MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

ELEVENTH

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH

A STATEMENT OF THE COURSES OF INSTRUCTION.

1875-76.

BOSTON:
PRESS OF A. A. KINGMAN.
1875.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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CONTENTS.

Extracts from Acts of the General Court of Massachusetts, in relation to the Massachusetts Institute of Technology.

Act of Incorporation. "William B. Rogers [and others named], their associates and successors, are hereby made a body corporate, by the name of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY, for the purpose of instituting and maintaining a Society of Arts, a Museum of Arts, and a School of Industrial Science, and aiding generally, by suitable means, the advancement, development, and practical application of sciences in connection with arts, agriculture, manufactures, and commerce."

Chapter 183, *Acts and Resolves of* 1861.

Grant of Public Lands. "When the Massachusetts Institute of Technology shall have been duly organized, located, and established, ... there shall be appropriated and paid to its treasurer, each year, on the warrant of the Governor, for its endowment, support, and maintenance, one third part of the annual interest or income which may be received from the fund created under and by virtue of the 130th chapter of the Acts of the 37th Congress, at the second session thereof, approved July 2, 1862 [giving Public Lands to the States in aid of instruction in Agriculture, the Mechanic Arts, and Military Science and Tactics]. . . . . Said Institute of Technology, in addition to the objects set forth in its Act of Incorporation [as above quoted], shall provide for instruction in military tactics."

Chapter 186, *Acts and Resolves of* 1863.

Power to confer Degrees. "The Massachusetts Institute of Technology is hereby authorized and empowered to award and confer degrees appropriate to the several courses of study pursued in said Institution, on such conditions as are usually prescribed in universities and colleges in the United States, and according to such tests of proficiency as shall best promote the interests of sound education in this Commonwealth."

Chapter 247, *Acts and Resolves of* 1868.

CORPORATION

OF THE

MASS. INSTITUTE OF TECHNOLOGY.

FOR THE YEAR 1875-76.

President,

JOHN D. RUNKLE.

Secretary,	Treasurer,
SAMUEL KNEELAND.	JOHN CUMMINGS.

Committee on the School of Industrial Science,

JOHN AMORY LOWELL, *Chairman*,	EDWARD S. PHILBRICK,
EDWARD ATKINSON,	JOHN D. PHILBRICK,
THOMAS T. BOUVÉ,	WILLIAM B. ROGERS,
J. ELIOT CABOT,	J. BAXTER UPHAM,
GEORGE B. EMERSON,	

Treasurer, *ex-officio.*

Committee on Finance,

J. INGERSOLL BOWDITCH, *Ch'man.*	HENRY P. KIDDER,
WILLIAM ENDICOTT, JR.,	JAMES L. LITTLE,
JOHN M. FORBES,	SAMUEL D. WARREN,

Treasurer, *ex-officio.*

Committee on the Museum,

ERASTUS B. BIGELOW, *Chairman*,	E. R. MUDGE,
CHARLES H. DALTON,	M. D. ROSS,
JOSEPH S. FAY,	STEPHEN P. RUGGLES,
AUGUSTUS LOWELL,	NATHANIEL THAYER.
HORACE McMURTRIE,	

Committee on the Society of Arts,

MARSHALL P. WILDER, *Chairman*,	J. C. HOADLEY,
PHILLIPS BROOKS,	FRED. W. LINCOLN,
J. WILEY EDMANDS,	SAMUEL K. LOTHROP,
CHARLES L. FLINT,	ALEXANDER H. RICE,
JAMES B. FRANCIS,	HENRY B. ROGERS.

On the Part of the Commonwealth,

HIS EXCELLENCY, GOVERNOR WILLIAM GASTON.

HON. HORACE GRAY, *Chief Justice of the Supreme Court.*

HON. JOSEPH WHITE, *Secretary of the Board of Edcation.*

OFFICERS OF INSTRUCTION.

President.

JOHN D. RUNKLE, PH.D., LL.D.

JOHN D. RUNKLE, PH.D., LL.D.
Walker Professor of Higher Mathematics.

JOHN B. HENCK, A.M.,
Hayward Professor of Civil and Topographical Engineering.

WILLIAM R. WARE, S.B.,
Professor of Architecture.

WILLIAM P. ATKINSON, A.M.,
Professor of English and History.

GEORGE A. OSBORNE, S.B.,
Professor of Mathematics.

EDWARD C. PICKERING, S.B.,
Thayer Professor of Physics, and Director of the Rogers Laboratory.

SAMUEL KNEELAND, A.M., M.D.,
Professor of Zoölogy and Physiology.

JOHN M. ORDWAY, A.M.,*
Professor of Metallurgy and Industrial Chemistry.

JAMES M. CRAFTS, S.B.,
Professor of Organic Chemistry.

ROBERT H. RICHARDS, S.B.,
Professor of Mining Engineering, and Director of the Mining and Metallurgical Laboratories.

THOMAS STERRY HUNT, LL.D.,
Professor of Geology.

GEORGE H. HOWISON, A.M.,
Professor of Logic and the Philosophy of Science.

WM. RIPLEY NICHOLS, S.B.,
Professor of General Chemistry.

CHARLES P. OTIS, PH.D.
Professor of Modern Languages.

CHARLES H. WING, S.B.,
Professor of Analytical Chemistry.

HENRY L. WHITING, U. S. Coast Survey,
Professor of Topography.

HENRY MITCHELL, A.M., U. S. Coast Survey,
Professor of Physical Hydrography.

ALPHEUS HYATT, S.B., Custodian of the Boston Society of Natural History,
Professor of Palæontology.

* The instruction in Botany is at present given by Prof. Ordway.

WILLIAM H. NILES, PH.B., A.M.,
Professor of Physical Geology and Geography.

LIEUT. E. L. ZALINSKI, U. S. A.,
Professor of Military Science and Tactics.

CHANNING WHITAKER, S.B.,
Professor of Mechanical Engineering.

CHARLES R. CROSS, S.B.,
Professor of Physics and Descriptive Astronomy.

GAETANO LANZA, S.B., C.E.,
Professor of Theoretical and Applied Mechanics.

EUGENE LETANG,
Assistant in Architecture.

WILLIAM E. HOYT, S.B,
Instructor in Civil Engineering and Stereotomy.

JULES LUQUIENS, PH.D.,
Instructor in Modern Languages.

CHARLES KASTNER,
Lowell Instructor in Practical Design.

WEBSTER WELLS, S.B.,
Instructor in Mathematics and Descriptive Geometry.

THOMAS E. POPE, A.M.,
Instructor in Quantitative Analysis.

FRANK B. MORSE, S.B.,
Instructor in Free-hand Drawing.

HENRY N. MUDGE,
Instructor in Mechanical and Free-hand Drawing.

WILLIAM FOSTER,
Assistant in the Mining and Metallurgical Laboratories.

FRANCIS T. SARGENT, S.B.,
Assistant in Mechanical Engineering.

J. AUSTIN KNAPP, S.B.,
Assistant in Mechanical Engineering.

LEWIS M. NORTON,
Assistant in Quantitative Analysis.

CHARLES C. R. FISH,
Assistant in General Chemistry and Qualitative Analysis.

WILLIAM E. NICKERSON,
Assistant in General Chemistry and Qualitative Analysis.

WILLIAM O. CROSBY,
Assistant in Palæontology.

FACULTY.

JOHN D. RUNKLE, PH.D., LL.D., *President.*

JOHN B. HENCK, A.M.

WILLIAM R. WARE, S.B.

WILLIAM P. ATKINSON, A.M.

GEORGE A. OSBORNE, S.B.

EDWARD C. PICKERING, S.B

SAMUEL KNEELAND, A.M., M.D., *Secretary.*

JOHN M. ORDWAY, A.M.

JAMES M. CRAFTS, S.B.

ROBERT H. RICHARDS, S.B.

THOMAS STERRY HUNT, LL.D.

GEORGE H. HOWISON, A.M.

WM. RIPLEY NICHOLS, S.B.

CHARLES P. OTIS, PH.D.

CHARLES H. WING, S.B.

E. L. ZALINSKI, U. S. A.

CHANNING WHITAKER, S.B.

CHARLES R. CROSS, S.B.

GAETANO LANZA, S.B., C.E.

STUDENTS.

GRADUATE STUDENTS.

