. XLI, 453.
"Componential Trusses for Traveling Crane." XXIII, 277.
Contracts: "Cost plus" and other forms.

LXXXIII, 816.

Counterstresses in bridges. XLII, 552. Effects of straining steel. LXXX, 1466. Elevated railroads. XXXVII, 367. Formula for strength of columns. Formula for XXVII, 93.

Hell Gate Arch Bridge. LXXXII, 1020 Kentucky and Indiana Bridge. XV

179. New facts about eye-bars. LVI, 429. Overloaded bridges. LVII, 259.

Preservation of materials of construc-

Preservation of Backering tion, L, 307.
Railway bridge designing, XXVI, 227.
Road building, XLI, 116.
Safe stresses in steel columns. LXI, 162.
Sand-blast cleaning of steel. L, 289.
Specifications for structural steel. XXXIII, 393.

"Specifications for the Design of Bridges and Subways." LXXV, 313. Stresses in railway bridges on curves. XXV, 498.

Structural design of buildings.

421.

"The Launhardt Formula, and Railroad Bridge Specifications." XLI, 140.

The manufacture of brick. XVIII, 308.

Train loadings for bridges. XXXI, 210.

Underplnning of heavy buildings.

XXXVII, 47.

Weights of bridges. XVI, 241.

West Side Manhattan water-front. LXXV,

290.

Wheel concentrations and fatigue formu-

las. XLII, 209. Wind bracing in high buildings. XXVII, 235; also, XXXIII, 221.

SEARLES, WILLIAM H.
A novel railroad survey.
Bridge accidents. IV, 219. VI, 262.

SEARLES, WILLIAM H .- (Continued).

Compensation for railroad curves. XIII.

"Description of Survey for Determining the Slope of Water Surface in the Eric Canal." VI, 289.

Distortion of riveted pipe by back-filling. XXXVIII, 108.
Rapid transit in large cities. IV, 245.

Relative quantities of material in bridges of different kinds, of various heights. VII, 192. "Stability of Stone Structures." VIII,

238, 259.

Translation

XXIX, 295.

of paper by J. Stübben. ransation XXIX, 718. ranslation of paper by R. Caesar. Translation

SEARS, ALFRED FRANCIS.

Availability of the cañons of the Colorado for railway purposes. XXVI, 332. rado for railway purposes. XXVI, 332. Brick manufacture and brick pavement. XXVI, 405.

"Commercial Cities: The Law of their Birth and Growth." XIV, 19.

Main relief sewer of Brooklyn. XXVI,

"Methods of Reducing the Cost of Rail-road Construction." II, 1.

Motive Power for Street Railways." XXVII, 313, 583. "Motive

Power required to drive electric street cars. XXVII, 676.
The Holland dikes. XXVI, 656.
Wind bracing in high buildings. XXVII,

SEARS, CLINTON B.

"Principles of Tidal Harbor Improve-ment as Applied at Wilmington, Cal." V, 388; VI, 191.

SEARS, WALTER HERBERT. Memoir of. LXXV, 1180.

SEAVER, JOHN WRIGHT. Memoir of. LXXII, 596.

SEDDON, JAMES A.

"A Mathematical Analysis of the Influence of Reservoirs Upon Stream-Flow." XL, 401.
Flow of water in pipes. XLVII, 238.
"River Hydraulics." XLIII, 179.

SEDGWICK, THOMAS S.

Apparatus for obtaining borings by direct pressure. II, 40.

SEDGWICK, W. T.

Water filtration at Washington, D. C. LVII, 408.

SEE, GEORGE CORLISS. Memoir of, LXXXIII, 2404.

SEELY, THOMAS JENNINGS. Memoir of, XXXVI, 574.

SEELYE, ELWYN E.

Shear tests on joints in T-beam stems. LXXVII, 1526.

SEJOURNE, M.

High-alloy steels for bridges. LXXVIII,

SELBY, O. E.

Elevated tanks and stand-pipes. LXIV,

"Painting the Louisville and Jefferson-ville Bridge." XXXIX, 19. Preservation of railroad ties. XLII, 361.

Preservation of railroad ties. XLII, 361. Wheel concentrations and fatigue formulas. XLII, 223.

SELLERS, COLEMAN.

Metric system of weights and measures. V. 364.

SELLERS, WILLIAM.

English and American rallroads compared. XV, 747.

Nagara Cantilever Bridge. XIV, 581.

Properties of steel: Its use in structures and heavy guns. XVI, 341.

Specifications for strength of iron bridges. XV, 459.

Use of steel for bridges. IX, 315.

SELLEW, FRANCIS L.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

Irrigation and river control. LXXVI, 1456.

SEMSCH, O. F.

Pneumatic foundations. LXIII, 21

SERBER, D. C.

Value of monopolies. LXXV, 477.

SEUROT, PAUL A.

Translation of paper by A. Considère. LIV. Part E, 495.

Translation of paper by E. Gruner. LIV, Part A, 113.

Part A, 113.

Translation of paper by Edouard Candlot. LIV, Part F, 31.

Translation of paper by Ernest Pontzen. LIV, Part F, 493.

Translation of paper by G. Forestier. LIV, Part F, 129.

Translation of paper by Jean Hersent. LIV, Part C, 327.

Translation of paper by L. Baclé. LIV, Part F, 55.

Part F, 55.

Translation of paper by Paul Lévy Salvador. LIV. Part C, 111. Translation of paper by V. Daymard and R. Lelong. LIV, Part C, 243.

SEWELL, H. A.

"A Shortened Method in Arch Computation." LXXVI, 133.

SEWELL, JOHN STEPHEN.

"Concrete and Concrete-Steel in the United States." LIV, Part E. 459, 613. Progress report of Special Committee on Concrete and Reinforced Concrete. on Concret LXVI, 469.

Questions in reinforced concrete design.

LXX, 124.

"The Economical Design of Reinforced Concrete Floor Systems for Fire-Resisting Structures." LVI. 252.

SEYMOUR, HORATIO, Jr.

Memoir of. LXVI, 507.

SEYMOUR, MARK TUCKER.

Memoir of. XXXVII, 578.

SHAILER, ROBERT A.

Earth pressures and bracing, LX, 48. Inspection and maintenance of railway structures, XVII, 288.

Subway construction problems. LXXXII,

Tunnel construction methods. LXXXI, 473.

SHALER, IRA A.

Bridge painting. XXXIX, 33. Memoir of. XLIX, 357.

SHANKLAND, E. C.

Structural design of buildings. LIV, 465.

SHARPLES, PHILIP P.

Road construction and maintenance: Bituminous surfaces. LXXV, 559. Road construction and maintenance:

Cement-concrete pavements. LXXVII, 123.

123.
Road construction and maintenance:
Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1178.
Road construction and maintenance:
Equipment for the construction of bituminous surfaces and bituminous pavements. LXXVII, 201.
Road construction and maintenance:
Surface treatment with tars, heavy oils, etc. LXXIII, 69.

etc. LXXIII, 69. oad construction oad construction and maintenance: Use of bituminous material in pene-tration and mixing methods. LXXV. Road 620.

Sampittie surfacing. LXIV, 366.

SHAW, CLARK H.

"Cement Joints for Cast-Iron Water Mains." LXXXIII, 277.

SHAW, WILLIAM THOMAS.

Memoir of, LXXXI, 1813.

SHEARWOOD, F. P.

Reinforced concrete floor systems, LVI, 376.

Safe stresses in steel columns. LXI, 186.

Tests of large steel columns. LXXIII, 471.

SHEDD, FRANK EDSON.

Memoir of. LXXXI, 1768.

SHEDD, JOEL HERBERT.

Bridge accidents. IV, 212. Cements and concrete. IV, 312. Croton Water-Works and supply for the

future. V, 254.
Memoir of. LXXX, 2211.
Rainfall, resulting water supply and gauging of streams, IV, 297.

"Report of the Committee on a Uniform System for Tests of Cement." Preliminary Report, XIII, 53 (1884); Final Report, XIV, 475 (1885).

SHELBOURNE, S. F.

Inter-oceanic canal projects, IX, 37.

SHELEY, HORACE W.

State and national water laws. LXXVI, 696

The Tieton Canal. LXXI, 185.

SHERMAN, A. L.

Sewage and wastes disposal for the U. S. Army, LXXXIII, 380.

SHERMAN, CHARLES W.

Bacteria and other organisms in water. XXXIII, 449,

Consumption and waste of water. XLVI, 446.

Determination of storm-water run-off. LXXVIII, 1170.

Flow of water in Ogden, Utah, pipe line, XLIV, 84. Flow of water in pipes, XLVII, 223. Huacal Dam, Sonora, Mexico (Concrete arch dam). LXXVIII, 602.

"Maximum Rates of Rainfall at Boston." LIV, 173.

Pressures resulting from changes of velocity of water in pipes. XXXIX,

Spirit leveling. XXXIX, 392. Steel sheeting and sheet-piling. LXIV, 452.

Translation of paper by F. Guillain XXIX.

Tuberculation in water pipes. XXVIII,

SHERMAN, RICHARD W.

Water-works valuation. XXXVIII, 159,

SHERRERD, MORRIS R.

Current meter and weir discharges. XLVII, 381.

ALVII, 381. Legitimate use of water. LV, 425. Protection of steel and aluminum ex-posed to sea water. XXXVI, 496. Standard leves sections. XXXIX, 208. Water supplies. LIX, 396.

SHERTZER, TYRRELL B.

l'ier construction in New York Harbor. LXXVII, 543.

SHIBA, C.

"Experiments on Vibration of the Japanese Torpedo-Boat Destroyers, Harusame and Hayatori." LIV, l'art D, 89.

SHIMA, S.

"Concrete Blocks at Osaka Harbour Works, Japan." LIV, Part A, 221.

SHIMA, TAKEJIRO.

Memoir of, LXXIV, 525.

SHINBUR, ELVER LA ZELLE.

Memoir of, LVII, 531,

SHINN, WILLIAM P.

"A Cheap Transfer Table." V, 377. Cause and prevention of decay of build-ing stone. XV, 709. Cheap freight transportation. IV, 252.

Construction of railway tracks. XXV, 243.

English and American railroads compared. XV, 751.
"How can Railways be made more Efficient in the Transportation of Freight?" XII, 189.

SHINN, WILLIAM P .- (Continued).

Notes on a mountain slide. XXIV, 561.

"On Railroad Account.
V. 215, 340.
"On the Increased Efficiency of Rail"On the Transportation of ways for the Transportation of Freight." XI, 365; XII, 144. Power Brakes for Freight Trains."

"Power B XIV, 405.

Presidential Address at the Annual Convention at Cresson, Pa., June 26th, 1890. XXII, 359. ailway pontoon bridge at Prairie du

1890. XXII, 359.
Railway pontoon bridge at Prairie du Chien. Wis. XIII, 69.
Railway signals. IV. 238.
Railway systems contrasted. IV, 264.
"Resistances of Railway Trains." V, 341.
Right of way for railroads. XXV, 330.
Street railway track. XXIV, 151.
Tests of cement. IX. 341.
Transportation of freight and passengers.
II. 249.

II, 249.

SHIPLEY, ROBERT EARLE,

Memoir of. LXXXIII, 2406.

SHIPMAN, C. E.

Economic canal location. LXXIV, 190. Hydrometry as an aid in irrigation. LXXI, 343.

SHIRAISHI, NAOJI.

"A New Graving Dock at Nagasaki, Japan." LVI. 73. Memoir of. LXXXIII, 2331.

SHIRLEY, H. G.

Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 93.

SHIRREFFS, REUBEN.

Lake Cheesman Dam and Reservoir. LIII, 155. Subaqueous foundations, XXIV, 242.

SHOEMAKER, LOUIS H.

"A Four-Track, Center-Bearing, Rail-road Draw Span." LXXV, 711.

SHREVE, SAMUEL H.

Memoir of. XXXVI, 576. Upright arched bridges. III, 227; IV,

SIBERT, WILLIAM L.

"Artificial Waterways in the States." LIV, Part F, 255. Improvement of rivers. XLIX, the United "The Improvement of the Ohio River." LXIII, 388.

SIBLEY, L. P.

Road construction and maintenance: Cement-concrete pavements. LXXVII, 124.

maintenance: Road construction and Fillers for brick and block pavements. LXXV, 537.

SICARD, MIRTILIANO,

Memoir of. XL, 577.

SICKELS, FREDERICK E.

Memoir of. XXXVI, 577.
"Some Details of Valves and other Apparatus in I'se by the National Water-Works Company at Kansas City, Mo."

XXIV, 385.

SIDENIUS, HARRY GODFRED.

Memoir of. LXXXIII, 2334.

SIEBERT, JOHN S.

Translation of paper by Max Gary. XXX,

SIEMENS, ALEXANDER.

"The Substitution of Electricity for Steam as a Motive Power." LIV, Part E, 51.

SIMIN, NICHOLAS.

Filtration of water. XLIV, 438.

SIMPSON, GEORGE FREDERIC. Memoir of. LXXIX, 1460.

SIMSON, DAVID.

Memoir of. LXXXI, 1770.

SINCLAIR, FRANK OSCAR, Memoir of. LXXXI, 1772,

SINKS, F. F.

Reinforced concrete buildings. LX, 482.

SISSON, WILLIAM LEE.

"Harper's Ferry Improvement." XXXII, 351.

SITES, WILMON W. C. Memoir of. XXXVI. 582.

SKINNER, FRANK W.

Cinder concrete floors. LXXVII, 1809. Destruction of rails by excessive weights. XX, 126.

Harlem Ship Canal Bridges, LXI, 265, Harlem Ship Canal Bridge, LXVII, 28, High-alloy steels for bridges, LXXVIII,

High masonry dams, XXXIV, 505, Kentucky and Indiana Bridge. 188.

Niagara Railway Arch. XL, 155. Permanent effects of strain in metals. XXIV, 165.

Pneumatic foundations for buildings. LXI, 222. Power plant at Ogden, Utah. XXXVIII,

306.

Protection of steel and aluminum. XLIII, 463.

Railroad cantilever bridge at Beaver, Pa. LXXIII, 171.

Railway bridge designing. XXVI, 218. Reconstruction of Kenova Bridge. LXXIX, 486.

Rivet spacing, etc., in plate girders. XLV, 570. Rolling friction of draw-bridges. XXV,

658.

Sinking bridge piers, LX11, 129. Stave pipe, XLI, 64. Steel sheeting and sheet-piling, LXIV.

465. The Halsted Street Lift-Bridge, XXXIII.

38.

SKINNER, FRANK W .- (Continued).

The Shone hydro-pneumatic system of he Shone Hydro photos sewerage. XXVIII, 67.

Timber preservation.

cast-iron submerged pipe line. XXXIII, 277. of heavy buildings.

Underpinning XXXVII, 41. Uniform practice in pile-driving, XXVII,

buildings.

bracing in high Wind XXXIII, 213.

SLATAPER, FELICIAN.

Memoir of. LVIII, 540. Railway systems contrasted. IV, 263.

SLEIGHT, R. B.

Flow of water in irrigation channels. LXXX, 1674.

SLETTUM, E. A.

Trafficway viaduct, Kansas City, Mo. LXXX, 550.

SLOAN, C. E.

Water supply of the San Francisco-Oak-Metropolitan District. LXXX, land 164.

SLOAN, MAURICE M.

Height of buildings. XLIV, 470.

SLOAN, R. I.

Inspection and maintenance of railway structures. XVII, 310. Memoir of, XLVI, 562.

Proper relation to each other of the secof railway wheels and rails. tions of XXI, 295.

SLOCUM, C. L.

Reinforced concrete bridges. LIX. 204 bonding of new to old concrete. The LXIV. 272 Use of reinforced concrete. LXI, 58.

SMEAD, RAPHAEL CHART. Memoir of. LXXXIII, 2335.

SMEDLEY, SAMUEL L. Sewerage of Memphis, X, 39.

SMELT. J. D.

Recent practice in rails. XLIV, 502,

SMITH, ALBERT.

The manufacture and use of paving brick. XXX, 588.

SMITH, ALBERT HENRY. Movable bridges. LX, 301

SMITH, ALBERT MATHER. Memoir of. LXX, 476.

SMITH, AUGUSTUS.

Concrete and concrete-steel. LIV, Part E. 581. Movable railroad bridges, LXXVI, 403. National railroad question of to-day. LXXXIII, 954.

Structural design of buildings. LIV, 423. The engineer and the inspection of work. LVI, 137.

"The Narragansett Bay Coal Depot." LVII, 204.

West Side Manhattan water-front. LXXV, 303.

SMITH, B. A.

"Arched Dams." LXXXIII, 2027.

SMITH, BENJAMIN BURGH.

Memoir of. LII, 550.

SMITH BURTON.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX,

SMITH, C. ELMORE.

Design of masonry dams. LXXV, 199.

SMITH, C. SHALER.