NAME.	HOME.	RESIDENCE.
Baldwin, Thomas W., I, (*A. B., Harvard College*)	Bangor, Me. . . .	Winchester.
Barrows, Herbert, *S.B.* . .	Reading	Reading.
Burnham, William A., IV, (*A. B., Harvard College*)	Boston	21 Commonw'th Ave.
Burton, William, II, (*A.B., Iowa College*)	Grinnell, Iowa . .	352 Columbus Ave.
Clarke, Eliot C., II, VIII, (*A. B., Harvard College*)	Jamaica Plain . . .	Jamaica Plain.
Hunnewell, Henry S., IV, (*A.B., Harvard College*) .	Boston	130 Beacon St.
Jackson, Frank (*A.B., Harvard College*)	Boston	88 Marlboro' St.
Sanders, Charles H., IV, (*B. S., Dartmouth Coll.*) .	Fisherville, N. H. .	48 Appleton St.
Shockley, Wm. H., *S.B.*, II,	New Bedford . . .	351 Columbus Ave.
Ware, Robert C., *S.B.*, X,	Marblehead . . .	Marblehead.

REGULAR STUDENTS.

I. Civ. Eng.; II. Mech. Eng.; III. Min. Eng.; IV. Arch.; V. Chem.; VI. Metal.; VII. Nat. Hist.; VIII. Phys.; IX. Sci. and Lit.; X. Phil.

FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Allen, Charles F.	III.	Cincinnati, O.	98 Pembroke St.
Aspinwall, Thos., Jr.	I.	Brookline	Brookline.
Atwood, Wm. P.	V.	Lowell	Lowell.
Baldwin, Thos. W. (*A.B., Harvard College*)	I.	Bangor, Me.,	Winchester.
Barrows, Walter B.	VII.	Reading	Reading.
Blodgett, Aaron D.	II.	Boston	83 Chambers St.
Breed, Joshua B. F.	I.	Louisville, Ky.	Lynn.
Buttolph, Harry T.	I.	Buffalo, N. Y.	57 Warren Ave.
Copeland, Frederick K.	I.	Winchester	Winchester.
Davis, Willis E.	IX.	San Francisco, Cal.	71 Bartlett St.
Dennett, Clarence L.	II.	Beverly	Beverly.
Fletcher, Charles R.	V.	Chelsea	Chelsea.
Freeman, John R.	I.	Lawrence	Lawrence.
Galloupe, Francis E.	II.	Lynn	Lynn.
Gay, Martin	I.	Staten Island, N. Y.	1507 Washington St.
Gould, Robert H.	VI.	E. Cambridge	E. Cambridge.
Hapgood, Everett E.	IV.	Wayland	188 Harrison Ave.
Henck, John B., Jr.	VIII.	Boston	350 Columbus Ave.
Heustis, Charles H.	IX.	Hyde Park	Hyde Park.
Hodgdon, Frank W.	I.	Arlington	Arlington.
Hollingsworth, Sumner.	II.	So. Braintree	So. Braintree.
Holman, Silas W.	VIII.	Framingham	Newton.
Hunt, Alfred E.	III.	Hyde Park	Hyde Park.
Jacques, Wm. W.	VIII.	Newburyport	135 Pembroke St.
James, Samuel, Jr.	III.	Cambridgeport.	Cambridgeport.
Kilham, Alfred C.	II.	Beverly	Beverly.
Learned, Francis M.	X.	Saxonville	Saxonville.
Lewis, Theodore J.	II.	Philadelphia, Pa.	16 Ashburton Pl.
Low, Albert H.	V.	Chelsea	Chelsea.
Main, Charles T.	II.	Marblehead	Marblehead.
Mills, Arthur L.	I.	Everett	Everett.
Partridge, Edward J.	II.	Boston	2828 Washington St.
Phipps, David W.	X.	Boston	31 Leverett St.
Prichard, Chas. F.	II.	Marblehead	Marblehead.

NAME.	COURSE.	HOME.	RESIDENCE.
Raeder, Henry, Jr.	I.	Hyde Park	Hyde Park.
Sawyer, Charles A.	IX.	Chicago, Ill.	16 Perrin St.
Schwarz, Theo. E.	III.	Boston	157 Charles St.
Susman, Julius H.	III.	Boston	42 Upton St.
Townsend, Walter D.	III.	Boston	10 Brimmer St.
Waite, Charles N.	V.	Medford	Medford.
Waitt, Henry M.	I.	Nantucket	349 Columbus Ave.
Ware, Robert C., *S. B.*	X.	Marblehead	Marblehead.
Wood, Henry B.	I.	Woburn	Woburn.

THIRD YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Alden, John, 2d	V.	Randolph	Randolph.
Baldwin, George J.	III.	New York, N. Y.	2 Asylum St.
Bartol, George	III.	Lancaster	Charlestown.
Beal, J. Williams	IV.	So. Scituate.	Hanover.
Beeching, Wm. H.	II.	Boston	117 Princeton St.
Capen, George W.	IV.	Canton	Canton.
Carter, Henry H.[1]	I.	Boston	55 St. James St.
Chamberlin, William E.	IV.	Cambridgeport	Cambridgeport.
Chapman, George H.	II.	Winchester	Winchester.
Davis, Lorenzo M.	I.	New Bedford	67 Appleton St.
Faunce, Linus	II.	Kingston	Kingston.
Fisher, Charles H.	II.	Canton	Canton.
Flint, William C.	III.	Salem	Salem.
Frost, Walter S.	II.	Boston	44 Winthrop St.
Furber, Pierce P.	IV.	Cottage Grove, Minn.	269 Meridian St.
Gowing, Earle H.	I.	Reading	Reading.
Gray, Joseph P.	I.	Lowell	Lowell.
Grover, Edmund	I.	E. Walpole	E. Walpole.
Hale, Richard A.	I.	Lawrence	Lawrence.
Hardman, John E.	III.	Lowell	20 Ashland Pl.
Hewitt, George H.[2]	VI.	Springfield	11 Dwight St.
Hibbard, Henry D.	III.	W. Roxbury	W. Roxbury.
Holman, Francis C.	III.	Boston	31 Bowdoin St.
Jenney, Walter	III.	Boston	525 Broadway.
Kirk, Joseph	II.	Boston	Cottage St.
Kittredge, George W.	I.	N. Andover	N. Andover.
Lawton, Charles F.	I.	New Bedford	67 Appleton St.
Monroe, Herbert J.	I.	Fitchburg	Charlestown.
Mudge, Benjamin C.	I.	Lynn	Lynn.

NAME.	COURSE.	HOME.	RESIDENCE.
Norton, Charles H.	I.	Charlestown	Charlestown.
Peabody, Cecil H.	II.	Chicago, Ill.	Randolph.
Peters, William M.	IV.	Jamaica Plain	Jamaica Plain.
Porter, John A.	III.	Allston	N. Beacon St.
Southworth, Harry C.	III.	Stoughton	Stoughton.
Spalding, Frederic P.	I.	Lowell	Lowell.
Stewart, Charles E.	I.	Boston	363 Dorchester St.
Stimpson, Thomas F.	III.	Swampscott	Swampscott.
Story, Isaac M.	I.	Somerville	Somerville.
Swain, George F.	I.	San Francisco, Cal.	19 Ashland Pl.
Taber, Edward G.	I.	New Bedford	67 Appleton St.
Taney, Edmund	I.	Bangor, Me.	2 Sharon St.
Wiggin, Frank E.	I.	Boston	11 Wyman St.
Wood, Frederick W.	III.	Lowell	Lowell.

SECOND YEAR.

Adams, William W.	III.	Castine, Me.	Reading.
Baker, Charles M.	IV.	Boston	22 Worcester St.
Bixby, Wm. P.	I.	Francestown, N. H.	550 Tremont St.
Brigham, Arthur A.	II.	Boston	36 St. James Ave.
Chappell, Henry W.	V.	Chicago, Ill.	1507 Washington St.
Dan, Takuma	III.	Fukuoka, Japan	21 Dover St.
Deane, Albert J.	II.	St. Paul, Minn.	536 Broadway.
Eaton, Charles S.	IV.	Lowell	Lowell.
Edwards, Charles F.	III.	Lowell	Lowell.
Fabens, George W.	I.	Marblehead.	Marblehead.
Fisher, William B.	III.	Brookline	Brookline.
Frost, J. Newton	III.	Belmont	Belmont.
Grimes, Frederick W.	II.	Mansfield, O.	Arlington.
Henshaw, John O.	I.	Cambridge	Cambridge.
Higgins, Alfred S.	IV.	Boston	173 Warren Ave.
Kebler, Julian A.	I.	Cincinnati, O.	130 Highland St.
Lovering, George G.	I.	Somerville	Somerville.
Nichols, Everell J.	I.	Everett	Everett.
Reed, Harry E.	V.	Lowell	Lowell.
Rich, Isaac	I.	Boston	706 Tremont St.
Ritchie, James	I.	Hyde Park	Hyde Park.
Robertson, R. Austin, Jr.	II.	Ridgefield Park, N. J.	85 Pembroke St.
Rollins, James W., Jr.	I.	W. Roxbury	W. Roxbury.

NAME.	COURSE.	HOME.	RESIDENCE.
Rollins, Theodore B.	IV.	Wellesley	Wellesley.
Sawin, Charles D.	IX.	Charlestown	Charlestown.
Schwamb, Peter	II.	Arlington	Arlington.
Sonrel, Louis A.	I.	Winchester	Winchester.
Towne, Linwood O.	III.	Newtonville	Newtonville.
Williams, Emile F.	I.	Boston	21 Dover St.
Woolworth, James G.	V.	Westfield	128 Pembroke St.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Alden, Frank E.	W. Roxbury	W. Roxbury.
Allen, Walter S.	New Bedford	94 Chestnut St.
Batchelder, Joseph F.	Yokohama, Japan	West Newton.
Betton, C. Grinnell	Boston	99 Mt. Vernon St.
Blake, George	Belmont	Belmont.
Boyd, Henry A.	St. John, N. B.	32 Worcester Sq.
Braley, Samuel T.	Fall River	Fall River.
Bronson, Frank P.	Ottawa, Ont.	Woburn.
Brown, Emery	Marblehead	Marblehead.
Byrne, James E.	Boston	31 Blossom St.
Cabot, John W.	Boston	267 Shawmut Ave.
Campbell, Harry H.	W. Roxbury	W. Roxbury.
Coffin, Frederic S.	Auburndale.	Auburndale.
Crosby, Charles F.	Boston	116 Tremont St.
Curtis, Henry R.	Rock Island, Ill.	Jamaica Plain.
Dunbar, William O.	Canton	Canton.
Eyre, Wilson, Jr.	Newport, R. I.	12 Pinckney St.
Fellows, Charles L.	Concord, N. H.	62 W. Cedar St.
Fifield, Charles B.	Salem	Salem.
Fullerton, Harry	Cincinnati, O.	Brookline.
Gooding, Charles S.	Brookline	Brookline.
Grant, Herbert C.	Walpole, N. H.	10 Rockland Ave.
Hall, Henry G.	Boston	6 W. Cedar St.
Hammatt, Edward S.	Rochester, N. Y.	16 Bradford St.
Harlow, Alfred B.	Middleboro'	2 Asylum St.
Hartwell, Ernest G.	Boston	602 Tremont St.
Haseltine, William S.	Brookline	Brookline.
Haskins, William J.	Boston	Maywood St.
Hosea, Raphael M.	Cincinnati, O.	68 Bartlett St.
Hosmer, Charles E.	Boscawen, N. H.	558 Tremont St.

NAME.	HOME.	RESIDENCE.
Hotchkiss, William D.	Chicago, Ill.	67 Appleton St.
Howe, Horace J.	Boston	796 Tremont St.
Howe, Louis P.	Marlboro'	49 Union Park.
Jenks, Allan M.	Newport, N. H.	62 W. Cedar St.
Knapp, Frederick B.	Plymouth	10 Rockland Ave.
Lane, Frederic H.	Boston	623 Tremont St.
Large, Walter	Dubuque, Iowa.	9 Ashburton Place.
Lodge, Richard W.	Boston	1423 Washington St.
Loring, Frederic R.	Boston	8 Greenwich Park.
Macfarlane, William W.	Woburn	Woburn.
McQuesten, Fred	Boston	126 Princeton St.
Metcalf, Arthur H.	Pawtucket, R. I.	Pawtucket.
Miller, Edwin C.	Boston	480 Columbus Ave.
Mitzuoka, Takeo	Japan	6 Centre St.
Morgan, Richard H.	New Bedford	94 Chestnut St.
Morton, N. Bowditch.	Boston	Norfolk House.
Nichols, Gilbert M.	Freetown	Cambridgeport.
Owen, Edward H., Jr.	Waltham	Waltham.
Pickering, William H.	Boston	84 Mt. Vernon St.
Pope, Sidney T.	Dorchester	Harrison Square.
Potter, William B.	Marblehead	Marblehead.
Rea, William H.	Pittsburgh, Pa.	212 W. Canton St.
Riggs, George F.	Cambridge	105 Oxford St.
Sargent, Winthrop O.	Malden	Malden.
Sessions, Wm. Alexander	Beverly	Beverly.
Smith, Frank L.	Boston	15 St. James Ave.
Spicer, Vibe C.	Winchester	Winchester.
Stantial, Frank G.	Melrose	Melrose.
Stearns, William S.	Cincinnati, O.	351 Columbus Ave.
Stephenson, Arthur H.	Boston	51 Chestnut St.
Tibbits, James H.	Mt. Vernon, N. Y.	81 E. Brookline St.
Turlay, William W.	Boston	Somerset House.
Waite, Alfred T.	Medford	Medford.
Waitt, Arthur M.	Boston	20 Bedford St.
Wilson, Arthur	Cambridgeport	10 Hamilton St.
Young, Joshua E.	Groton	Cambridge.

STUDENTS NOT CANDIDATES FOR A DEGREE.

[Students who are taking studies in different years are placed under the highest year, and the other years are indicated by the Arabic figures affixed. The Roman numerals show that a student is taking parts of the corresponding Regular Course.]

FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Buck, Waldo E.	I.	Woburn	Woburn.
Cabot, William R.	V.	Brookline	Brookline.
Claussen, Francis F. 3	V.	Pepperell	Cambridge.
Crosby, William O. 2	VII.	Washington, D.C.	6 Briggs Place.
Fish, Charles C. R.	V.	Cambridgeport	Cambridgeport.
Fletcher, Frank W. 1,2,3	V.	Detroit, Mich.	20 Worcester Sq.
Hopps, Arthur D.	I.	Lamoille, Ill.	87 Warren Ave.
Nickerson, William E.	V.	N. Somerville	N. Somerville.
Norcross, Edward M.	I.	Grantville	Grantville.
Powell, John H., Jr.	VI.	Newport, R. I.	7 W. Cedar St.
Rich, Charles L. 3	I.	Morrisville, Vt.	E. Somerville.
Robinson, Thomas W.	III.	Chicago, Ill.	20 Ashland Place.
Sanford, Orlin M. 1,2,3	IX.	Oneida, N. Y.	70 Temple St.
Shockley, William H. 2, 3 (*S.B.*)	II.	New Bedford	351 Columbus Ave.
Tucker, Frank	III.	Boston	1388 Tremont St.

THIRD YEAR.

Barnes, Wilfred	V.	Portland, Me.	2 Bowdoin St.
Brown, Frederic J.	I.	Woburn	Woburn.
Brown, Jacob F. 1, 2	II.	Hawaiian Is.	6 Cottage Pl.
Burton, William (*A.B., Iowa College*) 1, 2	II.	Grinnell, Io.	352 Columbus Ave.
Clarke, Eliot C. (*A. B., Harvard College*) 4	II, VIII.	Jamaica Plain	Jamaica Plain.
Dustan, R. Jaffray 2	V.	Boston	6 St James Ave.
Holbrook, Henry L.	II.	S. Abington.	S. Abington.
Lawton, Wm. H., Jr.	I.	Newport, R. I.	221 Shawmut Ave.
Mori, Haryosh 2	II.	Tokei, Japan	6 Central St.
Nelson, George A.	I.	Lincoln	Lincoln.
Plimpton, Arthur L. 2.	I.	Boston	7 Hawthorn St.

NAME.	COURSE.	HOME.	RESIDENCE.
Prentiss, Frederick H. [2]	II.	Boston	16 Bulfinch St.
Prescott, Charles O. [4]	V.	Westford.	Cambridgeport.
Williston, Thomas B.	II.	Springfield	28 Hanson St.

SECOND YEAR.