Back-water in streams as produced by dams. II, 259. Construction and maintenance of roads

VIII. 352.

Cruching strength of American iron. II. 231

Detroit River Tunnel, II, 238 "Draw-Spans and their Turn-Tables." TII, 129.

Failure of the Ashtabula Bridge, VI, 217.

"Proportions of Eve-Bar Heads and Pins as Determined by Experiment." VI 263.

Report of the Committee "On the Means of Averting Bridge Accidents." IV. of Averting 1 12, 221 (1875)

"Report of the Committee on the Preservation of Timber" Preliminary Report, VI, 295 (1882); Final Report, VIV, 247 (1885) VIV. 247 (1885) River mouths IV. 297 South Pass Jatties, VII, 166 South Pass Jatties, VII, 166

Tasts and tosting machines. IV Tasts of bridge irons. II, 225. Wind pressure against bridges I.Z. 303 "Wind Pressure upon Pridges"

SHITH CECH, B.

"Hydro-Electric Power in Canada" LXV. 154

SWITH, CHARLES A.

"Permanent Transmitting Dynamometer." XV. 357. Wind pressure upon bridges. X. 164.

SMITH, CHARLES E.

"History of Little Rock Junction Railway Bridge, of the St. Louis, Iron Mountain and Southern Railway Company, Over the Arkansas River at Little Rock, Arkansas, 1883-1914." LXXIX. 1.

"Roport on Cause and Correction of Foundation Troubles of Box Factory Natchez, Mississippi." LXXXIII.

SWITH, CHESTER WASON.

"Reinforced Concrete Pipe for Carrying Water under Pressure." LX, 124.

SMITH, EDGAR FIELD.

Memoir of. LXXXIII, 2408.

SMITH, EDWIN FOSTER. Memoir of, LXXXIII, 2336.

SMITH, EUGENE R.

"The Compressibility of Salt Marsh under the Weight of Earth Fill." XXXVII,

SMITH, FRANCIS P.

and maintenance: Road construction Equipment for the construction of bituminous surfaces and pavements. LXXVII, 171. bitumlnous

Road construction and maintenance: The use of bituminous materials by mixing methods. LXXIII, 128. Sampittie surfacing. LXIV, 375.

SMITH, FREDERICK H.

Memoir of. XLI, 643. Niagara Cantilever Bridge. XIV, 552, Railway bridge designing. XXVI, 192.

SMITH, G. E. P.

Dams on sand foundations. LXXIII, 193.

Railroad water supply. LXX, 186. Weir measurement of stream Weir measurement of stream now. LXXVII, 1300. Yield of underground reservoirs. LXXVIII, 221.

SMITH, GEORGE OTIS.

Forests, reservoirs, and stream flow. LXII, 361.

SMITH, HAMILTON.

Memoir of. XLVI, 564.
"Temperature of Water at Various Depths in Lakes and Oceans." XIII, 73.
"The Flow of Water through Pipes." XII, 119.

"Water Power with High Pressures and Wrought-Iron Water Pipe." XIII, 15.

SMITH, ISAAC W.

"Flow of Water in Wrought and Cast-Iron Pipes from 28 to 42 Ins. in Di-ameter." XXXVI, 197. Memoir of. XXXVIII, 456.

SMITH, J. WALDO.

Contracts: "Cost plus" and other forms. LXXXIII, 798.

"Experiments on the Discharge of a 30-In. Stop Valve." XXXIV, 235. Filtration works. L, 449. Flow of sewers. XLVI, 88.

Governing of water power under variable loads. XXXVII, 24.
Grouting operations. LXXXIII, 1062.
Ice diversion and hydraulic models.
LXXXII, 1154.

Lake Cheesman Dam and Reservoir, LIII, 152. LIII, 152.
Pittsburgh flood of March 22d, 1912.
LXXVI, 331.
Temperature changes in mass concrete.
LXXIX, 1259.
Tests of water meters. XLI, 359.
Water supplies. LIX, 391.
Water supply for camps, cantonments, etc. LXXXIII, 523.

SMITH, JAMES. Memoir of. LXXIV, 518.

SMITH, JAMES ALEXANDER.

Gauge of railways, LXXVIII, 440. Pumping machinery. LIV, Part D, 547.

SMITH, LEONARD S.

Retracement-resurveys. LXXV, 429. Surveying instruments. XLVIII, 130. Topographical surveys. LXXVII, 1040.

SMITH, MALCOLM H.

Road construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 89.

SMITH, OBERLIN.

Comparative tests of electric motor and steam locomotive. XXIII, 209. Consumption and waste of water. XLVI. 433.

Destruction of rails by excessive weights. XX, 126.
Electricity vs. steam for branch railroads.

XLII, 378.

English and American railroads com-pared. XV, 748. Friction, waste and loss of water in mains. XIX, 117. English and

Highway construction. LIV, Part F, 172. Steel and masonry construction. XLIX, Unit costs of work. XLIX, 68.

SMITH, THOMAS GUILFORD. Memoir of. LXXV, 1182.

SMITH, WALTER M., Sr.

"Concrete Bridges: Some Important Fea-tures in Their Design." LXXVII, 695, Reinforced concrete buildings. LX, 466. Temperature changes in mass concrete. LXXIX, 1254.

SMITH, WALTER M., Jr.

"Concrete Bridges: Some Important Features in Their Design." LXXVII, 695.

SMITH, WALTER T.

Elevated railroads. XXXVII, 423.

SMITH, WILLIAM SOOY.

"Pneumatic Foundations." II, 411.
"The Hudson River Tunnel." XI, 314.

SMITH, WILLIAM STUART. Memoir of. LXXXI, 1815.

SMITH, WILSON FITCH.

Design of concrete bridges. LXXVII, 710.

Temperature changes in mass concrete. LXXIX, 1250.

SNELLING, WALTER O.

Investigations of explosives. LXX, 307.

SNOW, CHARLES H.

"Marine Wood-Borers." XL, 178. Quality of water supplies. XXXII, 160. Railroad location. XXXI, 111. The form of railway excavations and embankments. XXXII, 266. The Niagara Gorge, XXXII, 211.

SNOW, FRANK HERBERT.

The septic tank. XLVI, 472. Water supplies. L1X, 376.

SNOW, J. PARKER.

Erection of arch bridges. LXI, 264.
"Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Property and Other Public Utilities." LXXXI.

1311.

Forests, reservoirs, and stream flow. LXII, 450. Life of iron railroad bridges. XXXIV,

Movable bridges. LX, 315.

Pier construction in New York Harbor.

LXXVII, 540.

Prospective competitor method of valuation. LXXXIII, 1360.

Railroad construction. LI, 440.

Railroad construction. LI, 440.
Railway bridge designing. XXVI, 156.
Sand-blast cleaning of steel. L. 279.
Shear tests on joints in T-beam stems.
LXXVII, 1525.
Tests of bridge members. XXXVIII,

71.

Tests of steel. LIV, Part F, 75.
The Launhardt formula and bridge specifications. XLI, 206.
The manufacture of steel. LIV, Part E, 413.

Thin floors for bridges. XXVII, 503. Track elevation. LXXVI, 1900. Wheel concentrations and fatigue formu-

las. XLII, 211. Wind bracing in high buildings. XXVII,

228.

SNYDER, BAIRD, Jr.

Memoir of. LXXVII, 1903.

SNYDER, C. H.

Effects of San Francisco earthquake on engineering constructions. LÎX, 223.

SNYDER, GEORGE DUNCAN.

"A Resurvey of the Williamsport Division of the Philadelphia and Reading Railroad. (Abstract.)" XXXVI, 509.
Contracts: "Cost plus" and other forms.

LXXXIII, 818.

Mule-back reconnaissances. LXXV, 19. Highway Tunnels." 'Subaqueous LXXVIII, 252.

Transition curves. XLVI, 383. Tunnel surveying. LXXV, 80.

SOARES, ALFONSO JOAQUIM NOGUEIRA.

"A Brief Account of the Building of Leixões Harbor." XXIX, 194.

SOHN, JOSEPH.

Indeterminate frameworks. XLIII, 424.

SONDEREGGER, A. L.

Control of the Colorado River. LXXXI, 326.

"Hydraulic Phenomena and the Effect of Spreading of Flood Water in the San Bernardino Basin, Southern Cali-

San Bernardino Basin, Southern Can-fornia." LXXXII, 802.
"Physiography of Water-Sheds and Chan-nels, and Analysis of Stream Action of Southern California Rivers, with Refer-ence to the Problems of Flood Con-trol." LXXXIII, 1111.

SOOYSMITH, CHARLES.

"Concerning Foundations for Buildings in New York City." Heavy XXXV.

Freezing as an aid to excavation. LII,

Van Buren, Arkansas, Bridge. XX, 192.

SOPER, GEORGE A.

Albany Filtration Plant. XLIII, 342.
Decolorization of water. XLVI, 163.
Engineering ethics. XLIX, 45, 61.
Filtration of water. LIII, 232.
Lawrence, Mass., Filter. XLVI, 338.
Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa. XLVIII, 555.
Sanitary disposal of refuse. L, 120.
Sewage clarification by fine screens.
LXVVIII 1033 LXXVIII, 1033. Water purification. LX, 20 Water supplies. LIX, 387. LX, 201,

SOPER, RALPH CARROLL.

Memoir of. LXXI, 450.

SORZANO, JULIO F.

"Water Supply for the Lock Canal at Panama." LXVII, 61.

SOSA Y AVELA, FRAN.

"Note on Brick-Making in Sinaloa, Mex-ico." XVIII, 303.

SOUDER, HARRISON.

Grouted cut-off for the Estacada Dam. LXXVIII, 519.

SOULE, FRANK.

Memoir of, LXXVI, 2246.

SPALDING, F. P.

The discharge of the Mississippi. XXXV,

SPARROW, W. W. K.

Nickel steel for bridges. LXIII, 345.

SPEAR, WALTER E.

Submerged pipe work, Portland, Ore. LXXVIII, 1339. Water supply of Parkersburg, W. Va. LXXXI, 804.

SPEIDEL, HUGO S.

Memoir of. LXXXIII, 2424.

SPELLER, F. N.

Effects of straining steel. LXXX, 1475.

SPENCE, DAVID WENDEL.

Memoir of. LXXXI, 1774.

SPENCER, HERBERT.

Road construction and maintenance: Equipment and methods for maintenance: Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1171.

Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV, 615.

SPERRY, AUSTIN RUSSELL WILLARD. Memoir of. LXXXIII, 2410.

SPERRY, W. A.

Water and sewage works, Columbus, Ohio, LXVII, 342.

SPIELMANN, ARTHUR.

.Construction and maintenance of roads. VIII. 333.

"The Hudson River Tunnel." IX, 259.

SPIKER, J. S.

Mississippi Valley drainage. LXXIX. 519.

SPILSBURY, E. GYBBON.

"Mining Engineering in the States." LIV, Part A, 121. Suspension bridges. XXXVI, 435. the United

SPRAGUE, FRANK J.

Electrification of suburban zone, New York Central & Hudson River R. R. in the vicinity of New York City. LXI, 136. Steam versus electric railway operation. LVII, 496.

SPROUL, ARCHIBALD ALEXANDER, Jr. Memoir of. LXXI, 435.

STAHL, BERTHOLD.

"Method Used to Secure the Stability of a Quay Wall at the Port of Altona, on the Elbe, in Germany, which had Shifted its Position after Comple-tion." XXX, 284.

STAHLBERG, ALBERT JACOB.

STANFORD, H. R.

"Notes on Manufacture and Properties of Malleable Cast-Iron." XXXIV, 1.
"Pearl Harbor Dry Dock." LXXX, 223.
"The Inspection of Treatment for the Protection of Timber by the Injection of Creosote Oil." LVI, 1.

STANIFORD, CHARLES W.

"Brafford's Ridge Tunnel." XXXII, Cup and screw current meters. LXXVI, 852.

"Modern Pier Construction in New York Harbor." LXXVII, 503. Railroad location. XXXI, 118. "Unusual Coffer-Dam for 1 000-Foot Pier, New York City." LXXXI, 498.

STANLEY, D. S.

Jetty harbors XXVIII, 380. of the Pacific Coast.

STANTON, FRED CASWELL.

Memoir of. LXXXIII, 2338.

STANTON, ROBERT BREWSTER,

Action of frost on cement and eement mortar. LXIV, 342.

"Availability of the Cañons of the Colorado River of the West for Railway Purposes." XXVI, 283.

Effect of freezing on cement-mortar. XVI, 82.

Excessive rainfalls. XXV, 110.

Lateral earth pressures. LIII, 307 Methods of tunnel alignment, XXVII,

457

"Notes upon the Construction of a Water System for Placer Mining, and Sug-gestions for a New Method of Dam Building." XXXV, 70. Operation of passenger elevators. LXIV,

Uniform practice in pile-driving. XXVII, 167.

STANTON, T. E.

Effects of straining steel. LXXX, 1481.

STANWOOD, JAMES II.

Life of iron railroad bridges. XXXIV, 310. Memoir of. XXXVI, 590.

STARLING, WILLIAM.

Bank revetment on the Lower Mississippi. XXXV, 225.
Erosion of river banks. XXXI, 1.
Memoir of. XLVI, 566.
"On Flood Heights in the Mississippi River, with Especial Reference to the Reach between Helena and Vicksburg." VX 195.

"Some Notes on the Holland Dikes." XXVI, 559. Standard levee sections. XXXIX, 219. Suspension of solids in rivers. XXXVI,

"The Discharge of the Mississippi River."
XXXIV, 347; XXXV, 358.
"The Improvement of the Mississippi

River." XX, 85.

STAUFFER, D. McN.

"A Peculiar Case of Failure in a Water Main." VII, 14. "Fall of the Western Arched Approach

to South Street Bridge, Philadelphia, Pa." VII, 264.

Shaft Sinking under Difficulties at Dorchester Bay Tunnel, Boston, Mass." "Shaft X, 343.

"The Use of Compressed Air in Tubular Foundations and its Application at South Street Bridge, Philadelphia, Pa." VII, 287.

STEARNS, FREDERIC P.

Algæ and the purity of water supplies. XXI, 539.

Changes at the New Croton Dam. LVI,

Decolorization of water. XLVI, 175.
"Description of Some Experiments on the Flow of Water Made during the Construction of Works for Conveying the Water of Sudbury River to Boston."

XII, 1. "Disposal of Sewage in Massachusetts." XVIII, 1, 28.

"Experiments on the Flow of Water in a 48-Inch Pipe." XIV, 1. "Final Report of the Special Committee to Formulate Principles and Methods for the Valuation of Railroad Prop-erty and Other Public Utilities." erty and C LXXXI, 1311.

Going value of water-works. LXXIII,

LV111, 262. Hydraulic-fill dams. Memoir of. LXXXIII, 2132.

STEARNS, FREDERIC P .- (Continued).

"On the Current Meter, together with a Reason Why the Maximum Velo-city of Water Flowing in Open Chan-nels is below the Surface." XII, 301. Rainfall, flow of streams, and storage. XXVII, 288.

XXVII, 288.

Temperature of lakes. XXXIV, 112.

Tests of cement. LIV, Part F, 46.

The Bohio Dam. XLVIII, 259.

"The Development of Water Supplies and Water-Supply Engineering." Presidential Address at the Annual Convention at Frontenac, Thousand Islands, N. Y., June 26th, 1906. LVI, 451.

The hydraulic jump. LXXX, 367.

The sewerage system of Milwaukee, XXX.

The sewerage system of Milwaukee, XXX. 710.

The Shone hydro-pneumatic system of sewerage. XXVIII, 57. Verification of Bazin weir formula. LXXXIII, 169.

Water power of the Falls of St. Anthony. XII, 423.

STEARNS, FREDERICK L. Municipal refuse disposal. LX, 422.

STECKEL, R. Spirit leveling. XXXIX, 392.

STEECE, EMMET A.

Rainfall, and run-off in storm-water sewers. LVIII, 501. Street paving crowns. LXXIII, 228.

STEELE, HENRY MAYNADIER. Memoir of, LXVII, 631.

STEELE, J. DUTTON.

Anthracite coal trade and labor question. I, 372.
Bridge accidents. IV, 211.
Caissons of the East River Bridge. I, 366; also, II, 132.
Cheap freight transportation. IV, 262.
"Compressed Air as a Motor for Subterranean Railways." I, 244.
Crushing strength of American iron. II,

230.

230.

"Early History of Railways and Origin of Gauge." II, 53.
Erection of bridges. IV, 206.
Fires In coal mines. III, 153.
Manufacture and wear of rails. I, 257.

"Nesquehoning Tunnel." I, 349.

"On Skew Bridges, and on the Construction of Falls Skew Bridge over the Schuylkill, near Philadelphia." I, 200. 209.

Rails. III, 110.

Ranis. 111, 140.
Rapid transit in large cities. IV, 243.
Report of the Committee on "Railway Signals." IV, 147, 238 (1875).
Retaining walls. III, 74.
"Tests of Bridge Irons." II, 223.
Unright grobed bridges. III, 216.