Allbright, William B.	V.	Boston	Boston St.
Bachelder, Charles S. [3]	V.	Brookline	Brookline.
Bradford, William B.	II.	Dorchester	Summer St.
Draper, Eben S.	II.	Milford	Milford.
Evans, Howard	I.	Cincinnati, O.	221 Shawmut Ave.
Lincoln, Arthur	V.	Dennysville, Me.	77 Pinckney St.
Paul, Charles	I.	Boston	Boston Highlands.
Pierce, Dean [1]	VIII.	Brookline	101 Beacon St.
Sargent, John W. [1]	II.	S. Amesbury	Chelsea.
Sohier, William D. [1]	IX.	Boston	5 Park Sq.
Webster, Edgar F.	I.	Waltham	Waltham.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Crocker, George H.	Fitchburg	53 Allen St.
Cutter, Edw. A.	Boston	148 W. Canton St.
Cutting, J. Clifton.	Leominster	Leominster.
Garratt, Allan V.	Boston	37 Boylston St.
Grover, George C.	Dedham	Dedham.
Hemingray, Daniel C.	Covington, Ky.	221 Shawmut Ave.
Jackson, Frank (*A. B., Harvard College*)	Boston	88 Marlboro' St.
Learned, Edward	New London, Ct.	2 Ringgold St.
Little, Philip	Boston	2 Commonwealth Av
Minchew, Chas. H. G.	Taunton	Taunton.
Perin, Frank L.	Cincinnati, O.	221 Shawmut Ave.
Purdy, George W. [2]	Cold Spring, N. Y.	64 Boylston St.
Sanborn, Willard T.	S. Newmarket.	S. Newmarket.
Washburn, Charles A.	Natick	Natick.

SPECIAL STUDENTS IN ARCHITECTURE.

Bacon, Francis H. [2, 3]	Biddeford, Me.	Natick.
Burnham, William A. (*A. B. Harvard College*)	Boston	21 Commonw'lth Ave.
Hoppin, Howard	Pomfret, Conn.	23 Pinckney St.

NAME.	HOME.	RESIDENCE.
Sanders, Charles H. 1, 3 (*B.S., Dartmouth College*)	Fisherville, N. H.	289 Columbus Ave.
Stebbins, Edward S.	Troy, N. Y.	21 Pembroke St.
Vonnegut, Bernard 1	Indianapolis, Ind.	48 Appleton St.
Clough, James A.	Holyoke	842 Washington St.
Andrews, Robert D.	Hartford, Conn.	60 Commonw'lth Av.
Borland, John, Jr., 1, 2	Boston	227 Beacon St.
Brown, Glenn	Alexandria, Va.	352 Columbus Ave.
Freeman, George A., Jr.	New York, N. Y.	37 Commonw'lth Av.
Goodman, A. J.	Collinsville, Conn.	31 Temple St.
Hunnewell, Henry S. (*A.B., Harvard College*)	Boston	130 Beacon St.
Jaques, Herbert 1	Boston	83 Boylston St.
Mann, George R.	Goshen, Ind.	48 Appleton St.
Monks, Henry G.	Boston	61 Chester Sq.
Riley, John	Boston	115 Pynchon St.
Tuck, Charles R.	Salem	19 Spring Lane.
Underwood, George F.	Boston	709 Tremont St.

STUDENTS IN PRACTICAL DESIGN.

NAME.	HOME.	RESIDENCE.
Bridgman, Lewis J.	Lawrence	Lawrence.
David, Frederic B.	W. Somerville	W. Somerville.
Eames, Edgar N.	Wilmington.	Wilmington.
Foster, Edwin LeB.	Boston	63 Ruggles St.
Graves, Abbott F.	Melrose	Melrose.
Hudson, Samuel L.	S. Boston	S. Boston.
Hyde, Frank	Danielsonville, Ct.	2 Lynde St.
Mabille, Henry P.	Roslindale	Roslindale.
Mahan, John J.	Boston	Boston Highlands.
Schroeder, Wm. O.	Somerville	Somerville.
Symmes, Harry M.	Winchester	Winchester.
Tarbell, John H.	Boston	236 Shawmut Ave.
Washburn, Charles A.	Natick.	Natick.
Cole Frances H.	Boston	622 Tremont St.
Foster, Gertrude E.	Boston	63 Ruggles St.
Frederick, Mary E.	W. Medford.	W. Medford.
Greene, Caroline S.	Boston	6 St. James Ave.
Hartshorn, Ada R.	Boston	106 Boylston St.
Joy, M. M.	Boston	30 Pleasant St.

NAME.	HOME.	RESIDENCE.
Marsh, C. Bronsdon . . .	Boston	6 Columbus Sq.
Mowton, Maria	Boston	6 St. James Ave.
Munroe, L. Bailey . . .	E. Cambridge . . .	E. Cambridge.
Parker, H. Augusta . . .	Boston	3 Allen Place.
Plumer, Grace H.	Lexington	Lexington.
Simonds, Kate T. . . .	Boston	45 Dover St.

SUMMARY.

Graduate Students	10
Regular Students, fourth year	43
" " third "	43
" " second "	30
" " first "	66
Students not candidates for a degree, fourth year . .	15
" " " " third " . .	14
" " " " second " . .	11
" " " " first " . .	14
Special Students in Architecture	19
Students in Practical Design	25
Deduct names counted twice	10
Total	280

CALENDAR.

School-year began	Monday, Sept 27, 1875.
School-year ends	Saturday, June 3, 1876.
The next School-year will begin . . .	Monday, Sept. 25, 1876.
First Entrance Examinations . . .	Monday, June 5, 1876, and Tuesday, June 6, 1876.
Second Entrance Examinations . .	Wednesday, Sept. 20, 1876, and Thursday, Sept. 21, 1876.
Examinations for advanced standing . .	Wednesday, June 7, 1876, and Friday, Sept. 22, 1876.

COURSES OF INSTRUCTION.

The Massachusetts Institute of Technology provides a series of scientific and literary studies and practical exercises, embracing pure and applied mathematics, the physical and natural sciences with their applications, drawing, the English language, mental and political science, French, and German. These studies and exercises are so selected and arranged as to offer a liberal and practical education in preparation for active pursuits, as well as a thorough training for the various scientific professions. Ten Regular Courses, each extending through four years, have been established as follows: —

I.	A	Course in	Civil and Topographical Engineering.
II.	"	"	" Mechanical Engineering.
III.	"	"	" Geology and Mining Engineering.
IV.	"	"	" Building and Architecture.
V.	"	"	" Chemistry.
VI.	"	"	" Metallurgy.
VII.	"	"	" Natural History.
VIII.	"	"	" Physics.
IX.	"	"	" Science and Literature.
X.	"	"	" Philosophy.

These courses are identical during the first year; but for the three remaining years the studies in each course are selected and arranged with reference to the end in view.

In the professional courses non-professional studies generally end at the middle of the fourth year. The course for the second half of the year is then made up, and is mainly devoted to professional studies, including the preparation of the Thesis.

The courses in Natural History, Physics, Science and Literature, and Philosophy, differ somewhat from the others in having

a less distinctly professional character. The course in Natural History affords an appropriate general training for those whose ulterior object is the special pursuit of Geology, Mineralogy, Botany, Zoology, Medicine, Pharmacy or Rural Economy. The course in Physics is based on the mathematical and physical sciences, the course in Philosophy on the mathematical and philosophical sciences, and the course in Science and Literature on the sciences and modern literature, and each course offers a sound education as well as suitable preparation for any of the departments of active life.

In all the courses it is intended to secure to every student a liberal mental development and general culture, as well as the more strictly technical education which may be his chief object.

For proficiency in any one of these courses the degree of S.B., Bachelor of Science, is conferred.

Advanced courses of study have recently been established, and the degree of Doctor of Science authorized by a vote of the Corporation.

The Institute also provides annually several courses of instruction, scientific and literary, open to both sexes. At present these courses are free, being supported by the Trustee of the Lowell Institute. Fuller details are given on page 62.

REGULAR COURSES.

ALL COURSES. — FIRST YEAR.

			No. of Exercises	Hrs. per week
1	Algebra finished	1st half	45	3
	Plane and Solid Geometry reviewed	2d half	15	3
	Plane and Spherical Trigonometry	2d half	30	3
2	General Chemistry	1st half	60	6
	General Chemistry	2d half	30	2
	Qualitative Analysis	2d half	30	4
3	Structure of the Sentence	1st half	30	2
	Rudiments of Logic	2d half	30	2
4	French		90	3
5	Mechanical Drawing and Elements of Descriptive Geometry and Perspective		90	6
6	Free Hand Drawing		90	3
7	Physiology and Hygiene	2d half	30	2
8	Military Tactics		90	3

I. CIVIL ENGINEERING.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
2	Descriptive Geometry	1st half	30	2
	Mechanical Drawing	1st half	30	4
	Surveying		60	2
	Topographical and Plan Drawing	2d half	30	4
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Survey and Location of Roads	1st half	45	6
	Construction of Roads	2d half	20	6
	Water supply, Drainage, etc.	2d half	25	6
	Field Practice		30	3
	Stereotomy	1st half	30	4
	Bridge and Roof Construction	2d half	30	4
2	Calculus	$\frac{1}{4}$ year	25	3
	Applied Mechanics	$\frac{3}{4}$ year	65	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Stability of Structures	1st half	20	6
	Strength of Materials	1st half	25	6
	Structures of Stone	2d half	15	6
	Structures of Wood	2d half	10	6
	Structures of Metal	2d half	20	6
	Topography (Field Practice)	2d half	10	
	Physical Hydrography	2d half	10	
	Structure Drawing	2d half	45	6
	Building Materials	2d half	10	3
2	Water power and Water wheels	2d half	25	4
3	Metallurgy of Iron	1st half	30	2
4	Applied Physics	1st half	30	2
5	German	1st half	45	3
6	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

II. MECHANICAL ENGINEERING.

SECOND YEAR.