Lests of Bridge Irons." 11, 223. Upright arched bridges. 111, 216. Water front of the City of New York. III, 188.

Water power of the Falls of the Ohio River. II, 270.

STEERE, EDMUND JOB. Memoir of. LXXX, 2216.

STEIN, M. F.

Economic conduit location. LXXVII, 785.

STEINMAN, D. B.

"Stress Measurements on the Hell Gate Arch Bridge." LXXXII, 1040.

STENGEL, C. II.

Engineering education. LXXV, 1120. Pier construction in New York Harbor. LXXVII, 544.

STENGER, E.

Financial management of water-works. XXXVIII, 24.

STEPHENS, CLINTON FITCH. Memoir of. LXXIX, 1462.

STEPHENS, GEORGE HIPPESLEY STAN-LEY.

Memoir of. LXXXIII, 2412.

STEPHENSON, F. H. Washing rapid sand filters. LXXX, 1383.

STERN, EUGENE W.

Action of frost on cement and cement mortar, LXIV, 344.
American highways. LXXXIII, 565.
Earth pressures and bracing. LX, 52.
Effect of earthquake shock on high buildings. LXI, 250.
Effects of San Francisco earthquake on

engineering constructions. LIX, 273. Faults in the theory of flexure. LXXV,

Precarious engineering expedients.

LXVII, 46.

Reinforced concrete bridges. LIX, 206. Reinforced concrete buildings. LX, 491. Reinforced concrete docks. LXXVIII, 1113.

Steel and masonry construction. XLIX, Structural design of buildings. LIV,

461. he bonding of new to old concrete. The LXIV, 275. Use of reinforced concrete. LXI, 65.

STEVENS, EDWIN AUGUSTUS. Memoir of. LXXXII, 1708.

STEVENS, F. S.

The creeping of rails. LIII, 485.

STEVENS, J. C.

Determination of duty of water. LXXXIII, 252.
"Hydrometry as an Aid to the Success-

ful Operation of an Irrigation System." LXXI, 314.

Rainfall and stream flow. LIX, 502, "The Accuracy of Water-Level Recorders and Indicators of the Float Type." LXXXIII, 894.
"The Duty of Water in the Pacific Northwest." LXXXIII, 2094.

STEVENS, P. E.

Reinforced concrete buildings. LX, 496. Size of high-pressure water-power pipe. LIX, 182.

STEVENS, SIMON.

Enlargement of the Erle Canal. XIV,

STEVENSON, A. A. Tests of steel. LIV, Part F, 75,

STEVENSON, C. L. Irrigation, XVI, 123.

STEVENSON, D. and C.

Artificial waterways. LIV, Part F, 287. Lighthouses and other aids to naviga-tion. LIV, Part B, 63.

STEVENSON, J. D.

Water supply of Parkersburg, W. Va. LXXXI, 832.

STEVENSON, JOHN J.

Geology in its relations to topography. XXXIX, 88.

STEVENSON, W. L.

Sewage clarification by fine screens. LXXVIII, 962.

STEWARD, W. G.

"Experiments on Weir Discharge." LXXVI. 1045.

STEWART, SPENCER J.

Sand-clay mixtures for road surfacing. LXXVII, 1484.

STEYH, WILLIAM.

Brick manufacture and brick pavement. XXVI, 409.

STICKNEY, G. F.

"The Compensating Works of the Lake Superior Power Company." LIV, 346.

STILES, W. M.

Protection of steel and aluminum exposed to sea water. XXXVI, 496.

STILLWELL, L. B.

"Electrical Power — Generating Stations and Transmission." LIV, Part D, 357. The substitution of electricity for steam as a motive power. LIV, Part E, 62.

STITES, ARCHER COCHRAN.

Memoir of. LVI, 475. Railway bridge designing. XXVI, 257.

STIXRUD, MARTINIUS.

Memoir of. LI, 463.

STONE, E. A.

Nickel steel for bridges. LXIII, 341.

STONE, E. HERBERT.

"The Determination of the Safe Working Stress for Railway Bridges of Wrought Iron and Steel." XLI, 467.

STONE, GEORGE B.

Depreciation of public utility properties. LXXVII, 880.

STONE, HENRY MORTON.

Memoir of. LXXXIII, 2340.

STONE, WATERMAN.

Cylindrical wheels and flat-topped rails for railways. XXI, 179. Memoir of. XLI, 649.

STONEY, EDWARD W.

Economics of steel arch bridges. LXXXIII, 85.

STORER, N. W.

Electric locomotives. LXIX, 426.

STOREY, FRANK BURNS. Memoir of. LXXIX, 1492.

STOREY, W. B., Jr.

Railroad location. XXXI, 91.

STOTT, HENRY GORDON.

Electrification of suburban zone. New York Central & Hudson River R.R. in the vicinity of New York City. LXI. 140.

Investigations of efficiency of gas engines, LXX, 313 Memoir of, LXXXI, 1776.

STOUGHTON, BRADLEY,

"Notes on the Metallography of Steel." LIV, Part E. 357, 418.

STOUT, O. V. P.

Surveying, LIV, Part B. 450.

STOWELL, CHAS. F.

American rallroad bridges XXI, 584. Elevated railroads, XXXVII, 414.

STRACHAN, JOSEPH.

Brafford's Ridge Tunnel, XXXII, 59.

STRACHAN, R. C.

Determination of storm-water run-off. LXXVIII. 1165.

"Nomographic Solutions for Formulas of Various Types." LXXVIII, 1359.

STRATTON, GEORGE DRAPER. Memoir of. LVI, 481.

STRAUB, THEODORE A.

The Sewickley Cantilever Bridge, LXXVI. 629.

STREHAN, GEORGE E.

"Cinder Concrete Floor Construction Be-tween Steel Beams." LXXIX, 523. Cinder concrete floors. LXXVII, 1812.

STRICKLER, G. B.

Almendares River Reinforced Concrete Bridge, LXXIV, 250.

STRIEDINGER, JULIUS H.

Improvement of sedimentary rivers, XX.

"On Igniting Blasts by Means of Elec-

"On tenting masse by Means of Electricity." VII. 1.
"On the Simultaneous Ignition of Thousands of Mines, and the Most Advantageous Grouping of Fuses." VI, 177.

STROBEL, C. L.

American railroad bridges. XXI, 592. Cylindrical wheels and flat-topped rails for railways. XXI, 191. "Experiments upon Z-Iron Columns."

XVIII, 103. Kentucky and Indiana Bridge, XVII.

STROBEL, C. L.—(Continued).

Niagara Cantilever Bridge. XIV, 583. Test of steel bridge compression members. XX, 260.

Wind pressure on bridges. LIV, 42. Wrought-iron columns, tests and formulæ, XI, 98,

STROHL, R. M.

"The St. John Levee and Drainage District of Missouri." LXXIX, 493.

STRONG, A. M.

Forests, reservoirs, and stream LXII, 377. flow.

Retracement-resurveys. LXXV, 427. Run-off from rainfall and other data. LXXIX, 1160.

The Storage of Flood-Waters for Irri-gation: A Study of the Supply Avail-able from Southern California Streams." LXXVII, 67. "The

STROUSE, W. F.

"The Reconstruction of the Passenger Terminals at Washington, D. C. LXXI, 11.

STUART, A. A.

A concrete sewer on piles. XXXI, 576. Elevated railroads. XXXVII, 392. Tornadoes and wind bracing for high buildings. XXXVII, 295.

STUART, FRANCIS LEE.

"The National Railroad Question of To-day." LXXXIII, 927. Tunnel construction methods. LXXXI.

481.

STÜBBEN, J.

"Practical and Aesthetic Principles for the Laying Out of Cities." (Translated from the German by W. H. Searles.) XXIX, 718.

STURDEVANT, JAMES H.

Road construction and maintenance: Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1169,

STURTEVANT, C. W.

Dredges: Their construction and performance. LIV, Part C, 505.

STUT, J. C. II.

Disposal of municipal refuse. LIV, Part E, 332.

SULLIVAN, J. G.

Tunnel construction methods. LXXXI, 489

SULLIVAN, VERNON L.

"Construction Methods Used in Building the Lower Reservoir Dam of the Balmorhea Project." LXXXIII, 305. the

SUNDSTROM, C. A.

Surveying instruments. XLVIII, 113. The Bohio Dam. XLVIII, 299. Transition curves. XLVI, 385.

SUPLEE, H. H.

Continuous rope driving. XXXIX, 178.

SUTERMEISTER, ARNOLD HENRY.

Memoir of. LXXXIII, 2342.

SUTHERLAND, K.

Bridge substructure and foundations in Nova Scotia. XXX, 567.

SWAAB, S. M.

Bridge and subway specifications. LXXV,

SWAIN, GEORGE FILLMORE.

Engineering education. LVII, 141, 177; LXXV. 1110.

"Final Report of the Special Committee on Steel Columns and Struts." LXXXIII, 1583.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV, 665.

Forests, res LXII, 365. reservoirs, and stream flow.

Hydraulics of fire streams. XXI, 470.

Hydraunes of fire streams. AXI, 440.
"On a New Principle in the Theory of Structures." LXXXII, 622.
"On the Calculation of the Stresses in Bridges for the Actual Concentrated Loads." XVII, 21.
Progress Report of Special Committee

on Steel Columns and Struts." LXVI,

Railway bridge designing. XXVI, 118, "Report of Progress of the Committee on the Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264

(1889); AVII, 210 (1881); AVIII, 210 (1888).

"Some Tendencies and Problems of the Present Day and the Relation of the Engineer Thereto." Address at the Annual Convention, in Ottawa, Ontario, June 18th. 1913. LXXVI, 1112.

"Specifications and Methods of Tests for Portland Cement." LXXXII, 166.

Specifications for strength of iron bridges. XV, 446. Steel and masonry construction. XLIX,

Three-span suspension bridges. LV, 118. Translation of paper by G. Kecker. XXIX, 491.

SWAN, CHARLES HERBERT.

Memoir of. XLVI, 568. "Note on Kutter's Diagram." IX, 326.

SWANITZ, H. W.

Hydraulie-fill dams. LXXXIII, 1811.

SWANKER, JOHN EDWARD.

Memoir of. LXXXII, 1711.

SWEENY, F. R. I.

"The Burden Water-Wheel." LXXIX, 708.

SWEET, CHARLES A.

Inter-oceanic canal projects. IX, 25.

SWEET, ELNATHAN.

Canals from the Lakes to New York.

XLV, 282.
"Some Important Phases of Canal Navigation, Illustrated by Recent Experiments in Germany." XLVII, 435.

SWEET, ELNATHAN—(Continued.)

Engineering Problems Involved the Proposed Improvement of the

in the Proposed Improvement of the Eric Canal by Increasing the Depth of the Channel One Foot." IX, 99. "The Radical Enlargement of the Artifi-cial Waterway between the Lakes and the Hudson River." XIV. 37, 128. "Web Strains in Simple Trusses with Parallel or Inclined Booms." IX, 415.

SWEETSER, C. II.

Water-bound macadam roads, LXXVI, 991.

SWEITZER, N. B.

"Origin of the Gulf Stream and Circulation of Waters in the Gulf of Mexico with Special Reference to the Effect on Jetty Construction." XL. 86.
"Retracement-Resurveys — Court Decisions and Field Procedure." LXXV,

SWENSSON, EMIL.

"Final Report of the Special Committee on Concrete and Reinforced Concrete.
LXXXI, 1101.

"Final Report of the Special Committee on Steel Columns and Struts." LXXXIII,

Fire-proof construction, XXXIX, 158, Loadings for railroad bridges. LI, 109, "Progress Report of Special Committee on Concrete and Reinforced Concrete."

LXVI, 481.
"Progress Report of Special Committee
on Steel Columns and Struts." LXVI, 401.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385.

SWENSSON, O. J.

Laramie-Poudre Tunnel. LXXV, 763.

SWICKARD, ANDREW.

Durability of wooden stave pipe. LVIII, 77.

SWIFT, A. J.

Proper relation to each other of the sections of railway wheels and rails. XXI, 296. Railway bridge designing. XXVI, 220.

SWIFT, McREE.

Memoir of, XXXVI, 616.

SWIGART, S. G.

Halligan Dam. LXXV, 132.

SYMONS, THOMAS W.

Canals from the Lakes to New York, XLV, 240.

Economic depth for canals. XXXIX, 300. Improvement of Gray's Harbor, Wash. XXXII, 486.

MAXII, 489.
Improvement of harbors, XXX, 596.
"Improving the Entrance to a Bar Harbor by a Single Jetty," XXXVI, 109,
"Jetty Harbors of the Pacific Coast,"
XXVIII, 155, 383. Reaction breakwater. XLII, 516.

SYMPHER, LEO.

Traffic on waterways and on railroads. LIV, Part B, 495.

TABER, GEORGE AYMAR.

Surveying instruments. XLVIII, 130,

TABOR, ERNEST FREDERICK.

Memoir of. LXXX, 2218.

TAFT, HARRISON S.

Pearl Harbor Dry Dock. LXXX, 297. Pier construction in New York Harbor.

LXXVII, 525.
"Reinforced Concrete Docks: Foreign
"Reinforced Structures. Failures," Costs, and General Considerations. LXXVIII, 1058.

TAGGART, RALPH C.

"Expansion of Pipes." LXX, 1.

TAINTOR, WILLIAM NOYES.

Memoir of. XXXIX, 704.

TAIT, JOHN G.

Dry docks — stone vs. wood. XLI, 586. Jordan Level, Erie Canal. XLIII, 593.

TALBOT, ARTHUR N.

Address at the Annual Meeting, January 15th, 1919. LXXXIII, 404. Bond-friction-resistance in reinforced concrete. LXXIII, 274.

Brick manufacture and brick pavement. XXVI, 414. Concrete and concrete-steel. LIV, Part

E. 564.

Engineering education. LVII, 170.

"Final Report of the Special Committee on Concrete and Reinforced Concrete."

LXXXI, 1101.

Flood waves in sewers. XXVIII, 199.
"Progress Report of Special Committee
on Concrete and Reinforced Concrete." LXVI. 431

"Progress Report of the Special Com-

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 285.
"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.
"Tests of Built-up Steel and Wrought-Iron Compression Pieces." LXV. 202.
Tests of large steel columns. LXXIII. Tests of large steel columns, LXXIII,

The transition curve. XXVIII, 35.

TALCOTT, E. N. KIRK.

Motive power for street railways, XXVII,

"The Manufacture of Pig-Iron." I, 191.

TALCOTT, T. M. R.

Mexico and Pacific Railroad, LXXX, 1614.

TAPPAN, ROGER.

Memoir of, LXXXII, 1735.

TARR, R. G.

Railroad location. XXXI, 99.

TASKER, STEPHEN PASCHALL MOR-

Memoir of. XLVI, 572.

TATNALL, GEORGE.

Memoir of. LVIII, 544. Protection of steel and Protection aluminum. XLIII, 464. The creeping of rails. LIII, 491.

TATUM. SLEDGE.

Memoir of. LXXXI, 1779.

TAUSSIG, H. P.

American railway line, V City of Mexico, XV, 838. Vera Cruz to

TAYLOR, ARTHUR.

"Some Experiments with Mortars and Concretes Mixed with Asphaltic Oils." LXXVI, 1094.

TAYLOR, EDWARD B.

American grain elevators. XXX, 583.

TAYLOR, H. BIRCHARD.

Hydro-electric power development. LXXVIII, 1556 Performance of reaction turbine. ล LXXVIII, 1289.

TAYLOR, H. M.

Mexico and Pacific Railroad, LXXX. 1618.

TAYLOR, HENRY.

"Reconstruction of the Norfolk and Western Railway Company's Bridge Over the Ohio River at Kenova, West Virginia." LXXIX, 411.

TAYLOR, JOHN.

How to build a stone jetty. LXXV, 1052.

TAYLOR, LUCIAN ARNOLD.

Memoir of, LXXIX, 1464.

TAYLOR, NORMAN ALFRED.

Memoir of. LXXI, 451.

TAYLOR, ROY.

Differential surge tank. LXXVIII, 785.

TAYLOR, SELWYN MELLON.

Memoir of, LII, 552.

TAYLOR, STEVENSON.

Physical valuation of railroads. LXXVII.

TAYLOR, T. U.

Storage for impounding reservoirs. LXXVII, 1641.

TAYLOR, WILLIAM DANA.

Memoir of, LXXIV, 520.
"Pioneer Railway Development in the United States." LXXIV, 94.
"The Location of the Knoxville, La Fol-

The Location of the Known, the Louis-lette and Jellico Railroad, of the Louis-ville and Nashville System." LII, 467. Valuation of railroad properties. 353.

TAYLOR, WILLIAM GAVIN.

Reinforced concrete pipe. LX, 148. Water and sewage works, Columbus, Ohio. LXVII, 397.

TAYS, E. A. H.

Sand-blast cleaning of steel. L, 290.

TEICHMAN, F.

Reinforced concrete pipe. LX, 142. "Rotating Screen of Power Canal, Salt River Project." LX, 337.

TEIGEN, THOMAS WILLIAM ROSTAD. Memoir of. LXXV. 1193.

TEMPLE, E. B.

"The New York Tunnel Extension of the Penusylvania Railroad. Meadows Division and Harrison Transfer Yard." LXVIII, 75.

TERANO, S.

"Experiments on Vibration of the Jap-anese Torpedo-Boat Destrovers, Haru-same and Hayatori." LIV, Part D, 89. "The Development of Japanese Shipbuilding." LIV, Part D, 43.

TERRY, ARTHUR L., Jr.

Purification of ground-waters. LXIV, 185.

TERRY, EDWARD CLINTON.

Memoir of. LXXXI, 1781.

THACHER, EDWIN.

"Concrete and Concrete Steel in the United States," LIV, Part E. 425, 612, "Description of a Combined Triangular and Suspension Bridge Truss, and Comperison of its Cost with that of Warren. Pratt, Whipple and H Trusses." XIII, 123.

Questions in reinforced concrete design.

LXX, 85, Railway bridge designing, XXVI. 13; Red Rock Cantilever Bridge, XXV Reinforced concrete floor systems. XXV, LVI, 317.

Specifications for strength of iron bridges. XV, 461.

XV, 461.

Stresses in railway bridges on curves.

XXV, 496.

"Tables of the Strength of Cast-Iron Columns," II, 294.

The American railroad viaduct. XXV, 361.

Train loadings for bridges. XXXI, 193.

Use of reinforced concrete. LXI, 42.

Weights of bridges, XVI. 227.

Wheel concentrations and fatigue formulas. XLII, 212.

THACKRAY, GEORGE E.

Designing and erection of the Oakley Arch, XXIII, 182.

"Final Report of Special Committee on Rail Sections." LXX, 456.

THAYER, W. W.

"The Philadelphia Tunnel of the Balti-more and Ohio Railroad, its Construction and Cost." XXVI, 529.

THOMAS, ARTHUR TOWNE. Memoir of, XLIX, 360,

THOMAS, B. F.

Artificial waterways. LIV, Part F, 287. Improvement of rivers. XLIX, 314. Levees of the Mississippi River. LI, 380. "Moyable Dams." XXXIX, 431.

THOMAS, D. G.

Use and care of the current meter. LXVI, 129. ater purification at Steelton, Pa. LXVI, 208. Water

THOMAS, GEORGE E. Freezing as an aid to excavation. LII,

Memoir of. LXI, 571.

THOMAS, JOSEPH RUSSELL. Memoir of, XXXVII, 566.

THOMAS, PERCY H.

High-voltage power transmission. 246.

THOMAS, R. J.

Highway construction. LIV, Part F, 163.

THOMAS, T. C.

Movable dams. XXXIX, 573.

THOMES, E. H

Oil-mixed Portland cement mortar and

concrete. LXXIV, 281.
Paving practice in Chicago. LXVI, 35.
Road construction and maintenance: Cement-concrete pavements. LXXVII.

maintenance: Road construction and Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1128.

Road construction and maintenance:
Use of bituminous material in penetration and mixing methods. LXXV,

580.

THOMPSON, BENJAMIN.

The engineer and the inspection of work. LVI, 126.

THOMPSON, CLARK WALLACE. Memoir of. LXXXII, 1732.

THOMPSON, JOHN CHAMBERS. Memoir of. XXXVI, 584.

THOMPSON, JOHN T.

"The Art of Designing and Construc-ing Small Arms." LIV, Part B, 351.

THOMPSON, MISSAC.
Contracts: "Cost plus" and other forms.
LXXXIII, 795.

THOMPSON, R. A.

"Method Used by the Railroad Commission, of Texas, under the Stock and Bond Law, in Valuing Railroad Properties." LII, 328.

The valuation of public service property. LXXII, 200.

THOMPSON, S. C.

Brick manufacture and brick pavement. XXVI, 405. Maintenance of asphalt streets. XLIX,

206 Road building. XLI, 117. THOMPSON, SANFORD E.

Concrete and concrete-steel, LIV, Part

Impervious concrete. LI, 130. Impurities in sand for concrete. LXV, 250, 271. Questions in reinforced concrete design.

LXX, 128.
Road construction and maintenance:

Cement-concrete pavements. LXXVII, Steel stresses in flat slabs. LXXVII,

1395.

"The Laws of Proportioning Coucrete." LIX, 67.

Unit costs of work. XLIX, 70. Use of reinforced concrete. LXI, 46.

THOMPSON, W. G. B.

American highways. LXXXIII, 550.

THOMPSON, WILFORD A.

Railroad location. LIV, 142.

THOMSON, E. BURSLEM.

Foreshore protection. L, 89.

THOMSON, GEORGE H.

Bridge experiments with moving train-XLI, 456. loads.

Continuous superstructure of the Memphis Bridge. XXX, 559.

Early building.

XXXVII, 5.

Memoir of. LXXI, 438.

Painting of iron structures. XXXIII,

Proper relation to each other of

Proper relation to each other of the sections of railway wheels and rails. XXI, 297.

Protection of piles from the Teredo. XXXI, 233.

Tests of bridge members. XXXVIII, 73.

"The DeWitt Clinton." XXIII, 44.

The Halsted Street Lift-Bridge. XXXIII, 27 37.

The strength of pillars. XXXV, 411. Thin floors for bridges. XXVII, 506. Use of mild steel. XXX, 681. Weights of bridges. XVI, 241.

THOMSON, JOHN.

"A Memoir on Water Meters." XXV, 40, 68, 569.

Bridge painting. XXXIX, 32.
Brooklyn Elevated R.R. improvement.
XXXII, 378.

Consumption and waste of water. XXXIV, 205.

205.
Hydraulics of the Hemlock Lake Conduit, and restriction of the use and waste of water in Rochester, N. Y. XXVI, 44.
New facts about eye-bars. LVI, 435.
On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 455.
"Platen Presses for Letter-Press Printing, Embossing, Cutting and Scoring." XXXII, 493.
"Proportional Water Meter. Specially

"Proportional Water Meter, Specially Adapted to Inferentially Measure the Total Discharge of Nozzles." XXIV, 528.

Tests of water meters. XLI, 353.

THOMSON, SAMUEL FORSYTHE.

Memoir of. LXXXI, 1817.

THOMSON, T. KENNARD.

Bridge experiments with moving trainloads. XLI, 455.

Caisson disease and its prevention. LXV,

Cape Cod Canal. LXXXII, 154. Classification of irrigable lands. LXXXI, 243.

Coffer-dam for 1000-foot pier. LXXXI,

551. Concrete tunnel lining. XXXI, 325. Cost keeping. LXIV, 422.

Dams on sand foundations. LXXIII, 193. practice bridge Early in building. XXXVII, 12.

Earth pressure and stability. LXX, 389. Earth pressures and bracing. LX, 45. Economics of LXXXIII, 43, steel arch bridges.

Elevated railway improvements. LXXXII, 747.

Foundations for heavy buildings, XXXV.

"Foundations for the New Singer Building, New York City." LXIII, 1.

Freezing as an aid to excavation.

Grading contracts. LVIII, 372.

Municipally owned public utilities. LXXX1, 424. National railroad question of to-day,

LXXXIII, 935.

Notes on tunnel lining, LXXXIII, 1904. Physical valuation of railroads. LXXVII,

Pneumatic foundations for buildings. LXI, 231.

Proposed New York and New Jersey Vehicular Tunnel. LXXXIII, 468.

Reconstruction of Kenova Bridge. LXXIX, 484.

Repairing a swing bridge, LXXXIII, 1107.

Reservoirs for flood control. LXXXII, 1497.

"Rust — As Shown in the Removal of a Seventeen-Story Building." LXXI, 200.

Sinking a wet shaft. LXXIII, 419. Subway tunnel work. LXXXI, 398. Suspension bridges. XXXVI, 471.

Tests of concrete in sea water. LXXXI, 676.

The Launhardt formula and bridge specifications. XLI, 198.

Tidal phenomena in New York Harbor. LXXVI, 2096.

Train loadings for bridges. XXXI, 211. Tunnel construction methods. LXXXI,

Underpinning of heavy buildings. XXXVII, 54.

"Underpinning the Cambridge Building, New York City." LXVII, 553,

Underpinning Trinity Vestry Building. LXXX1, 104.

Use of reinforced concrete. LX1, 52. Valuation of land. LXXXI, 628.

Water supply for camps, cantonments, etc. LXXXIII, 521. Water supply of Parkersburg, W. Va. LXXXI, 805.

West Side Manhattan water-front. LXXV,

THORNDIKE, JOHN LARKIN. Memoir of. LX, 590.

THORP, RICHARD FENWICK. Memoir of, LXXI, 442.

THORPE, JOHN E. STIRLING.

Evaporation from Lake Conchos, Mexico. LXXX, 1918.

THRUPP, EDGAR C.

Flow of water in pipes. XLVII, 234; also, LI, 315. Fountain flow of water in vertical pipes. LV11, 302.

THURSTON, E. T.

Agreements for building contracts. LXVII, 497.

Water supply for camps, cantonments, etc. LXXXIII, 524.

THURSTON, ROBERT H.

"A Note on the Resistance of Materials."
(1873) 11, 239.
"A Practical Method for Reducing the Internal Wastes of the Steam-Engine."
XXIII, 39; XXV, 15.
Brick manufacture and brick pavement.

XXV1, 407.

"Efficiency of Furnaces Burning Wet buel, as Determined by Experiments on a Large Scale." III, 290; IV, 88. Eye-bar tests. XXXI, 418.

Eye-bar tests. XXXI, 448.
Fiexure of beams. III, 128; IV, 284.
Journal friction. XIII, 438.
"Note on the Resistance of Materials."
(IS75.) IV, 334.
"Note on the Resistance of Materials, as Affected by Flow and by Rapidity of Distortion." V, 199.
"Note Relating to Rumford's Determination of the Mechanical Equivalent of Heat." II, 289.
"On a New Method of Detecting Overstrain in Iron and Other Metals, and on its Application in the Investigation of the Causes of Accidents to Bridges and Other Constructions." VII, 53. VII, 53.

"On a Newly Discovered Relation between the Tenacity of Metals and their Resistance to Torsion." VII, 169. "On the Permanent Effects of Strain in Metals; on their Self-Registration and Mutual Interactions." XXIV, 159, 184; XXV, 18.

"On the Real Value of Lubricants and on the Correct Method of Comparing Prices." XIII, 476.

"On the Strength, Elasticity, Ductility and Resilience of Materials of Machine Construction, and on Various Hither-to Unobserved Phenomena, Noticed during Experimental Researches with a New Testing Machine, Fitted with an Antographic Registry." II, 349 (Section I); III, 1 (Section II).

"On the Variation due to Orthogonal Strains in the Elastic Limit in Metals, and on its Practical Value and More Important Applications." IX, 173.

Screw steamship and tow-barge effi-ciency, XXV, 387. "Strength and Ductility of the Copper-Tin-Zinc Alloys." X, 309.

THURSTON, ROBERT H.—(Continued).

"The Rate of Set of Metals Subjected
to Strain for Considerable Periods of

VI, 28. Time.

Time." v1, 28.

"The Strength and Other Properties of Materials of Construction, as Deduced from Strain Diagrams Automatically Produced by the Autographic Recording Testing Machine." V, 9.

"The Strongest of the Bronzes. A Newly Discovered May of Maximum Strongth."

Discovered Alloy of Maximum Strength.

Working stress for bridges. XLI, 509.

THWAITES, W.

Sewage disposal, LIV, Part E, 214.

TIBBETTS, FRED. II.

Reservoirs for flood control, LXXXII, 1503

Weather Bureau service in California. LXXXI, 177.

TIDD, MARSHALL M.

Memoir of. XXXVII, 568. Rainfall and the flow of streams. X, 239.

TIGHE, JAMES L.

Storage for impounding reservoirs. LXXVII, 1646.

TILDEN, C. J.

Collapse of a building during construc-tion. LIII, 13.
"Final Report of the Special Committee on Materials for Road Construction and on Standards for Their Test and Use. LXXXII, 1384. "Kinetic Effects of Crowds." LXXVI.

2107.

Safe stresses in steel columns. LXI, 195,

TILLSON, GEORGE W.

"Asphalt and Asphalt Pavements."
XXXVIII, 215.
"Final Report of the Special Committee
on Materials for Road Construction and
on Standards for Their Test and Use."
LXXXII, 1384.
"Winel Report of the Special Committee

"Final Report of the Special Committee to Investigate the Conditions of Employment of, and Compensation of, Civil Engineers." LXXXI, 1207.
Flow in sewers. XLVI, 88.
Flushing in pipe sewers. XL, 27.
Pavements. LIX. 336.
Partland comment concrete. XXXVII.

Portland cement concrete. XXXVII,

Preservation of railway ties. XLV, 532. Road building. XLI, 111. Road conditions in California. XLVIII,

oad construction and maintenance: Cost records and reports, LXXVII. Road 147.

Road construction and maintenance: Factors limiting the selection of materials and of methods in highway construction. LXXVII, 1139.
Road construction and maintenance:

Pillers for brick and block pavements. LXXV, 527, 545. Road construction and maintenance: Use of bituminous material in penetration and mixing methods. LXXV,

Stave pipe. XLI, 60. Street grades and cross-sections. XLII, 13.

Street traffic in New York City. LVII.

Theory and practice of special assessments. XXXVIII, 406.
Theory of concrete. XLII, 118.
Timber preservation. LXXI, 384.
Water-works of Porterville, Cal. LIV,

TIMONOFF, V. E.

"Temporary Dry Docks for Rapid Construction." LIV, Part F, 397, 437.

TINGLEY, GEORGE CURTIS.

Memoir of. LIII, 510,

TISDALE, CHARLES HARRY. Memoir of. LXXVI, 2258.

TOCH, MAXIMILIAN.

Painting structural steel. LXXVII, 971.

TODD, A. MILLER,

Forests, reservoirs, and stream flov LXII, 340, Natural waterways, LIV, Part D, 454, River hydraulies, XLIII, 230, reservoirs, and stream flow.

TOLL, ASAHEL C.

Rain and run-off near San Francisco. LXI, 520. Size of high-pressure water-power pipe. LIX, 192.

TOLMAN, EDWARD MAYO.

Water supply of Parkersburg, W. Va. LXXXI, 838.

TOMKINS, CALVIN.

American highways. LXXXIII, 568. Brick manufacture and brick pavement.

XXVI, 400.

Controverted questions in road construc-tion, XXVIII, 121. National railroad question of to-day.

National Fairroad question of to-LXXXIII, 950.

Proposed New York and New Je Vehicular Tunnel, LXXXIII, 474.
Road building, XLI, 104.

Steel concrete construction, XXX Jersey

XXXIX.

637.

Tests of fire-proof MANY 128.

XXXV, 128.

Brick Industry about New York

1811 1981

West Side Manhattan water-front, LXXV.

TOMLINSON, A. T.

Elevated railroads. XXXVII, 441.

TOMPKINS, E. De V.

West Side Manhaftan water-front. LXXV,

TOMS, JAY WILLIAM.

Memoir of, LXXXIII, 2425.

TORREY, D.

Use of steel for bridges. VIII, 290,

TOTTEN, JOSEPH G.

Memoir of, XXXVI, 525.

TOUCEY, JOHN MONTGOMERY,

Memoir of. XLV, 644.

TOWER, ASHLEY BEMIS. Memoir of. XLIX, 361.

TOWER, BEAUCHAMP. Journal friction. XIII, 459.

TOWER, MORTON L.

Concrete piles. LXV, 488. How to build a stone jetty. LXXV, 1057. Memoir of. LXXX, 2220. "Notes on the Bar Harbors at the En-

trances to Coos Bay, and Umpqua and Sinslaw Rivers, Oregon." LXXI, 349.

TOWLE, STEVENSON.

Memoir of, LXXX, 2223.

TOWNE, HENRY R.

Journal friction. XIII, 450. Strength of wrought-iron struts and of structural steel in the form of beams and struts. XIII, 285.

TOWNSEND, C. McD.

"Final Report of the Special Committee on Floods and Flood Prevention." LXXXI, 1218.

The discharge of the Mississippi. XXXV, 336.

TRASK. F. E.

"The Irrigation System of Ontario, California - Its Development and Cost.

LV, 173.
"The Ontlet Control of Little Bear Valley Reservoir." LXVI, 280.

TRATMAN, E. E. RUSSELL.

Bank revetment on the Lower Mississippi. XXXV, 223.
Brooklyn Elevated R.R. improvement.
XXXII, 279.

Concrete tunnel lining. XXXI, 325. Construction of railway tracks. XXV.