			No. of Exercises	Hrs. per week.
1	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
2	Descriptive Geometry	1st half	30	2
	Mechanical Drawing	1st half	30	4
	Principles of Mechanism	1st half	30	2
	Principles of Mechanism	2d half	60	4
	Machine Drawing	2d half	30	4
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Machinery and Millwork	$\frac{2}{3}$ year	80	6
	Strength of Materials	$\frac{1}{3}$ year	40	6
	Mechanical Laboratory		30	2
	Machine Drawing		60	4
2	Calculus	$\frac{1}{4}$ year	25	3
	Applied Mechanics	$\frac{3}{4}$ year	65	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Principles of Thermodynamics	1st half	90	6
	Mechanism of the Steam Engine	2d half	50	8
	Water power and Water wheels	2d half	70	8
	Machine Drawing		90	6
	Mechanical Laboratory		105	7
	Building Materials	2d half	10	3
2	Metallurgy of Iron	1st half	30	3
3	German	1st half	45	3
4	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

III. MINING ENGINEERING.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
2	Qualitative Analysis	1st half	45	6
	Drawing	1st half	30	2
	Mineralogy	2d half	45	6
	Botany	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Chemical Laboratory		150	10
	General Quantitative Analysis (Lectures)	1st half	30	2
	Mining Engineering		90	3
	Assaying	2d half	15	3
	Structural Palæontology	2d half	15	2
2	Calculus	$\frac{1}{4}$ year	25	3
	Applied Mechanics	$\frac{3}{4}$ year	65	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Ore dressing	$\frac{1}{4}$ year	15	3
	Metallurgy	$\frac{1}{2}$ year	45	3
	Drawing	1st half	30	2
	Mining and Metallurgical Laboratory	2d half	75	10
	Chemical Laboratory		150	10
2	American Geology	1st half	40	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
	Chemical Geology	2d half	15	3
3	German	1st half	45	3
4	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

IV. ARCHITECTURE.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
2	Descriptive Geometry	1st half	30	2
	Mechanical Drawing	1st half	30	4
	Shades, and Shadows	2d half	30	2
	The Orders	1st quar.	16	2
	Greek and Roman Arch. History	2d quar.	14	2
	Architectural History and Design	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Theory of Architecture	1st half	15	1
	Architectural History and Design	2d half	30	2
	Stereotomy	1st half	30	4
	Mechanical Drawing	1st half	30	4
	Architectural Drawing		150	10
	Specifications and Working Drawings		30	1
2	Calculus	$\frac{1}{4}$ year	25	3
	Applied Mechanics	$\frac{3}{4}$ year	65	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Architectural History and Design		30	1
	Architectural Ornament and Detail		30	1
	Specifications and Working Drawings		30	1
	Architectural Drawing		150	10
2	Stability of Structures	1st half	20	6
	Strength of Materials	1st half	25	6
	Structures of Stone	2d half	15	6
	Structures of Wood	2d half	10	6
	Structures of Metal	2d half	20	6
	Building Materials	2d half	10	3
3	Applied Physics	1st half	30	2
4	German	1st half	45	3
5	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

V. CHEMISTRY.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Qualitative Analysis	1st half	45	6
	Mineralogy	2d half	45	6
2	Chemical Philosophy	1st half	45	3
	Botany	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science and Tactics		24	1

THIRD YEAR.

	Chemical Laboratory		150	12
	General Quantitative Analysis (Lectures)	1st half	30	2
	Quant. Anal., Special Methods (Lectures)	2d half	30	2
	Industrial Chemistry	2d half	45	3
2	Chemical Physiology	1st half	30	2
	Structural Palæontology	2d half	15	2
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Chemical Laboratory		150	15
	Organic Chemistry (Lectures)		60	2
	Metallurgy	½ year	45	3
	Drawing	1st half	30	2
2	American Geology	1st half	40	3
	Chemical Geology	2d half	15	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
	Assaying	2d half	10	
3	Applied Physics	1st half	30	2
4	German	1st half	45	3
5	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

VI. METALLURGY.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Qualitative Analysis	1st half	45	6
	Mineralogy	2d half	45	6
2	Chemical Philosophy	1st half	45	3
	Botany	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Chemical Laboratory		150	12
	General Quantitative Analysis (Lectures)	1st half	30	2
	Quant. Anal., Special Methods (Lectures)	2d half	30	2
	Industrial Chemistry	2d half	45	3
2	Chemical Physiology	1st half	30	2
	Structural Palæontology	2d half	15	2
	Assaying	2d half	15	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Ore-dressing	½ year	15	3
	Metallurgy	½ year	45	3
	Drawing	1st half	30	2
	Mining and Metallurgical Laboratory	2d half	75	10
	Chemical Laboratory		150	10
2	American Geology	1st half	40	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
	Chemical Geology	2d half	15	3
3	German	1st half	45	3
4	Philosophy of Science	1st half	45	3

In addition to the prescribed studies, optional studies, selected from other courses, may be taken.

VII. NATURAL HISTORY.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Chemical Philosophy	1st half	45	3
	Botany	2d half	30	2
2	Qualitative Analysis	1st half	45	6
	Mineralogy	2d half	45	6
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	General Quantitative Analysis (Lectures)	1st half	30	2
	Comparative Zoology	2d half	45	3
	Chemical Laboratory		150	10
2	Chemical Physiology	1st half	30	2
	Structural Palæontology	2d half	15	2
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Special Zoology, Special Geology, Special Botany, or Special Stratigraphical Palæontology	Laboratory	180	12
2	American Geology	1st half	40	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
	Chemical Geology	2d half	15	3
3	Applied Physics	1st half	30	2
4	German		90	3
5	Philosophy of Science	1st half	45	3
	Political and Industrial Geography	2d half	30	2

In addition to the prescribed studies, optional studies, elected from other courses, may be taken.

VIII. PHYSICS.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
2	Qualitative Analysis	1st half	45	6
	Quantitative Analysis	2d half	45	6
	Chemical Philosophy	1st half	45	3
	Botany	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Rhetoric and English Literature, or Descriptive Astronomy	1st half	30	2
6	English Literature, or Physical Geography	2d half	30	2
7	Military Science		24	1

THIRD YEAR.

1	Physical Laboratory		120	4
	Physics (additional Lectures)		60	2
2	Calculus	$\frac{1}{2}$ year	25	3
	Applied Mechanics	$\frac{3}{4}$ year	65	3
	Strength of Materials	2d half	30	4
3	General Quantitative Analysis (Lectures)	1st half	30	2
	Chemical Physiology	1st half	30	2
	Chemical Laboratory	1st half	45	6
4	German		90	3
5	Outlines of Zoology, or History	1st half	30	2
6	General Geology, or Political Economy	2d half	30	2

FOURTH YEAR.

1	Physical Research		150	10
	Advanced Physics		30	2
	Photography	1st half	15	4
	Lantern Projections	1st half	15	4
2	Chemical Laboratory	2d half	75	10
3	Practical Astronomy	1st half	30	3
	Mechanical Engineering	1st half	15	3
4	Principles of Thermodynamics	1st half	60	4
5	American Geology	1st half	40	3
	Chemical Geology	2d half	15	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
6	German		90	3
7	Philosophy of Science	1st half	45	3
	Political and Industrial Geography	2d half	30	2

In addition to the prescribed studies, optional studies selected from other courses, may be taken.

IX. SCIENCE AND LITERATURE.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Rhetoric and English Literature . . .		90	3
	Elements of Philosophy	2d half	45	3
2	Chemical Philosophy	1st half	45	3
	Botany	2d half	30	2
3	Physics (Lectures)		90	3
4	French finished, German begun		90	3
5	Descriptive Astronomy	1st half	30	2
	Physical Geography	2d half	30	2
6	Military Science		24	1

THIRD YEAR.

1	History		90	3
2	Advanced French		90	3
3	German		90	3
4	Physical Laboratory		60	2
5	Outlines of Zoology	1st half	30	2
	General Geology	2d half	30	2
6	History of Commerce and Industry . .	1st half	30	2
	Political Economy	2d half	30	2

FOURTH YEAR.