Controverted questions in road construction. XXVIII, 113.
Cost of operating cable railways. XXVIII, 460.
Electric rock blasting. XXVIII, 149.
"English Railroad Track." XVIII, 217; XX, 67.

Gauges of railway track. XXX, 541.
Influence of rails on street pavements.
XXXVII. 114.

AXXVII, 114.

1ce diversion and hydraulic models.

LXXXII, 1165.

Irrigation. XVI, 125.

"Longitudinals vs. Cross-Ties for Railway Tracks." XXV, 615.

Metal railroad ties. XVIII, 261.

Metal railroad ties at your railways.

Motive power for street railways. XXVII,

Power plant at Ogden, Utah. XXXVIII,

308.
Preservation of railroad ties. XLII, 353.
Proposed New York and New Jersey
Vehicular Tunnel. LXXXIII, 479.
Railroad signaling—the block system.
XXXII, 456.
Railroad terminals. LIV. Part F, 539.
Railway signaling. XXVIII, 291.
Street railway track. XXIV, 129.
Street railway track construction. LXXVI,
466.

"The Improvement of Railway and Street Railway Track." XXII, 135.

Twenty-eighth Street electric light and power central station. XXXV, 455. Underground railways. LIV, Part F,

TRAUTWINE, JOHN C., Jr.

Albany Filtration Plant. XLIII, 327. Construction of a water system for placer mining and suggestions for a new method of dam building. XXXV,

Consumption and waste of water. XLVI,

Flow of water in Ogden, Utah, pipe line.

XL, 528. Induced currents of fluids. LXXX, 911. Locomotive performance on grades. LXX, 330.

On the loss of head resulting from the passage of water through a 24-inch stop valve. XXVI, 458. enstock and surge-tank problems.

Penstock and LXXIX, 281.

Proportional water meter. XXIV, 535.
Road construction and maintenance:
Engineering organizations for highway
work. LXXVII, 1111.
The nozzle as an accurate water meter.

The nozzle as an accurate water XXIV, 518.

Transverse breaking strain of plate glass. XXV, 226, 635.

Tuberculation in water pipes. XXVIII,

Uniform practice in pile-driving. XXVII,

TRAVELL, WARREN B.

Action of water under dams. LXXX, 454. Road building. XLI, 123.

TREADWELL, LEE.

Elevated railroads. XXXVII, 426. Railway bridge designing. XXVI, 257. The Halsted Street Lift-Bridge. XXXIII,

TRIBUS, L. L.

"Driven Wells of the Plainfield Water Supply System." XXXI, 371. Filtration works. L, 455. Financial management of water-works. XXXVIII, 22.

Friction, waste and loss of water in mains. XIX, 124. Gravity sand filters at Nyack, N. Y.

Gravity san XLV, 494.

Lawrence, Mass., Filter. XLVI, 347. Maintenance of macadam and o roads. LXI, 459. other

Municipal refuse disposal. LX, 406.

Old-time water-wheels of America.

XXVIII, 249.

Principles of valuation. LXXIX, 174.

Road construction and maintenance:

Cost records and reports. LXXVII, 132.

fication. XLII, 179.

The Santa Ana Canal of the Bear Valley Irrigation Company. XXXIII, 588.

The water-works of Denver, Colorado. XXXI, 170.

Tuberculation in water pipes. XXVIII,

264.

28-in. cast-iron submerged pipe line. XXXIII, 275. Underground water supply. XXX, 694. Water purification. LX, 205.

TRIBUS, L. L .- (Continued).

Water-works valuation. XXXVIII, 135; also, LXIV, 86.

TRIEST, WOLFGANG G.

Concrete-iron highway bridges. XXXI,

Detroit Union Depot Viaduet. XXVIII,

Translation of paper by E. A. Ziffer. XX1X, 453.

TRIPP, O. II.

Influence of rails on street pavements. XXXVII, 115. Railroad Iocation. LIV, 163.

TROCON, ALBERT A.

Elevated railroads. XXXVII, 395.

TROTTER, A. W.

One way of obtaining brine. XXIII, 99.

TRUESDELL, CHARLES.

Memoir of, XXXVI, 585.

TRUMP, EDWARD N.

One way of obtaining brine. XXIII, 98.

TUBBS, J. NELSON.

Aeration of water. XV, 143. Enlargement of the Erie Canal. XIV,

Hydraulies of the Hemlock Lake Con-duit, and restriction of the use and waste of water in Rochester, N. Y. XXVI, 52.

Preservation of forests. XIV, 398.

TUCKER, H. F.

Reinforced concrete buildings. LX, 458.

TULLOCK, ALONZO J.

Letters relating to repair of foundations of the piers of the Little Rock Junc-tion Bridge, LXXIX, 91. Memoir of. LIV, 535.

TUR, P.

"Note on the Removal and Utilization of Municipal Refuse in French Cities," (Translated from the French.) LIV, l'art E, 309, 345.

TURNEAURE, F. E.

Bond-friction-resistance in reinforced concrete. LXXIII, 286.

Concrete and reinforced concrete. LXXXI, 1199; LXXXII, 1571.

LXXXI, 1199; LXXXII, 1571.

New principle in the theory of structures.

LXXXIII, 662.

"Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXII, 1191.

"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409.

"Some Experiments on Bridges Under Moving Train Loads." XLI, 410.

Stress measurements, Hell Gate Arch.

LXXXIII. 1097.

Stress measurements, Hell Gate Arch. LXXXII, 1997. The Launhardt formula and bridge spe-cifications. XLI, 195. Working stress for bridges. XLI, 527.

TURNER, C. A. P.

Concrete and reinforced concrete. LXXXI, 1193.

LXXXI, 1193.
Designing reinforced concrete slabs.
LAXX, 1713.
Effects of straining steel. LXXX, 1466.
"Probable Wind Pressure Involved in
the Wreck of the High Bridge over
the Mississippi River, on Smith Avenue, St. Paul, Minn., August 20th,
1904." LIV, 31.
Progress Report of Special Committee
on Concrete and Reinforced Concrete.
LXVI, 491.
Onestions in reinforced concrete design.

Questions in reinforced concrete design. LXX, 87. Reinforced

concrete flat slab floors. LXXVII, 1691. Reinforced concrete floor systems. LVI,

297.

Steel stresses in flat slabs. LXXVII, 1416. Structural design of buildings.

476. The

"The Ferry Bridge Across the Ship Canal at Duluth, Minnesota." LV, 322. "The St. Croix River Bridge." LXXV,

"Thermo-Electric Measurement of Stress." XLVIII, 140.

TURNER, EDMUND K.

"Final Report of Special Committee on Rail Sections." LXX, 456.

TURNER, H. C.

Use of reinforced concrete. LXI, 69.

TURNER, NATHANIEL.

Memoir of. LXXVII, 1905.

TURNER, WILLIS TUBBS.

Memoir of, LXXV, 1195.

TURRILL, SHERMAN M.

"An Investigation of the Properties of Brick, under Different Physical Con-ditions." LI, 35.

TUSKA, GUSTAVE R.

"Construction of Substructure for Lonesome Valley Viaduct, Knoxville, Cumberland Gap and Louisville Rallroad." XXXIV, 247.

TUTEIN-NOLTHENIUS, R. P. J.

Canals from the Lakes to New York. XLV, 299.

TUTTLE, A. S.

Distortion of riveted pipe by back-filling. XXXVIII, 104. Driven wells at Plainfield, N. J. XXXI, Water-works valuation. XXXVIII, 175.

TUTTLE, GEORGE W.

Adjustment of transit and compass surveys. XLV, 465.

TUTTON, CHARLES H.

"A Proposed Solution of Some Hydrau-lic Problems." XLVII, 392. Flow of water in pipes. XLVII, 215. Memoir of. LXII, 560.

UHLER, W. D.

Road construction and maintenance: Bituminous surfaces. LXXV, 551.

UHLIG, CARL.

Memoir of, LXXXIII, 2344.

HERICH, D.

Street grades and cross-sections. XLII, 10.

ULRICH, J.C.

"The Prewitt Reservoir Proposition." LXXVII, 96.

UNDERWOOD, HOWARD W.

Filtration of water. LIII, 229,

UPHAM, R. D.

Protection of steel and aluminum exposed to sea water. XXXVI, 496.

UPSON, MAXWELL M.

Concrete piles. LXV, 494. Trafficway viaduct, Kansas City, Mo. LXXX, 547.

USINA, D. A.

"Copyright in Drawings of a Technical Character." LXV, 38. Engineering patents. LVII, 83, 90. Recent Developments in Pneumatic Foundations for Buildings." LXI, 211. "Recent Developments

VAIL, JOHN JERVIS.

Water-proofing railroad bridge floors, LXXIX, 385.

VALENTINE, GEORGE S.

Timber preservation. XLIV, 210.

VAN BUREN, JOHN DASH.

Enlargement of the Erie Canal. XIV,

Memoir of. LXXXII, 1713. New facts about eye-bars. "Notes on High Maso LVI, 439. Dams." Masonry Notes on XXXIV, 493.

"Quay and other Retaining Walls." II, 193.

Reclamation of the Potomac Flats. XXXI, 492.

Teredo Navalis, or ship-worm. III, 171.
"The Improvement of the Water Front of the City of New York." III, 172.

VAN CLEVE, A. II.

Appraisal of public service properties. Appraish of Judic Service properties. LXXV, 856.
"The Hydro-Electric Development and Transmission Lines of the Canadian Niagara Power Company." LXII, 199.

VAN CLEVE, HORATIO P.

Economies of steel arch LXXXIII, 69. bridges.

VAN DER HOEK, JACOBUS. Memoir of, LXX, 477.

VANDEVANTER, C. O.

Grading contracts. LVIII, 390.

VAN METER, J. D.

Standard levee sections. XXXIX, 223.

VAN NORDEN, RUDOLPH W.

Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 152.

VAN ORDEN, C. II.

Spirit leveling, XXXIX, 385.

VAN ORNUM, J. L.

Concrete and concrete-steel. LIV, Part E, 555.

Engineering education. LIV, Part A, 497.

Geology in its relations to topography. XXXIX, 90.
Harbors. LIV, Part A, 369.
Sewage disposal. LIV, Part E, 207.
Surveying. LIV, Part B, 455.

"The Eatigue of Cement Products."

LI, 443.

"The Fatigue of Concrete." LVIII, 294.

The Fatigue of Confeder LYVIII, 253.
The water-works of Syracuse, N. Y.
XXXIV, 63.
"Theory and Practice of Special Assessments." XXXVIII, 336.
"Topography on the Survey of the Mexico-United States Boundary." XXXIV,

VAN REIGERSBERG VERSLUYS, J. C.

Determination of duty of water. LXXXIII, 251.

VANSITTART, GEORGE EDWARD.

Memoir of. LXXXI, 1821.

VAN WINKLE, EDGAR B.

Construction and maintenance of roads. VIII, 344. Report of the Committee on "Nomencla-

ture of Building Stones and of Stone Masonry." VI, 297 (1877).

VARNEY, THEODORE.

Catenary trolley construction. LXII, 187.

VAUCLAIN, S. M.

"The Balanced Compound Locomotive." LIV, Part D, 329.

VAUGHN, CLARENCE GEORGE.

Memoir of, LXII, 562.

VAUGHN, GEORGE WASHINGTON.

Memoir of. LXXX, 2225.

VEAZIE, J.

Nomenclature of building stones and of stone masonry. VII, 286.

VEDEL, P.

"Island Harbors and the Accumulations of Material Caused by Detached Works. LIV, Part A, 139, 384. Stability of quay walls. XXX, 687.

VELSCHOW, FRANZ A.

Characteristics of the Ravine du Sud and plan for averting its overflow. XXIV, 483.

Irrigation in India. XXIII, 254. "On the Cause of Trade-Winds." XXIII,

101.
"The Cause of Rain and the Structure of the Atmosphere." XXIII, 303.

VENABLE, WILLIAM MAYO.

Action of frost on cement and cement mortar. LXIV, 333.

Centrifugal pumps and fans. LI, 224. Dredges: Their construction and perform-

maximum rates of rainfall. LIV, 199.
Maximum rates of rainfall. LIV, 199.
Municipal refuse disposal. LX, 390.
"The Principles of Design of Velocity Pumps." LIV, Part D, 473, 592.
Water-works of Porterville, Cal. LIV,

VENSANO, H. C.

Depreciation of public utility properties.

LXXVII, 814.

Penstock and surge-tank problems.
LXXIX, 289. "Pulsations in Pipe Lines, as Shown by Some Recent Tests." LXXXII, 185.

VERMEHREN, ED.

Disposal of municipal refuse. LIV, Part E, 334.

VERMEULE, C. C. Rainfall and stream flow, LIX, 496.

VERNON-HARCOURT, L. F.

Economic depth for canals. XXXIX, 309. Movable dams. XXXIX, 580.

VERVEER, E. L.

Rust in a LXXI, 202, seventeen-story building.

VEUVE, ERLE LeROY,

Memoir of. LXXXI, 1784. Redemption of the Gr California. LXVI, 256. Great Valley of

VILAR y BOY, S.

Faults in the theory of flexure. LXXV,

"Notes on Bridgework." LXXVI, 241 "Notes on the Guatemala Earthquakes, and Earthquake-Proof Construction." LXXXIII, 1689.

VILLALON, JOSE R.

Light mountain railroad construction. XXXVI, 87. "Slate Bricks." XVIII, 297.

VINING, E. P.

Efficiency of railroads for the transportation of freight. XII, 132.

JOHANNES VLIEGENTHART, COR-NELIS.

Memoir of. LXXVII, 1923.

VOGLESON, J. A.

Water filtration at Washington, D. C. LVII, 386.

von FABRICE, R.

Steel columns and struts. LXXXIII, 1662.

VON GELDERN, OTTO.

Effects of San Francisco earthquake on engineering constructions. LIX, 216.

VON SCHON, H.

Theory of concrete. XLII, 135.

von SCHRENK, HERMANN.

Timber tests. LI, 83. Wood stave pipe design. LXXXII, 469.

VOORHEES, THEODORE.

Memoir of, LXXXI, 1786. Railway signaling, XXVIII, 284.

VORCE, CLARENCE BROWNING.

Memoir of. LXXXII, 1715. Street railway track construction. LXXVI, 478.

VOSE, GEORGE L.

Specifications for bridges. XV, 444. strength iron

WACHTEL, LOUIS.

Memoir of. LXXXII, 1734.

WACHTER, LEONARD M.

Lawrence, Mass., Filter. XLVI, 324.

WADDELL, CHARLES E.

Design of masoury dams. LXXV, 155.

WADDELL, J. A. L.

"A Study in the Designing and Con-struction of Elevated Railroads, with Special Reference to the Northwestern Elevated Railroad and the Union Loop Elevated Railroad of Chicago, Ill." XXXVII, 308.

Agreements for building contracts.

LXVII, 510.

American railroad bridges. XXI, 596.

Contracts: "Cost plus" and other forms. LXXXIII, 832

Effects of straining steel. LXXX, 1464.
"General Suggestions as to the Conditions Proper to be Required in Ordinary Iron Highway Bridge Construcary Iron Hightion." XII, 459.

tion." X11, 459.
Inspection and maintenance of railway structures. XVII, 279.
Loadings for railway bridges. XXX, 522.
"Nickel Steel for Bridges." LXIII, 101.
Revision of Niagara Railway Arch Bridge.
LXXXIII, 2003.

"Some Disputed Points in Railway Bridge Designing." XXVI, 77. Specifications for structural steel. XXXIII,

"Specifications for the Strength of Iron Bridges." XVI, 33. Steel columns and struts. LXXXIII, 1642.

Stress measurements, Hell Gate Arch. LXXXII, 1078.
Tensile strength and composition of structural steel. XXXVIII, 86.
"The Economics of Steel Arch Bridges."
LXXXIII, 1.
"The Helyted Street Lift Bridge?"

Halsted Street Lift-Bridge."

XXXIII. 1.

The Launhardt formula and bridge specifications. XLI, 210.
"The Possibilities in Bridge Construction by the Use of High-Alloy Steels."

LXXVIII, 1.
"Train Lordings for bridges XXVI 213.

Train loadings for bridges. XXXI, 213. Weights of bridges. XVI, 218. Wheel concentrations and fatigue for-mulas. XLII, 214. Working stress for bridges. XLI, 517.

WADSWORTH, H. H.

Control of hydraulic mining ln Califor-

nia. LVII, 31.

Effects of San Francisco earthquake on engineering constructions. LIX, 270. Flood of March, 1907, in California rivers.

Flood of March, 1907, in California rivers.
LXI, 355.
Harbors. LIV, Part A, 356.
Redemption of the Great Valley of California. LXVI, 251.
Spherical and framed domes. LII, 317.
"The Failure of the Yuba River Débris Barrier, and the Efforts Made for Its Maintenance." LXXI, 217.
Water supply of the San Francisco-Oakland Metropolitan District. LXXX, 170.

WAGNER, BERNARD MATTHEW.

Memoir of. LXXXII, 1716. Preservation of rallroad ties. XLII, 349.

WAGNER, SAMUEL TOBIAS.

Elevated railroads. XXXVII, 411. External corrosion of cast-lron LXXVIII, 866.

Grading contracts. LVIII, 387.
Hell Gate Arch Bridge. LXXXII, 1009.
"History of the Pennsylvania Avenue
Subway, Philadelphia, and Sewer Construction Connected Therewith." XLIV,

"Inspectors and Bridge Work." XVII,

Kentucky and Indiana Bridge. XVII, 174.

Laws of proportioning concrete. LIX, 150.

Nickel steel for bridges. LXIII, 350.
Painting structural steel. LXXVII, 962.
Properties of steel: Its use in structures and heavy guns. XVI, 369.
Railway brldge designing. XXVI, 207. struc-

Reading Terminal in Philadelphia. XXXIV, 181. "Some Notes on the Creeping of Rails." LIII, 466.

Specifications for structural steel. XXXIII, 353.

"The Elevation The Elevation of the Tracks of the Philadelphia Germantown and Norristown Railroad, Philadelphia, LXXVI, 1819.

The Halsted Street Lift-Bridge. XXXIII, 54.

"The Pennsylvania Avenue Subway and Tunnel, Philadelphia, Pa." XLVIII,

"The The Water-Proofing of Solid Steel-Floor Railroad Bridges." LXXIX, 306. Water and sewage Ohio. LXVII, 334. works, Columbus,

WAGONER, LUTHER,

"A Study of Fluid Resistance." LXXVII, 890.

Design of the New Croton Dam. LVIII, 441.

Effects of San Francisco earthquake on engineering constructions. LIX, 216.

Flood of March, 1907, in California rivers. LXI, 353.

"Notes upon Docks and Harbors." LXII, Ultimate load on pile foundations. LXX,

442. Seepage losses in irrigation systems. LXXVI, 367. Tufa cement. LXXVI, 553.

WAHLMAN, P.

Air tanks on pipe lines. LXXXII, 270.

WAINWRIGHT, D. B.

"Surveying." LIV, Part B, 399.

WAIT, BERTRAND H.

Laramie-Poudre Tunnel, LXXV, 764. Sinking a wet shaft. LXXIII, 420.

WAIT, JOHN C.

Action of frost on cement and cement mortar. LXIV, 337. Agreements for building contracts.

LAVII, 488.

Spirit leveling. XXXIX, 380. Standard levee sections. XXXIX, 208.

WAITE, CHRISTOPHER CHAMPLIN. Memoir of. XLIX, 363.

WAITE, GUY B.

Cinder concrete floor construction. LAAIA, 624. "Cinder Concrete

Floors." LXXVII. 1773.

Comapse of a building during construction. L111, 21. Effect of earthquake shock on high build-

ings. LAI, 246. Precarious engineering expedients.

LAVII, 55. Reinforced concrete buildings. LX, 470.

XXXXX, Steel concrete construction. 639.

Transverse strength of beams as a direct function of the tensile and crushing stresses of material. XXXV, 494. Use of reinforced concrete. LXI, 55. "Wind Bracing in High Buildings."

XXXIII, 190.

WAITT, ARTHUR M.

Electrification of suburban zone, New York Central & Hudson River R.R. in the vicinity of New York City. LXI, 111.

Physical valuation of railroads. LXXVII, 315.

WALKER, CLIFF S.

Creosoting timber. LVI, 17.

WALKER, E. G.

Contracts: "Cost plus" and other forms. LXXXIII, 829. Economy in rectangular panels. LXXIV,

175. Effect of earthquake shock on high

buildings. LXI, 248. Elevated tanks and stand-pipes. LXIV,

543. Pier construction in New York Harbor. LXXVII, 522. Reinforced concrete docks. LXXVIII,

1125.

Reinforced concrete flat slab floors. LXXVII, 1721. Stresses in masonry dams. LXIV, 224.

The bonding of new to old concrete.

LXIV, 281.

The hydraulic jump. LXXX, 387.

WALKER, E. H.

Enlargement of the Erie Canal. XIV, 95.

WALKER, E. M.

Detroit River Tunnel. LXXIV, 360. WALKER, J. S.

Valuation of land. LXXXI, 629.

WALKER, PHILIP B.

Water-proofing railroad bridge floors. LXXIX, 390.

WALL, E. E.

Purification of water for domestic use. LIV, Part D. 236. "Water Purification at St. Louis, Mo." LX, 170.

WALLACE, JOHN F.

Height of buildings. XLIV, 468. Preservation of railroad ties. XLII, 352. Presidential Address at the Annual Convention, London, England, July 2d, vention, London, England, July 2d, 1900, XLIII, 603. Railroad signaling—the block system. XXXII, 457.

Recent practice in rails. XLIV, 499. Red Rock Cantilever Bridge. XXV, 722. Right of way for railroads. XXV, 334.

Right of way for railroads. XXV, 334.
Shall civil engineering practice be regulated by law? XLVI, 138.
Stadia topographic surveys. XLIV, 103.
The form of railway excavations and embankments. XXXII, 263.
"The Lake Front Improvements of the Illinois Central Railroad in Chicago." XXXVIII, 315.
"The Sibley Bridge." XXI, 97.
"The Sibley Bridge." XXI, 97.
"The Substitution of Electricity for Steam as a Motive Power for Suburban Traffic." XXXVII, 133.

WALLACE, JOHN H.

Effects of San Francisco earthquake on engineering constructions, LIX, 258.

Notes on a mountain slide. XXIV, 563.

WALLACE, W. CARLILE.

Marine engineering. LIV, Part C, 261.

WALLER, ELWYN.

Algæ and the purity of water supplies. XX1, 506.

WALLING, HENRY F.

"Co-ordinate Surveying." VI, 88.

WALTON, LOUIS ROBERTS.

Memoir of. XXXVI, 586.

WARD, C. N.

Flow of water in irrigation channels. LXXX, 1685.

WARD, CHARLES DOD.

Inter-oceanic canal projects. IX, 34.
Memoir of. LXXX, 2228.
Submerged pipe work, Portland, Ore.
LXXVIII, 1344.
"The Gatun Dam." LIII, 36.

WARD, JOHN F.

"A Simple Method of Running in a Transition Curve." XXVII, 18. Apparatus for obtaining borings by direct pressure. II, 39.
Portland cement concrete. XXXVII, 515.
28-in. cast-fron submerged pipe line. XXXIII, 279.

WARD, JOSEPH S. The creeping of rails. LIII, 498.

WARD, L. B.

Sewage disposal. XVIII, 26.

WARE, R. WILLARD.

Driven wells at Plainfield, N. J. XXXI,

WARING, GEORGE E., Jr.

Influence of rails on street pavements. XXXVII, 87.
Sewerage of Memphis. X, 45.

WARNER, EDWIN II.

Necaxa light and power plant. LVIII, "The Hydraulic Plant of the Puget Sound Power Company." LV, 228.

WARNER, JAMES MADISON. Memoir of. LXXXI, 1823.

WARREN, GOUVERNEUR K.

Failure of the Ashtabula Bridge. VI. 195. Levees as a system for reclaiming low-lands. V, 304.

WARREN, J. G.

Movable dams. XXXIX, 579.

WARREN, MINTON M.

"Air Tanks on Pipe Lines." LXXXII. 250.and Surge-Tank Problems."

"Penstock and Surge-Tank Problems, LXXIX, 238, Pressures in penstocks, LXXXIII, 763, Pulsations in pipe lines, LXXXII, 246,

WARREN, W. H.

High-alloy steels for bridges. LXXVIII. Nickel steel for bridges. LXIII, 331.

WASHBURN, F. S.

Improvement XXVIII, 448. James River, Va. Reclamation of the Potomac Flats. XXXI, 494.

Steel concrete construction. XXXIX, 637.
The form of railway excavations and embankments. XXXII, 257.

WASHINGTON, WILLIAM de HERT-BURNE.

Colorado River and Salton Basin, LIX.

Eve-bar tests. XXXI, 423. Memoir of. LXXIX, 1490. Road construction and maintenance:

Road construction and maintenance:
Engineering organizations for highway work. LXXVII, 1117.
Road construction and maintenance:
Equipment and methods for maintaining bituminous surfaces and bituminous pavements. LXXVII, 1180.
Road construction and maintenance:
Factors limiting the selection of materials and of methods in highway
construction. LXXVII, 1151.

WASON, LEONARD C.

Reinforced concrete floor systems. LVI. 311. Steel-concrete construction. XLVI, 102.

WATERBURY, L. A.

Stress measurements, Hell Gate Arch. LXXXII, 1080.

WATERHOUSE, JOHN.

Memoir of. LXXXII, 1718.

WATERS, W. L.

Chemi-hydrometry. LXXX, 1281.

WATKINS, F. W.

"A Method of Taking Cross-Sections in Deep Rock Cuts by Triangulation." XXII, 386. "Tunnel Surveying on Division No. 6, New Croton Aqueduct." XXIII, 17.

WATKINS, J. ELFRETH.

American railroad bridges, XXI, 574.
"Development of the American Rail and Track." XXII, 209.
"The Beginnings of Engineering." XXIV,

WATSON, G.

Disposal of municipal refuse. LIV, Part E, 335.

WATSON, JAMES.

"The Action of Frost on Cement and Cement Mortar. Together with Other Experiments on These Materials." Experiments on LXIV, 320.

WATSON, WALTER.

Railroad location. LII, 510.

WATSON, WILBUR J.

"Concerning the Investigation of Overloaded Bridges." LVII, 247.
Movable bridges. LX, 311.
Progress report of Special Committee
on Concrete and Reinforced Concrete.

LXVI, 467.

Reinforced concrete arches, LV, 194. Reinforced concrete floor systems, LVI, 289

"Steel Centering Used in the Construction of the Rocky River Bridge, Cleveland, Ohio." LXXIV, 1.

WATSON, WILLIAM.

Uniform practice in pile-driving, XXVII, 168.

WATSON, WILLIAM PARSONS.

Memoir of. LXXV, 1184. Railroad location. LII, 497.

WATT, D. A.

Coffer-dam for 1000-foot pier. LXXXI,

Improvement of rivers. XLIX, 275.
Movable dams. XXXIX, 600.
"Notes on the Improvement of River and Harbor Outlets in the United States." LV, 288.

WATT, JOHN M. G.

Improvement of rivers. XLIX, 281.

WEBB, DeWITT C.

Reinforced concrete docks. LXXVIII, 1117.

WEBB. F. W.

Cylindrical wheels and flat-topped rails for railways. XXI, 183.

WEBB, GEORGE.

"The 'Crinoline' Chimneys of the Cambria Iron Company at Johnstown, Pa." XIV, 186.

WEBB, J. BURKITT.

Proportional water meter. XXIV, 536. The nozzle as an accurate water meter. XXIV, 524.

WEBB, WALTER L.

Electricity vs. steam for branch rail-roads. XLII, 381. "Some Devices for Increasing the Ac-

curacy or Rapidity of Surveying Operations." XLVIII, 98.

Topography on the survey of the Mexico-United States boundary. XXXIV, 279.

WEBBER, CHARLES PERKINS.

Memoir of. LXXX, 2232.

WEBBER, SAMUEL.

Continuous rope driving. XXXIX, 184.

WEBSTER, D. L.

Differential surge tank. LXXVIII, 805.

WEBSTER, GEORGE S.

"Final Report of the Special Committee on Uniform Tests of Cement." LXXV, 665.

"History of the Pennsylvania Avenue Subway, Philadelphia, and Sewer Con-struction Connected Therewith." XLIV,

Maximum rates of rainfall. LIV, 204.
"Specifications and Methods of Tests for
Portland Cement." LXXXII, 166.
"The Pennsylvania Avenue Subway and
Tunnel, Philadelphia, Pa." XLVIII,

470.

Track elevation. LXXVI, 1901. "Walnut Lane Bridge, Philadelphia." LXV, 423.

WEBSTER, WILLIAM R.

"Final Report of Special Committee on Rail Sections." LXX, 456. "Nickel-Steel Eye-Bars for Blackwell's Island Bridge." LXIV, 289. Nickel steel for bridges. LXIII, 337. Preservation of materials of construction. L, 296.

Recent practice in rails. XLIV, 496.
Specifications for structural steel.

XXXIII, 362. Steel and masonry construction. XLIX, 82

Tensile strength and composition of structural steel. XL, 449.
"Tests of Steel." LIV, Part F, 63.
The manufacture of steel. LIV, Part E, 411.

WEDGEWORTH, D. C.

Maintenance of macadam and other roads. LXI. 467.

WEGMANN, EDWARD,

A new type of masonry dam. XLIX, 103

of water under dams, LXXX, Action

462

Astoria Gas Tunnel, LXXX, 682. Constant-augle arch dam. LXXVIII, 724. Design of masonry dams. LXXV, 162. Designing an earth dam. LXXXI, 42. Electricity vs. steam for branch railroads. XLII, 384.

Elevated railway improvements. LXXXII, High

igh masonry dams. XIX, 171; also, XXXIV, 508.

Lake Cheesman Dam and Reservoir, LIII, 150

Method of tunneling on part of New Croton Aqueduct. LXIX, 388.

Moving two-36-in, water mains. XXXIV.

536.

Multiple-arch dams. LXXXI, 890.
New water-works of Havana, Cuba.
XXXVI, 232.
Pneumatic pumping plants. L1V, 27.
Reconstruction of Stony River Dam.

LXXXI, 1071. Reinforced concrete reservoir. LXXVII,

Sweetwater Dam. XIX, 219.
The Bohio Dam. XLVIII, 300.
"The Design of the New Croton Dam."
LVIII, 398. Top width of non-overflow dams, LXXX, 738.

Tunnel surveying, XXIII, 31.

WELCH, ASHBEL,

"A Memoir on Rails." III, 106,
"Comparative Economy of Steel R
with Light and Heavy Heads." Rails

251.
Draw-bridges. III, 194.
Highway bridges. X1, 287.
Hudson River Tunnel, IX, 273.
Huprovement of the Eric Canal. 1X, 287.
Inter-oceanic canal projects. IX, 47, 132.
Presidential Address at the Annual Convention of the Society, at Washington, D. C., May 16th, 1882. XI, 153.
Rainfall and the flow of streams, X, 236.

Report of the Committee on "Rapid Transit and Terminal Freight Facilities."

sit and Ter 1V, 1 (1875)

W. 1 (1875).

Report of the Committee "On the Form, Weight, Mannfacture and Life of Rails."

First Report, 11, 87 (1874); Second Report, IV, 130 (1875); Final Report, V, 327 (1876).

Sewerage of Memphis. X, 43.
"Ship Canal Locks Calculated for Operation by Steam." 1X, 293.

Teredo Navalis, or ship-worm, 111, 170.

Tests of cement. IX, 342.

[Ipright arched bridges. III, 216.

Water front of the City of New York, III, 186.

"Wind Pressure against Bridges." IX.

"Wind Pressure against Bridges." IX, 391.

WELLINGTON, A. M.

Comparative tests of electric motor and steam locomotive. XXIII, 206. Compensation for railroad curves. XIII,

195.

Cylindrical wheels and flat-topped rails.
for railways. XXI, 160.
English and American railroads compared. XV, 748.
"Experiments on the Resistances of Rolling Stock." VIII, 21.

Resistances of

"Experiments with New Apparatus on Journal Friction at Low Velocities." XIII, 409.

Flattening the ends of railroad curves. XV, 367.

AV, 36.
Inspection and maintenance of railway structures. XVII, 305.
Preservation of forests. XIV, 393.
"Report of the Committee on Standard Rail Sections," Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 495, (1892).

425 (1893).
"Report of the Committee on the Proper

"Report of the Committee on the Proper Relation to Each Other of the Sections of Railway Wheels and Rails." Preliminary Report, XIX, 1 (1888); Final Report, XXI, 223 (1889).
"The American Line from Vera Cruz to the City of Mexico, via Jalapa, with Notes on the Best Methods of Surmounting High Elevations by Rail." XV 701

XV, 791. he cheapest railroad in the world.

XXIII, 118. Uniform practice in pile-driving, XXVII,

WELLS, CLINTON GLENCAIRN.

Memoir of. LX1V, 590.

WELLS, LIONEL B.

Canals from the Lakes to New York, XLV, 302. Traffic on waterways and on railroads, L1V, Part B, 503.

WELTON, B. F.

Municipal refuse disposal. LX, 398.

WELTON, NELSON JAMES.

Memoir of. LXXXII, 1736,

WENDT, EDWIN F.

Engineering education. LVII, 168.

WENTWORTH, C. A.

Coffer-dam for 1000-foot pier, LXXXI, 545.

Concrete and concrete-steel. LIV, Part E, 597.