1	Earlier English Literature	1st half	45	3
	Science of Language	2d half	45	3
2	Business Law	1st half	30	2
	Political and Industrial Geography . .	2d half	30	2
3	American Geology	1st half	40	3
	Chemical Geology	2d half	15	3
	Coal and Ore Deposits	2d half	15	3
	Building Materials	2d half	10	3
4	German		90	3
5	Constitutional History		60	2
6	Philosophy of Science	1st half	45	3
	Applied Physics	1st half	30	2

In addition to the prescribed studies, optional studies selected from other courses, may be taken.

X. PHILOSOPHY.

SECOND YEAR.

			No. of Exercises.	Hrs. per week.
1	Applied Logic	1st half	45	3
	Elements of Philosophy, viz.,	2d half	45	3
	(*a*) Its Definition and General Problems (5 lectures)			
	(*b*) The Solutions proposed by the several Schools (10 lectures).			
	(*c*) Résumé of Terminology (5 lectures)			
	(*d*) Outlines of Psychology (25 lectures)			
2	French finished, German begun		90	3
3	Analytic Geometry	1st half	45	3
	Calculus	2d half	45	3
4	Physics (Lectures)		90	3
5	Chemical Philosophy	1st half	45	3
6	English Literature	2d half	45	3
7	Military Science		24	1

THIRD YEAR.

1	Philosophy: Critical History of Modern Systems		150	5
	(*a*) Descartes, Spinoza, Locke. (1st half, 75 lectures.)			
	(*b*) Leibnitz, Berkeley, Hume. (2d half, 60 lectures.)			
	(*c*) Reid, the Transition to Kant. (2d half. 15 lectures.)			
2	Advanced French		90	3
3	German		90	3
4	History	1st half	30	2
	Political Economy	2d half	30	2
5	Physical Laboratory	1st half	30	2
	General Geology	2d half	30	2

FOURTH YEAR.

1	Philosophy: Critical History of Modern Systems		150	5
	(*a*) Kant and Fichte. (1st half. 75 lectures.)			
	(*b*) Schelling and Hegel. (2d half. 75 lectures.)			
2	Philosophy of Science, viz.,	1st half	45	3
	(*a*) Theory of Induction—its precise nature as a Mental Process, its Conditions of Application, and its Five Auxiliary Methods (20 lectures)			
	(*b*) Classification of the Natural Sciences, with discussion of their Logical Connexion, and of the Logical System of each (10 lectures)			
	(*c*) Same treatment of the Mathematical Sciences (5 lectures)			
	(*d*) Logical Theory of the Calculus (10 lectures)			
	Science of Language	2d half	45	3
3	German		90	3
4	Earlier English Literature	1st half	45	3

In addition to the prescribed studies, optional studies selected from other courses, may be taken.

ADVANCED COURSES.

These courses are intended to afford to Bachelors of Science of this Institute, and others of equal attainments, the means of continuing their studies. For proficiency in them the degree of S. D., or Doctor of Science, has been authorized.

The particular course of study which a student wishes to pursue must be submitted in writing, and must meet the approval of the Faculty. The methods of instruction, whether by lectures, or projects, or practice in the field or in the laboratories, will be those best adapted to each case. Frequent examinations will be held to test the progress of the student; but in voluntary subjects no examination will be required.

The minimum term of residence of candidates for a degree will be two years; but occasional short absences, when the time is spent upon professional work by advice of the Faculty, will not be considered as interruptions of the student's residence.

A candidate will be required to present at least one printed thesis on some subject embraced in his course.

The usual final examinations for the degree will be held, and these, with all previous examinations and the thesis, will be the tests of the student's proficiency.

CONDITIONS OF ADMISSION.

Regular Courses. To be admitted as a regular student of the first year's class, applicants must have attained the age of sixteen years, and must pass a satisfactory examination in arithmetic (including the metric system of weights and measures), algebra through equations of the second degree, plane and solid geometry, including spherical geometry, French grammar through regular and irregular verbs, and the first two books of Voltaire's "Charles XII" (*i.e.*, about sixty pages) or the equivalent of the same, English grammar, including, especially,

the ability to detect the parts of speech, to use correctly the conjugation of verbs regular and irregular, to classify terms as Singular, General, and Universal, and to analyze phrases and sentences, English composition, rhetoric (so much as is included in the first part of Bain's Rhetoric, or its equivalent), history of the United States, and geography.[1] In general, the training given at the best High Schools, Academies, and Classical Schools, will be a suitable preparation for this School.

To be admitted as a regular student of the second year's class, applicants must be at least seventeen years of age, and must pass a satisfactory examination upon the first year's studies, besides passing the examination for admission to the first year's class; and a like rule applies to the case of applicants for admission into the classes of the succeeding years.

Graduates of Colleges will, in general, be presumed to have the requisite attainments for entering the third year as regular students, and may do so on satisfying the department which they purpose to enter that they are prepared to pursue their studies to advantage. Such students, if deficient in any of the scientific studies of the first two years, will have opportunities for making them up without extra charge, and will be required to pass an examination in them before entering upon the studies of the fourth year. Should they be already proficient in any of the general studies of the third and fourth years, they will be excused, if they wish, from attendance on the exercises in these subjects.

A knowledge of the Latin language is not required for admission; but the study of Latin is strongly recommended to persons who purpose to enter this School. Those who intend to take the course in Natural History will find it advantageous also to acquire the elements of Greek.

Persons not candidates for a degree will be allowed to enter special divisions of either of the courses,—as, for example, the

[1] For fuller details respecting the requirements for admission, see the accompanying paper, to which the attention of teachers is especially directed.

classes of mathematics, chemistry, physics, drawing, engineering, metallurgy, architecture, natural history, etc., — on giving satisfactory evidence to the Faculty that they are prepared to pursue with advantage the studies selected. They must be present for examination at the times stated below, and will be required to pass the entrance examination prescribed for regular students, except when the studies selected do not require a knowledge of certain of the subjects covered by that examination; in that case solid geometry and French may be omitted, and the examination in algebra may cover that portion of the subject only which precedes quadratics. Students may be admitted to the classes in drawing without examination.

An examination for admission to the first year's class will begin at 9 A. M., on the first Monday in June, and continue two days. A second examination will begin at 9 A. M., on the Wednesday preceding the last Monday in September, and continue two days. Attendance on both days of either examination is required. Applicants for advanced standing must present themselves at either the first or second entrance examination, as given above, and if they pass this examination, must present themselves for further examination at 9 A. M., on the Friday following either entrance examination. Applications for admission at other times than the above will be received only when sickness or some other equally good cause has prevented attendance on the days prescribed. Copies of recent examination papers and further information in regard to the requirements for admission may be obtained by application to the Secretary of the Institute.

Advanced Courses. Bachelors of Science of the Institute may enter on these courses without examination. Bachelors of Arts, Science, or Philosophy of any other Institution may enter, on giving satisfactory evidence, by examination or otherwise, that they are qualified to pursue the course selected. Any person may enter who, by examination, is found qualified to take the degree of Bachelor of Science in the Institute.

METHODS AND APPARATUS OF INSTRUCTION.

Ordinary Exercises. Instruction is given by lectures and recitations, and by practical exercises in the field, the laboratories, and the drawing rooms. The progress of each student is tested by frequent oral examinations. Text-books are used in many, but not in all departments. A high value is set upon the educational effect of laboratory practice, drawing, and field-work.

Written Examinations. Besides the oral examinations in connection with the ordinary exercises, written examinations are held from time to time, particularly in those departments in which the oral examination of the students is necessarily too infrequent to be exclusively relied upon.

Near the close of the months of January and May, general examinations are held,—that of January embracing the subjects studied during the first half-year, that of May covering the studies of the whole year. Each examination on a distinct subject is marked on a scale of 100, and the marks of each student are reported to his parent or guardian. These returns are intended to enable the parent or guardian to judge of his son's or ward's proficiency in each department of instruction. The examinations of January and May form the basis of admonition or advice from the Faculty in the case of students who are not profiting by their connection with the School. A student who fails to pass the May examination in any subject will not be permitted to enter upon the studies of the following year without passing a new examination. Such students must appear for re-examination at 9 A. M., on the Friday preceding the first Monday in October.

The Instruction in Chemistry. In the chemical laboratories provision is made for teaching General Chemistry, Qualitative Analysis, Quantitative Analysis, Assaying, Determinative Min-

eralogy, the Use of the Blowpipe, Metallurgy, and Industrial Chemistry.