WENTWORTH, CHARLES CHANCEL-LOR.

Lighthouses and other aids to naviga-tion. LIV, Part B, 73.
"Line and Surface for Railway Curves." XLV1II, 357.
Memoir of. LXXX, 2234.
Steel and masonry construction. XLIX,

Transition curves. XLV1, 395. Ventilation of tunnels. L1V, Part C. 567.

WERBIN, ISRAEL V.

"Tunnel Work on Sections 8, 9, 10, and 11, Broadway-Lexington Avenue Sub-way, New York City." LXXXI, 341.

WERNECKE, CHAUNCY.

Arched dams. LXXXIII, 2078.

WEST, C. H. Natural waterways. LIV, Part D, 462.

WESTCOTT, JOHN. 1rrigation, XVI, 132

WESTON, CHARLES V.

Elevated railroads, XXXVII, 433,

WESTON, EDMUND BROWNELL.

A high-speed gravity filter bed. XXXV, 57.

Astoria, Oregon, Water-Works, XXXVI.

"Description of Some Experiments Made on the Providence, R. I., Water-Works, to Ascertain the Force of Water Ram in Pipes." XIV, 238.

in Pipes." XIV, 238.
"Description of Some Experiments on the Flow of Water through 2 1-2-Inch Rubber Hose, and Nozzles of Various Forms and Sizes, made on the Providence, R. I., Water-Works. Also Results of Investigations relating to the Height of Jets of Water." XIII, 376.
Flow of water in Ogden, Utah, pipe line.

XL. 548.
Flow of water in pipes. XXXV. 285.
Hydraulies of fire streams. XXI, 477.
Memoir of. LXXXI, 1789.

Purification of water for domestic use. LIV, Part D, 207.

Rainfall, flow of streams, and storage. XXVII, 296. "Tests of a Mechanical Filter." XLIII,

69.

"The Results of Investigations Relative to Formulas for the Flow of Water in Pipes" XXII, 1.
Water-works valuation. XXXVIII, 149.

WESTON, GEORGE.

Memoir of. LXXXIII, 2345.

WESTON, JOHN W.

Friction, waste and loss of water in mains. XIX, 107.

WESTON, ROBERT SPURR.

Disposal of municipal refuse. LIV, Part

Filtration works, L. 450. Lawrence, Mass., Filter, XLVI, 319. Purification of water for domestic use. LIV. Part D. 232. Sedimentation, LHI, 74.

Sedimentation. LIII. 74.
Sewage disposal. LIV, Part E. 241.
"The Purification of Ground-Waters Containing Iron and Manganese." LXIV,

112. WEYRICH, C.

"The Use of Basic Mild Steel as Material for Construction in Germany."

WHEELER, EBENEZER SMITH.

Memoir of. LXXVI, 2249.

WHEELER, L. L.

Railroad levels, XV, 899,

WHEELER, O. B.

Memoir of. XXXVI. 587. Use of long steel tapes for measuring base lines, XXX, 641.

WHEELER, S. S.

Water power and compressed air transmission plant. XXXVI, 191.

WHEELER, W. H.

Dredges and dredging, XL, 318.

WHEELER, WALTER H.

Contracts: "Cost plus" and other forms. LXXXIII, 826.

WHEELER, WALTER S.

Klondike pipe line. LXXVIII, 561. Saturation and strength of concrete. LXXVII, 448.

WHEELER, WILLIAM.

Water-works valuation. XXXVIII, 193.

WHINERY, SAMUEL.

Algæ and the purity of water supplies. XXI, 539.

Asphaltum for reservoir linings. XXVIII,

Brick manufacture and brick pavement. XXVI, 401.

Construction of a water system for pla-cer mining and suggestions for a new method of dam building. XXXV, 86. Electric rock blasting. XXVIII, 145. Engineers as patentees. XLVIII, 318. Excessive rainfalls. XXV, 116.

Fire-resistant construction of buildings. LXV, 293.

Improvement of rivers. XLIX, 307.
Impurities in sand for concrete. LXV, 262.

of rails on street pavements. Influence

XXXVII, 96.

Jordan Level, Erie Canal. XLIII, 594 Maintenance of asphalt streets. XLIX, 192.

Maximum rates of rainfall. LIV, 201. National railroad question of to-day. LXXXIII, 972.

Oiling of roads, LXV, 462.
"On the Theoretical Resistance of Rail-road Curves." VII, 79: VIII, 179.
Physical valuation of railroads, LXXVII,

Preservation of railway ties. XLV, 533. Quality of water supplies. XXXII, 160. Quality of water supplies. Railroad location. LIV, 143.

Restoration of the cable ends of the Covington and Cincinnati Suspension Bridge, XXVIII, 365. Road construction and maintenance:

Cement-concrete pavements. LXXVII. 124.

Road construction and maintenance: Drainage and foundations. LXXV, 524. Road construction and maintenance: Factors limiting the selection of ma-terials and of methods in highway construction. LXXVII, 1130 Road construction and maintenance:

Fillers for brick and block pavements. LXXV, 537.

Road construction and maintenance:
Relative value of three methods of carrying on work. LXXIII, 21.
Road construction and maintenance:
The use of water, calcium chloride, light oils, etc., as dust palliatives.
LXXIII, 33, 42.
Self-purification of flowers.

LAXIII, 33, 42.
Self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 77.
Shall civil engineering practice be regulated by law? XLVI, 129, 140.
Street sprinkling, LXXVI, 87.
Street traffic in New York City, LVII, 191

Timber preservation, XLIV, 200 Unit costs of work, XLIX, 63, 73.

WHIPPLE, GEORGE C.

Albany Filtration Plant. XLIII, 316. Decolorization of water. XLVI, 141. Filtration works. L. 452. Flow in sewers. XLVI, 89. Flow of water in Ogden, Utah, pipe line.

XLIV. 59.

LXIV,

WHIPPLE, GEORGE C .- (Continued).

Lawrence, Mass., Filter. XLVI, 343. Purification of water for domestic use.

LIV, Part D, 192.

elarification by fine screens. LXXVIII, 964.

Sewage disposal. LVII, 91, 138. Washington water filtration plant. LXXII, 381.

Water purification, LX, 203. Water purification at Steelton, Pa. LXVI, 210.

WHIPPLE, SQUIRE.

Crushing strength of American iron. II,

Failure of the Ashtabula Bridge. VI, 203.

203.
Memoir of. XXXVI, 527.
"On Truss Bridge Building." I, 239.
"The Utica Lift Draw-Bridge." III, 190.
Upright arched bridges. III, 235, 285;
IV, 81, 201.
Web strains in simple trusses. X, 20.

WHISKEMAN, JAMES P.

Collapse of a building during construc-tion. LIII, 17.

WHITAKER, THOMAS D.

Hot-bath tests for cements. XXXII,

WHITAKER, W. F.

Effects of San Francisco earthquake on engineering constructions. LIX, 284.

WHITCOMB, HENRY D.

River mouths. IV, 295.
"The Improvement of James River, Virginia." XXVIII, 209, 451.

WHITE, C. F.

Improvement of Gray's Harbor, Wash. XXXII, 489.

WHITE, GEORGE HOWARD.

Memoir of. LXXV, 1186.

WHITE, HENRY FISHER.

Memoir of, LXXVI, 2251.

WHITE, J. G.

"The Substitution of Electricity for Steam as a Motive Power." LIV, Part E, 3, 76.

WHITE, LAZARUS.

Contracts: "Cost plus" and other forms, LXXXIII, 803.

Earth pressures and bracing. LX, 25. Grouted cut-off for the Estacada Dam, LXXVIII, 510.

Grouting operations. LXXXIII, 1063, Laramie-Poudre Tunnel. LXXV, 761 Secure subway supports, LXXX, 94 Sinking a wet shaft. LXXIII, 415. 945.

Sixth Avenue Subway, Hudson & Man-hattan R.R. LXXVI, 70.

Tunnel construction methods. LXXXI,

Tunnel surveying. LXXV, 99.

WHITE, LINN.

Road construction and maintenance: Use of bituminous material in pene-tration and mixing methods, LXXV,

WHITE, W. HOWARD.

"An Account of the Erection of a Bridge

over the Danube, near Vienna." II. 291

291.

Cylindrical wheels and flat-topped rails for railways. XXI, 164.

English and American railroads compared. XV, 769.

"European Railways—as They Appear to an American Engineer." III, 61.

European Sewage and Garbage Removal." XV, 849.
Flattening the ends of railroad curves.

XV, 364.

Memoir of, XLV, 635.
"On an Economical and Efficient Railroad Bridge Floor." XII, 451.
Proper relation to each other of the

sections of railway wheels and rails. XXI, 299.

Specifications for strength of iron bridges. XV, 420. Steam heating. XXIV, 219.

The Holland dikes. XXVI, 665.

WHITE, W. M.

Flow of water in pipes. XLVII, 292.

WHITE, Sir WILLIAM H.

Dry docks. LIV, Part F, 433. Engineering education. LIV, Part A,

Marine engineering. LIV, Part C, 264.
Memoir of. LXXVII, 1824.
"Naval Architecture in Great Britain."
LIV, Part D, 3, 126.
Ordnance. LIV, Part B, 389.
Tests of steel. LIV, Part F, 73.
Tests of timber. LIV, Part F, 96.

WHITED, WILLIS.

Road construction and maintenance: Engineering organizations way work. LXXVII, 1074. for high-

WHITFIELD, J. EDWARD.

"Some Notes on Hot-Bath Tests for Cements." XXXII, 321.

WHITFORD, OSCAR F.

"Closing Breaks in Canals, under Diffi-culties," II, 161. Memoir of. XLIX, 364.

WHITMAN, T. J.

Friction, waste and loss of water in mains. XIX, 108.

WHITNEY, F. O.

Road construction and maintenance: Design of highway systems. LXXVII, 169

WHITNEY, H. A.

Evaporation from Lake Conchos, Mexico. LXXX, 1983.

owned public utilities. Municipally LXXXI, 438.

WHITNEY, T. B., Jr.

Sixth Avenne Subway, Hudson & Manhattan R.R. LXXVI, 66.

WHITTEMORE, DON J.

American railroad bridges, XXI, 601. Beginnings of engineering, XXIV, 383. Cause and prevention of decay of building stone, XV, 713. Cements, mortars and concretes, XXV,

"Cylindrical Wheels and Flat-Topped Rails for Railways." XXI, 133, 157.

WHITTEMORE, DON J .- (Continued),

Designing and erection of the Oakley Arch. XXIII, 177.

Destruction of rails by excessive weights, XX, 128.

XX, 128.
Inspection and maintenance of railway structures, XVII, 299.
Journal friction, XIII, 447.
Manufacture and testing of Portland cement, XXX, 594.
Memoir of, LXXXII, 1653.
Neat tests vs. sand tests for Portland cement, XXV, 300.
"On Form of Railway Excavations and Embankments." XXXII, 255.
"On the Nasmyth Pile Driver." XII, 441

441. Permanent effects of strain in metals.

XXIV, 176.

Proper relation to each other of the sections of railway wheels and rails.

XXI, 301.

XXI, 301,
Properties of steel: Its use in structures and heavy guns. XVI, 371.
Railway pontoon bridge at Prairie du Chien, Wis. XIII, 70.
"Report of Progress of the Committee on the Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry." XV, 717 (1886); XVII, 213 (1887); XVIII, 264 (1888). (1888).

(Report of the Committee on a Uniform System for Tests of Cement." Pre-liminary Report, XIII, 53 (1884); Final Report, XIV, 475 (1885). Sandrock sewers of St. Paul. XXXII,

203.

South Pass Jetties. XV, 229, Stability of stone structures.VIII, 253.

Temperature of water at various depths in lakes and oceans. XIII. 80. "Tensile Tests of Cement, and an Appliance for More Accurate Determinations." IX, 329.

Testing cement. IX, 199. Tests of cement. VII, 274

The cheapest railroad in the world. XXIII, 118.

The sewerage system of Milwaukee, XXX,

Underground water supply. XXX, 696.
Use of mild steel. XXX, 682.
Weights of iron and steel railway bridges.
XV, 94.
Wind pressure upon bridges. X, 162.

Wrought-iron comulie. XI, 91. columns, tests and for-

Z-iron columns. XVIII, 118.

WHITTEMORE, L. C.

Sewage clarification by fine screens. LXXVIII. 1004.

WHITTET, RUFUS MASON.

Memoir of. LXXXIII, 2347.

WICKES, J. L.

oad construction and maintenance: The use of water, calcium chloride, light oils, etc., as Dust Palliatives. Road construction LXXIII, 37.

WIG, RUDOLPH J.

"Specifications and Methods of Tests for Portland Cement." LXXXII, 166. Tests of concrete in sea water. LXXXI, 703.

WIGGIN, THOMAS H.

Astoria Gas Tunnel. LXXX, 685. Chemi-hydrometry. LXXX, 1286. Chemi-hydrometry. LXXX, 128 Coffer-dam for 1,000-foot pier.

548.
Filtration of water. LIII, 235.
Reinforced concrete pipe. LX, 153.
Shear tests on joints in T-beam stems.
LXXVII, 1530.
Sinking a wet shaft. LXXIII, 420.
Submerged pipe work, Portland, Ore.
LXXVIII, 1335.

WILCOCK, FREDERICK.

Road construction and maintenance: Cost records and reports. LXXVII,

WILD, HERBERT J.

"The Substructure Bridge." LII, 451. of Marsh River

WILDER, F. M.

Cylindrical wheels and flat-topped rails for railways. XXI, 165. Journal friction. XIII, 452. "Report of the Committee on Standard Rail Sections." Progress Report, XXIV, 1 (1891); Final Report, XXVIII, 425 (1893).

WILEY, A. J.

East Canyon Creek Dam. LXXXIII, 609. Obstruction to flow by bridge piers. LXXXII, 364.

Temperature changes in mass concrete. LXXIX, 1256.

WILEY, H. L.

"The Sinking of the Piers for the Grand Trunk Pacific Bridge at Fort William, Ontario, Canada." LXII, 113.

WILGUS, WILLIAM J.

Bridge painting. XXXIX, 38. Depreciation of public utility properties.

LXXVII, 804.
"Final Report of the Special Committee
to Formulate Principles and Methods
for the Valuation of Railroad Property and C LXXXI, 1311. Other Publie

Light railways of the battle front. LXXXIII, 1243.

Location and design of terminal railroad stations and yards. LXIX, 417.

"Physical Valuation of Railroads."

LXXVII, 203.

"The Electrification of the Suburban Zone of the New York Central and Hudson River Railroad in the Vicinity of New York City." LXI, 73.

WILKES, JAMES KNAPP.

Memoir of. LXXX, 2236.

WILKINS, GEORGE SHREVE. Memoir of, LXXV, 1197.

WILKINS, W. G.

Agreements for building contracts. LXVII, 483.

WILLARD, J. II.

Movable dams. XXXIX, 590.

WILLARD, JAMES EAGER. Memoir of. LXXI, 445.

WILLCOMB, GEORGE E.

Washing rapid sand filters. LXXX, 1384.

WILLIAMS, BENEZETTE.

Gauging of Cedar River, Washington, XLI, 21,

WILLIAMS, CLEMENT C.

Economic canal location. LXXIV, 194, National railroad question of to-day. LXXXIII, 966.

WILLIAMS, DAVID.

Memoir of. LXXX, 2238.

WILLIAMS, EDWARD H., Jr.

Geology in its relations to topography. XXXIX, 84. Strength and weathering qualities of roof-

ing slates. XXVII, 687. WILLIAMS, GARDNER, S.

Cinder concrete floor construction. LXXIX, 643.

Concrete and concrete-steel. LIV, Part E, 566.

Consumption and waste of water. XLVI,

411 Disposal of municipal refuse. LIV, Part

Engineering education. LVII, 156.

"Experiments at Detroit, Mich... on the Effect of Curvature upon the Flow of Water in Pipes." XLVII, 1. Financial management of water-works.

XXXVIII, 30.

XXXVIII, 30.
Flow of water in Ogden, Utah, pipe line. XL, 528; XLIV, 61.
Flow of water in pipes. I.I. 326.
Flow of water in wood pipes. XLIX, 155; also, LXXIV, 463.
Flow of water over dams. XLIV, 316.
Hydro-electric power development.
LXXVIII, 1571.
Irrigation. LXII, 37.

Lake Cheesman Dam and Reservoir. LIII,

182

Multiple-arch dams. LXXXI, 899. Pavements. LIX, 348. Penstock and surge-tank pro-Penstock and surge-tank problems, LXXIX, 287. Pressures resulting from changes of velo-

city of water in pipes. XXXIX, 15.
Purification of water for domestic use.
LIV, Part D. 234.

Reaction breakwater. XLIII, 101.

Stream contamination and sewage purification. XLII, 165.

Temperature changes in mass concrete.