During the first term of the first year, instruction is given in General Chemistry by recitations and lectures, and by practical exercises in the laboratory, where every student is provided with a desk and the necessary apparatus, and is required to perform, under the supervision of the professors, a large number of experiments selected to illustrate the laws of chemical action and the properties of all the more important chemical elements. In the second term, a systematic course of instruction in Qualitative Analysis is given, by laboratory practice and by oral and written examinations.

During the first term of the second year, further instruction in Qualitative Analysis is given to those students who pursue the regular courses in Mining Engineering, Chemistry, Metallurgy, Natural History, and Physics. Instruction is also given in Chemical Philosophy to students pursuing the courses just named, and also to those who choose the courses in Science and Literature and Philosophy. In the second term of the second year, and in the third and fourth years, the principal subjects of study are Volumetric and Gravimetric Analysis, Organic Chemistry, Gas Analysis, the Preparation of Chemical Products, Assaying, Mineralogy, the Use of the Blowpipe, Metallurgy, and Industrial Chemistry. A large portion of the time is allotted to work in the laboratories. In the third year, courses of lectures are given on Quantitative Analysis and on Industrial Chemistry. In the fourth year, the lecture room exercises are devoted to Organic Chemistry and Metallurgy. During the last two years the student is required to make frequent reference to standard works and original memoirs in English, French, and German. Both regular and special students are encouraged to undertake experimental researches, and are assisted in bringing them to useful results.

The Instruction in Physics. During the second year the whole subject is discussed in a series of lectures, which are attended by all the regular students. The various branches

are treated both mathematically and experimentally. In all cases the theoretical discussion of a question is followed by a full account of its practical applications.

The first part of the course is devoted to Mechanics of solids, liquids, and gases, and is designed both to prepare the student for an extended study of General Physics, and to serve as an introduction to Analytical and Applied Mechanics.

The Institute possesses an extensive and constantly increasing collection of physical apparatus. The lectures are also illustrated by a large number of photographs on glass; which are projected upon a screen by means of a calcium light.

In the third year the students enter the *Rogers Laboratory of Physics* and learn to use the different instruments, and to prove many of the fundamental laws of nature. Some of the experiments, as for instance the microscope, the spectroscope, and the determination of specific gravities have a direct value; others are intended to establish certain principles in the mind; others again serve to cultivate manual skill in teaching the student to handle minute or delicate objects; and still others exercise his reasoning faculties, and show him how to apply his mathematics to concrete problems. This course therefore has a value beyond the direct application of the experiments, in the direction of general culture, teaching the student to derive conclusions from observed facts, and showing him the various methods of experimental research.

In the fourth year a portion of the students carry on work of a more technical nature, or more closely connected with their professional studies. In this course original investigation is stimulated, as far as possible, and the result has been a considerable number of published memoirs.

Besides the above, the students in the department of Physics pursue the following practical courses.

Photography. Methods of photography and its connection with lithography and printing; preparation of baths; taking glass negatives, lantern slides, paper positives; photographs of microscopic objects, of spectra and other scientific applications.

Lantern Projections. Sunlight, calcium, magnesium, and electric lights; lanterns, condensers, and projecting lenses; projection of views, of real objects; tanks, chemical and electric decompositions; projection of spectra.

Mechanical Engineering. Tests of engines and boilers; evaporation per pound of coal; measurement of power; transmission and absorption dynamometers; coating of steam pipes; friction of belts and pullies; strength of materials.

Meteorology. Atmospheric temperature, pressure, and moisture; velocity of the wind; magnetic elements; electricity of of the air.

Astronomy. Sextant, and its adjustment; determination of latitude, time, longitude, and meridian; transit, its adjustment and corrections; measurement of time; transit in prime vertical; transit circle; zenith telescope; altitude and azimuth instrument; equatorial telescope; position and spider-line micrometer; principal objects, the sun, moon, planets, double stars, clusters, and nebulæ.

Advanced Physics. As most of the students taking the course in Physics intend to make teaching their profession, a special course is prepared with this object in view, in which each student in turn prepares a particular subject, giving the result of his own or others' researches, and presents it in the form of a lecture, illustrated, as far as possible, by experiments.

Teachers of physics, or others properly qualified, may enter the laboratory, and take the whole or any part of the above courses.

The Instruction in Rhetoric and History. Lectures are given on Rhetoric and the history of the English Language. Systematic practical exercises in English Composition will be required of all regular students, as an essential part of their training. Practice in writing English will be continued throughout the four years, in the preparation of abstracts of the lectures or of the collateral reading prescribed, of translations from

the French or German manuals used in the instruction in history, and of original papers or essays to be read to the class.

In the second and third years, courses of lectures are given on Modern Literature and History, in connection with the reading of manuals in French or English, and accompanied by written abstracts and translations.

In the fourth year, instruction is given in English and American Constitutional History. To students in the department of Science and Literature opportunity is afforded for a more detailed study of English by the critical reading of annotated texts of standard English authors; and for a more extended study of History, especially of the political, commercial and industrial history of present times.

The Instruction in Logic and Philosophy. The work done under these heads may be divided into two bodies: first, that required of all regular students, irrespective of the special Department to which they belong; and, second, that required as the main work of the students in the special Department of Philosophy.

I. The subjects required of all regular students are the Rudiments of Logic and the Philosophy of Science. In these, the aim of the instruction will be to familiarize all with the logical principles underlying the sciences which form the subjects of their other studies, and warranting the methods of investigation which are taught in each. The final object will therefore be, to acquaint each student with the Laws of Belief, so far as they have been reduced to system, and to give him so rational a comprehension and conviction of them, that he shall be able to apply them in testing and regulating his own acceptance of propositions in all the fields of his knowledge. But, as the first step towards this end, a knowledge of the mere elements of Formal Logic will be secured, as contributing towards the essentials of Belief so much as is involved in the conditions of Consistency.

In the teaching of Logic, especial attention will be paid dur-

ing the first year to the structure and analysis of sentences, and to the classification and analysis of terms.

The instruction in the Philosophy of Science will include, as requirements for *all* regular students, (1) the Theory of Induction — its Nature, Limits, and Canons, and (2) the Classification, Logical Connexion, and Logical Structure of the Natural Sciences. It will add, as requisites for the students in Engineering, Architecture, Physics, and Philosophy, (3) the Classification and Logical Structure of the Mathematical Sciences, and (4) the Logical Theory of the Calculus, developing the real grounds for the validity of the Infinitesimal Method, and its entire consonance with the arithmetical and geometric axioms.

II. The requirements for regular students in the special department of Philosophy are embraced in a somewhat detailed study of the elements of Philosophy in General, in addition to the subjects taken in common with other regular students.

The specific object of this Department is to furnish the basis for a sound general education, in such a study of Philosophy as, gathering within its scope the solid products of the modern mind, will bring its idea into immediate connection with the Conduct of Life. The Department rests upon the theory, that the problem of all general education is, to equip its subject for the highest concerns of the real world; that these are the various exercises of *character*, in its relations to the great combinations of mankind in the State, in Civil Society, in Art, and in Religion; and that the formation of a character adequate to deal with these combinations must depend at last on a study and comprehension of the principles which account for their existence, warrant their continuance, and explain their spiritual significance as the theatres of the highest human action.

The characteristic studies of this Department, additional to those pursued in the same field by all regular students, will be Applied Logic, the Elements of Philosophy, and the history and criticism of Philosophical Systems. The work in Applied Logic will consist in analyzing certain celebrated arguments,

and in investigating the reasoning of at least one of the important parallel studies pursued by the class. In the history of Systems, the ground chosen will be that of Modern Philosophy, beginning in France with Descartes, passing to England through Locke and his successors, and ending in Germany with the speculative movement from Kant to Hegel. Such references to ancient systems as may be necessary merely to explain the modern, will of course be made; and the central works of the leaders of the modern systems will themselves be the text upon which the work will be founded; the student will be brought into direct contact with them by his own reading. Under the head of Ethics, in this course, will be included the doctrine of the foundations of the State and of Society in General, as well as the grounds of individual conduct.

The Instruction in Modern Languages. The immediate object of the instruction in French and German is to enable the student to avail himself of the literature in these languages relating to his particular department of professional study. As important sources of information, such as periodicals, text and reference books, in the various departments, are only accessible in one or the other of these languages, it is desirable that he should become able to use them as soon as possible. But although the object aimed at is the practical one of learning in the shortest time to read with readiness a foreign scientific work, it is believed that this is most satisfactorily accomplished by a thorough and systematic preliminary training, in which the main laws and the structure of the language are the principal studies; since it is only in this way that the essential of *accuracy* can be attained. In this way the student acquires sufficient *strength* in the language to master the difficulties he will meet, and obtains a general view of the structure of the same, so that he will not easily *forget* his acquisition in after years. Moreover, at the same time with the best and quickest attainment of the practical object, much of the *culture* resulting from the study of the language and literature of another people, is secured.