LXXIX, 1253.
Test of a mechanical filter. XLIII, 79. Theory and practice of special assessments. XXXVIII. 416.
Water supplies. L1X, 388.
Water-works valuation. LXIV, 90.
Weir measurement of stream flow.

LXXVII, 1304.

WILLIAMS, J. P. J.

Faults in the theory of flexure. LXXV, 932.

"The Theorem of Three Moments."

LXXVI, 785.
Theory of concrete beams, LXXVIII, 1267.

WILLIAMS, W. H.

The valuation of public service property. LXXII, 217.

WILLIAMS, W. S.

Precise spirit leveling. XLV, 175.

WILLIAMS, WILLIAM PLUMB,

"Plant and Material of the Panama Canal," XIX, 273.

WILLIAMSON, FRANK ROBERT.

Memoir of, LXXX, 2240.

WILLIAMSON, SIDNEY B.

Concrete and concrete-steel. LIV, Part Tests of concrete in sea water. LXXXI,

683.

WILLIAMSON, WILLIAM GARNETT. Memoir of. XLI, 645.

WILLIS, BAILEY.

Forests, reservoirs, and stream flow. LXII, 384. Railroad location, XXXI, 117.

WILLIS, H. P.

Road construction and maintenance: Drainage and foundations.

WILLOUGHBY, J. E.

Correction of foundation troubles. LXXXIII, 1310. Depreciation of public utility properties.

LXXVII, 804.

Physical valuation of railroads. LXXVII, 266.

"Progress Report of the Special Committee to Report on Stresses in Rail-road Track." LXXXII, 1191.

Prospective competitor method of valua-tion. LXXXIII, 1376.
"Second Progress Report of the Special Committee to Report on Stresses in Railroad Track." LXXXIII, 1409. The valuation of public service property. LXXII, 193.

Valuation of public utilities. LXXXI,

1584.

WILSON, ELLIOTT HINCKLEY.

Memoir of. LXXXIII, 2349.

WILSON, F. W.

The Halsted Street Lift-Bridge, XXXIII,

WILSON, GEORGE L.

Influence of rails on street pavements. XXXVII, 119.

"The Sandrock Sewers of St. Paul, Minn." XXXII, 195.

WILSON, HENRY W.

Niagara Cantilever Bridge. XIV, 553.

WILSON, HERBERT M.

"American Irrigation Engineering." XXV, 161

tion. XXVIII, 115.

Designing and erection of the Oakley
Arch. XXIII, 177.

"Federal Investigations of Mine Accidents

Pederal Investigations of Mine Accidents, Structural Materials, and Fuels." LXX, 190.

Fire-resistant construction of buildings.

Fire-resistant construction of buildings, LXV, 274.

"Irrigation in India." XXIII, 217.

Precise spirit leveling. XLV, 122.

"Spirit Leveling of the United States Geological Survey." XXXIX, 339.

"Surveying." LIV, Part B, 419.

"The Topographic Map of the United States." XXXIII, 405.

WILSON, JOHN A.

Inspection and maintenance of railway structures, XVII, 260, Memoir of, XXXVI, 588.

WILSON, JOSEPH M.

Concrete-iron highway bridges. XXXI, 459.

Inspection and maintenance of railway structures. XVII, 274. Kentucky and Indiana Bridge, XVII,

Life of iron railroad bridges. XXXIV, 309.

Memoir of. L, 504.

Niagara Cantilever Bridge, XIV, 551.
"On Specifications for Strength of Iron Bridges," XV, 389, 484; XVI, 38.
Painting of iron structures, XXXIII,

540.

Pennsylvania Avenue Subway and Tun-nel, Philadelphia, Pa. XLVIII, 548. Properties of steel: Its use in structures and heavy guns. XVI, 371.

and heavy guns. XVI, 371.

The Launhardt formula and bridge specifications. XLI, 228.

"The Philadelphia and Reading Terminal Railroad and Station in Philadelphia." XXXIV, 115.

Tower of the New City Hall. Philadelphia. XXXIV, 273.

Train loadings for bridges. XXXI, 207.

Weights of iron and steel railway.

railway

Weights of iron and steel railw bridges, XV, 95. Wind pressure upon bridges, X, 160. Working stress for bridges, XLI, 538.

WILSON, W. E.

Flow of water in pipes. XLVII, 323.

WILSON, W. J. R.

"Secure Subway Supports." LXXX, 914,

WILSON, WILLIAM W.

Report of the Committee "On the Failure of the Worcester Dam." V, 244 (1876).

WILSON, WINTER L.

"Typhoid Mortality in South Bethle-hem, Pa." LVIII, 511.

WINCHELL, N. H.

Geology in its relations to topography, XXX1X, 83.

WING, CHARLES B.

Effects of San Francisco earthquake on engineering constructions. LIX, 223, 245.

24a,
"Experiments on the Flow of Water in
the Six-Foot Steel and Wood Pipe
Line of the Pioneer Electric Power
Company, at Ogden, "I'tah." (1900).
First Paper, XL, 471 (1898); Supplementary Paper, XLIV, 34 (1900).

Reinforced concrete floor systems. 390.

Rivet spacing, etc., in plate girders. XLV, 580, Size of high-pressure water-power pipe.

LIX, 188.
Wheel concentrations and fatigue formu-

WINSLOW, C-E. A.

Sewage disposal. LVII, 136. Water and sewage works, Columbus, Ohio. LXVII, 328.

WINSOR, FRANK E.

Sanitation of construction camps. LXXVI. 510.

WINSOR, L. M.

Weir measurement stream flow. LXXVII, 1295.

WINSTON, ISAAC.

Spirit leveling. XXXIX, 395. "Surveying." LIV, Part B, 399.

WISE, JAMES HUGH.

Memoir of. LXXVI, 2260. Size of high-pressure water-power pipe. LIX, 189.

WISE, R. S.

Compensation of civil engineers. LXXXI, 1217.

WISNER, GEORGE Y.

Economic depth for canals. XXXIX, 306. Flow of water in pipes. XLVII, 231. Flow of water over dams. XLIV, 315, "Geodetic Field Work." XII, 267. Improvement of rivers. XLIX, 277. Jetty harbors of the Pacific Coast.

Jetty harbors XXVIII, 372.

Lake Cheesman Dam and Reservoir, LIII, 170.

Origin of Gulf Stream, and circulation of waters in Gulf of Mexico. XL, 113. Railroad freight differentials. XLVI, 223. Railroad freight differentials. XLVI, 223. Reaction breakwater. XLII, 512; XLIII,

Reservoir system of the Great Lakes. XL, 428.

Suspension of solids in rivers. XXXVI,

"The Brazos River Harbor Improve-ment." XXV, 519. "The Economic Dimensions for a Water-

way from the Great Lakes to the Atlantic." XLV, 224.

WITT, CARL C.

The valuation of public service property. LXXII, 197.

WIXFORD, JOHN F.

Purification of water for domestic use. LIV, Part D, 239.

WOLFEL, PAUL L.

Railway bridge designing. XXVI, 165.

WOLFF, H. H.

"The Design of a Drift Barrier across White River, near Auburn, Washington." LXXX, 2061.

WONDERS, JAMES C.

oad construction and maintenance: The use of bituminous materials by penetration methods. LXXIII, 95. Road construction

WOOD, CHARLES.

Memoir of, XXXVI, 591.

WOOD, CHARLES WIDNEY.

Memoir of, LXXIV, 522.

WOOD, DE VOLSON.

"Back-Water in Streams as Produced by Dams." II. 255. Determination of stresses in the eye-

Determination of stresses in the eye-bar head. VII, 189. Education of civil engineers. III. 264. Flexure of beams. III, 48, 127; IV, 284. Flow of water in pipes under pressure, and in open channels. VII, 126. Gnnpowder pile-driver. II, 410. "On the Flow of Water in Rivers." VIII 178

VIII, 173.

Resistance of beams. IX, 353.

WOOD, De VOLSON-(Continued).

Tensile strength of bar-iron and boilerplate. II, 348. Tests of bridge irons, II, 226.

Wrought-iron columns, tests and formu-Iæ. XI, 95.

WOOD, FRED J.

Railway development States. LXXIV, 156. United in the

WOOD, IRVING SPARROW. Memoir of, LXXXIII, 2351.

WOODARD, SILAS IL.

Arch action in arch dams, LXXXIII, 333. "Lake Cheesman Dam and Reservoir." LIII, 85. New

"The New York Tunnel Extension the Pennsylvania Railroad. The East River Tunnels." LXVIII, 419. York Tunnel Extension of

WOODARD, WILKIE.

Railroad terminals, LIV, Part F, 539. LIV, Part F, Underground railways.

WOODBURY, C. J. H.

Cause and prevention of decay of building stone, XV, 714.
Preservation of forests. XIV, 388.

WOODBURY, JOHN McGAW,

Sanitary disposal of refuse. L, 103.

WOODRUFF, GLENN B.

Water-proofing railroad bridge floors, LXXIX, 343.

WOODS, ROBERT P.

"Street Grades and Cross-Sections in Asphalt and Cement," XLII, 1.

WOODWARD, C. M.

American railway line, Vera Cruz to City of Mexico. XV, 839. "Engineering Education." L1V, Part A, 483, 507.

WOODWARD, R. S.

"Recent Experience on the U. S. Coast and Geodetic Survey in the Use of Long Steel Tapes for Measuring Base Lines." XXX, S1. Lines." XXX, S1.
Terrestrial magnetism in North America.

XXX, 653.

WOODWARD, WILLIAM C.

Water filtration at Washington, D. C. LVII, 373.

WOODWORTH, R. B.

Steel sheeting and sheet-piling. LXIV,

WOOLLARD, GEORGE CLIFTON. Memoir of. LV, 456.

WOOLLEY, A. F., Jr.

Dredges and dredging, XL, 329,

WOOLLEY, WILLIAM E.

American highways, LXXXIII, 572. Contracts: "Cost plus" and other forms, LXXXIII, 852.

WOOLSON, IRA H.

Cinder concrete LXXIX, 640. floor construction.

WOOTTON, E. H.

Use of asphaltum in building sea walls, XXIV, 225,

WORCESTER, JOSEPH R.

Boston South Terminal Station, XLIII,

nder concrete floor LXXIX, 642. Cinder construction.

Cinder concrete floors. LXXVII, 1801. Concrete and reinforced concrete.

LXXXII, 1571.

Erection of arch bridges. LXI, 263.

Experiments on retaining walls, etc.

LXXII, 449.
"Final Report of the Special Committee on Concrete and Reinforced Concrete."
LXXXI, 1101.
"Final Report of the Concrete."

"Final Report of the Special Committee Steel Columns and onLXXXIII, 1583.

Movable bridges. LX, 299.
"Progress Report of Special Committee on Concrete and Reinforced Concrete." LXVI, 431, 478.

"Progress Report of Special Committee on Steel Columns and Struts." LXVI, 401.

"Progress Report of the Special Committee on Concrete and Reinforced Concrete." LXXVII, 385.

Questions in reinforced concrete design. LXX, 74.

Reinforced concrete pipe. LX, 144. "Safe Stresses in Steel Columns." LXI, 156.

Saturation and strength of concrete. LXXVII, 447.

Steel-concrete construction, XLVI. Structural design of buildings. LIV, 415. Tests of fire-proof flooring material. XXXV, 130. Tests of large steel columns. LXXIII, fire-proof flooring material.

460.

The Launhardt formula and bridge specifications. XLI, 191.

WORMSER, MORITZ.

Underground railways. LIV, Part F, 368

WORSDELL, WILSON.

Niekel steel for bridges. LX111, 378.

WORTHEN, WILLIAM E.

Algae and the purity of water supplies. XXI. 521.

Back-water in streams as produced by dams, 11, 260. "Concrete Sewer at Mt. Vernon (N. Y.)"

XXIV, 393. Crushing st strength of American iron,

II. 232 Determination of wind pressures.

Dunning's D XXXII, 407. Dam, near Scranton, Pa.

XXXIV. 505. High masonry dams.

Hoisting apparatus of canal head-gates. XXXII, 302

Improvement of sedimentary rivers, XX, 230.

horse-power of a stream, XXII, Mean 403.

Memoir of, XL, 565, Presidential Address at the Annual Convention at the Hotel Kaaterskill, New York, July 2d, 1887, XVII, 1, Quality of water supplies, XXXII, 159, Rainfall and river-flow, XXVIII, 339.

WORTHEN, WILLIAM E.—(Continued).

"Report of the Committee on the Cause of the Failure of the South Fork Dam. XXIV, 431 (1891).

Report of the Committee on "The Fail-nre of the Dam on Mill River." III, 118 (1874).

Self-purification of flowing water and the influence of polluted water in the causation of disease. XXIV, 60. Sewerage of Memphis. X, 40. "Steam Heating." XXIV, 206. Storage and pondage of water. XXXI,

Tests of cement. XIII, 64. The Holland dikes. XXVI, 685.

WORTHINGTON, CHARLES.

Faults in the theory of flexure. LXXV.

Separate versus general contracts, XLIX, 12.

"Stresses in Columns Subject to Combined Axial and Transverse Loading."

XLVIII, 462. Structural design of buildings. LIV, 414. Tests of large steel columns. LXXIII,

The Sewickley Cantilever Bridge, LXXVI,

Unit costs of work. XLIX, 69.

WORTMAN, H.

"Harbour Development in Holland." LIV, Part A, 181.

WRENTMORE, C. G.

"Report on a Series of Tests on Concrete Columns Reinforced with a Spiral of Steel." LXXVIII, 97.

WRIGHT, AUGUSTINE WASHINGTON. Memoir of. LXXXII, 1721. South African irrigation. LII, 27.

WRIGHT, CHARLES H.

The Launhardt formula and bridge specifications. XLI, 188.

WRIGHT, EDWARD THOMAS.

Memoir of. LXXXI, 1791.

WRIGHT, FRANCIS H.

Physiography of water-sheds and chan-nels, LXXXIII, 1137.

WRIGHT, HORATIO GOUVERNEUR, Memoir of, XLVI, 551.

WRIGHT, JOSEPH.

"Questions in reinforced concrete design. LXX, 72.

WRIGHT, WILLIS BENTON.

Memoir of. LXXXIII, 2352,

WROTNOWSKI, ARTHUR FRANCIS.

Erosion of river banks. XXXI, 26. Memoir of. LXXX, 2242. Origin of Gulf Stream, and circulation of waters in Gulf of Mexico, XL, 114. Reaction breakwater, XLIII, 103.

WURTELE, ARTHUR S. C.

Cements, mortars and concretes. XXV, 282.

"Spirals and their Use on Railroads." XXXI, 329.

"The False Ellipse Reduced by Equations of Condition." XXIV, 540. "The Stability of Loaded Masonry

Arches." XXIII, 1.

Wind pressure upon bridges, X, 164. Wrought-iron columns, tests and formulæ. XI, 110.

YARDLEY, EDMUND.

"Experiments on Cements." II, 153. Resistances of railroad curves. VII, 105.

YATES, E. A.

Underpinning buildings, LXVII, 566,

YATES, J. J.

Tests of concrete in sea water. LXXXI,

YATES, P. K.

Driven wells at Plainfield, N. J. XXXI, 378.

YEATMAN, HENRY CLAY.

Memoir of. XL, 579.

YEATMAN, M. E.

Life of iron railroad bridges. XXXIV, 317

YEREANCE, W. B.

Municipally owned LXXXI, 426. utilities. publie

YONGE, SAMUEL H.

Erosion of river banks, XXXI, 12. Flow of water in pipes, XIV, 9. Misssouri River improvements. LIV, 327.

YORK, H. W.

"The Twenty-Eighth Street Central Station of the United Electric Light and Power Company." XXXV, 429.

YOUNG, C. G.

Water power and compressed air transmission plant, XXXVI, 192.

YOUNG, EDDY ELBERT.

Memoir of. LVIII, 551.

YOUNG, H. A.

Sanitary disposal of refuse. L. 152.

YUILLE, NAT. A.

Improvement of rivers. XLIX, 325.

ZELLER, ALBERT HENRY.

Memoir of. LVIII, 554.

ZIFFER, E. A.

"On the Gauges of Railroad Track in General, with Special Consideration of Narrow-Gauge Railroads." (Translated from the German by Wolfgang G. Triest.) XXIX, 453; XXX, 541.

ZIPPERLEIN, JOSEPH WILLIAM.

Memoir of. LIX, 565.

ZIPSER, M. E.

"Grouting Supply." Operations, Catskill Water LXXXIII, 980.

ZOLLINGER, LUTHER REESE.

LXXVII, 1907. Memoir of.

ZON, RAPHAEL.

Rainfall and stream flow. LIX, 493.

ZOWSKI, S. J.

Modern hydraulic turbines. LXVI, 369. reaction Performance ofa LXXVIII, 1288.

zur NEDDEN, F.

"Induced Currents of Fluids." LXXX, 844.









NORTHEASTERN UNIVERSITY LIBRARIES
3 9358 00836881 0