For the reasons above indicated, French is diligently continued through the first year and until a period of two years' study, including the time of preparation, has been devoted to the same. German is commenced at the beginning of the second year (or after the French is finished), and continued with the same thoroughness and concentration as the French, and for a like period. To this point these languages are studied by all regular students.

In the courses of Science and Literature and Philosophy, French and German are continued after they are finished in the professional courses. In these courses it is intended to pursue more extensively the critical study of difficult authors in both languages, with more special reference also to the literature of the same, and the relations of these languages to the English. The special object of these courses being to afford a liberal education, it is felt that the languages should be taught here accordingly, and in a more disciplinary manner than where the object is principally to learn to read in the shortest time.

The elements of Italian and Spanish are taught in volunteer classes in the third and fourth years, for the benefit of those who may have especial reasons for making a beginning in those languages. It is, however, recommended to students to go farther in French and German rather than to take up a new language. Only the elements, however, are taught, the student being expected to build up by himself on the foundation here laid. A more extended course in Italian and Spanish is contemplated in connection with the Advanced Courses.

Opportunity is also offered in these courses for the study of the older forms of the modern Languages, the relations to one another of the different branches of the German and Roman families, and of the subject of linguistic science.

A knowledge of Latin is essential to those pursuing the latter studies. A previous study of Latin is also of very great help to all the students in the Modern Languages. The vocabulary and forms of the French come directly from it; and a previous study of it (although brief) gives the student a training in lan-

guage which will enable him to take up the French and German with much greater facility and advance much more rapidly.

The Instruction in Descriptive Geometry and Drawing. Descriptive Geometry is taught under the main divisions of Planes; Developable Surfaces; Warped Surfaces, and Double Curved Surfaces; and each under the subdivisions, relative to the kinds of problems treated, of Projections; Tangencies; Intersections, and Developments.

The exercises are of two kinds. In the lecture room, instruction, with models and diagrams, is combined with testing the student's knowledge as gained from a text book. In the drawing room, the student aims to construct such problems, each week, from the lessons for that week, as shall, during the course, give him practice in all the usual operations belonging to the subject.

The Instruction in Stereotomy is given by means of lectures and drawing exercises, illustrating a variety of problems in Stone Cutting, on plane, double-curved, and warped surfaces. The application of Descriptive Geometry is extended to the construction of the oblique arch and winding staircases of various forms, so as to include a large number of useful and practical problems.

The Instruction in Civil Engineering is given by means of lectures and recitations, and by practice in the field and in the drawing rooms. The use of the various instruments for measuring lines and angles, and of the level, is taught mainly by actual work in the field; first, in ordinary surveying and levelling; then in laying out curves, both circular and parabolic; and afterwards in the survey of a railway line, and in staking it out ready for construction. These surveys are plotted and represented on finished plans. The necessary computations of areas, earth-work, etc., are also made. In most of the remaining subjects peculiar to this department, as set down in the Course of Instruction on page 42, Rankine's Civil Engineer-

ing is used as a text-book; and the aim is to enable the student, by means of suitable explanations, illustrations and examples, to acquire a thorough working knowledge in these branches. The department has a good stock of excellent field instruments. An *Observatory*, erected upon the Institute building, from which a large number of U. S. Coast Survey stations are visible, is used in the instruction in triangulation and geodesy. Observations are also made for the determination of the meridian, and of latitude and longitude.

The Instruction in Designing Bridges and Roofs. Problems are given to the fourth year's class to be worked out by each student independently, in the form of original designs for structures to meet stated requirements of loading and limits of stress. Working drawings are made in the usual form of workshop practice, showing dimensions and combinations of parts corresponding to the calculated stresses. Computations are checked by graphical determinations, and these diagrams are affixed to the finished drawings of the structure.

During the third year, a course of lectures on Construction is given, preliminary to the course in Designing. These lectures comprise a careful analysis of a wide range of engineering works, selected and described so as to make the student familiar with existing structures to such an extent that he may have at his command a variety of forms and mechanical combinations of practical value, from which he can choose when he is required to design bridges and roofs in the fourth year's course.

The Instruction in Topography is mainly given in the field by means of the Plane-Table, as perfected and used in the United States Coast Survey. The maps are completed in the drawing rooms, where instruction is given in the conventional modes of shading and topographical illustration.

The Instruction in Physical Hydrography is begun by practice in water surveys. After the student has become familiar

with the data and the means of obtaining them, applications are made to the construction of breakwaters, docks, wharves, and other harbor improvements, as well as to the dyking and reclaiming of lands, to the location and construction of canals, and to the rectification of rivers.

The Instruction in Mechanical Engineering is given in three courses: the mathematical, the practical, and the graphical. In these courses the work is taken up in the same order as in Professor Rankine's works on "Mills and Millwork," and "Steam Engine and other Prime Movers," which are read as text-books. All three courses are carried on together with the same class, each approaching the same subject from a somewhat different stand-point. In the mathematical course Prof. Rankine's demonstrations are usually given; but care is taken to collect from his books and papers all he has given upon a particular subject, that the simplest as well as fullest discussion may be presented to the class. In the practical course the entire attention is given to the application of the theory, as involved in practice. Applications, as far as possible, are made to existing engineering works, and to problems as they occur in practice. In the graphical course the instruction is chiefly based upon good examples of American practice; and it is intended that each exercise in theory, or practice, shall be supplemented by a drawing exercise covering the same ground. Once a fortnight, or oftener, visits are made to establishments where machines are in use, or in process of construction. Each student is held responsible for some particular part of a machine or operation, which he must report upon, either in writing, or by measurement and sketches. Afterwards a summary of all these reports is made for the benefit of the whole class, and as the basis of such further instruction upon the particular subject under consideration as may be desired.

A Mechanical Laboratory has recently been established, and is now in use by the students of this department. Particular attention is given to experiments on steam.

The Instruction in Mineralogy. Determinative Mineralogy is taught by the study of crystalline forms and the physical properties of minerals, the use of the blowpipe, and by the handling of specimens.

The collections of minerals in use for instruction is placed in the study room of the Mining department, and is convenient at all times for reference. This collection is receiving frequent additions from specimens gathered in the summer excursions of students, and from private contributions. Students are furnished with tools at cost; but if any choose to return them at the end of the year, they are taken with a slight deduction for use.

The Instruction in Geology and certain related subjects is given as follows: —

In the third year is given a course of thirty lectures on Descriptive and Theoretical Geology, embracing the Classification of the Sciences; Scope of Geological Studies; Nature of Rocks, or Lithology; Stratigraphy; Succession of Formations; Zoological History; Geological Dynamics; Chemical and Physical Forces; Aqueous and Igneous Agencies; Currents; Sedimentation; Elevation and Subsidence; Geographical Distribution of Formations; Nature and Origin of Mountains; Volcanic Action.

In the fourth year are given: — a course of forty lectures on American Geology, comprising Geological History; Geology of North America, considered lithologically, stratigraphically, and palæontologically; Comparative Geognosy: — a course of ten lectures on Practical Lithology, comprising the mineralogical composition of Rocks; Building-stones, their cohesion, porosity, etc.; Granites, Marbles, Limestones, Sandstones, Slates; Limes, Cements, and Mortars; Ornamental Stones and Gems:—and a course of fifteen lectures on Chemical Geology, or the chemical history of the globe; comprising the Origin of Rocks, both stratified and unstratified; the History of Veinstones and Ore-deposits; the Formation of Coal and Petro-

leum; the Chemistry of Salt-deposits and of Mineral Waters; the Seat and Origin of Volcanic and Earthquake phenomena; and a course of fifteen lectures on Economic Geology, mainly devoted to a detailed description of the coal and ore-deposits of North America, especially such as are most extensively worked.

The Instruction in Palæontology is given to students of the third year.

Palæontology, including the history of ancient animal life, and the study of the distinctive and characteristic fossils of the different formations, is taught as a necessary foundation for the further study of Geology. The aim of the course is to give the student a practical acquaintance with the structure of the characteristic families and orders of living and extinct animals, and by a judicious selection of examples to familiarize him to some extent with the genera which characterize various formations.

The handling and drawing of specimens by the students is an essential feature of the method of instruction. The lectures of the instructor are devoted largely to explanatory demonstrations of the specimens which the students are at the same time drawing.

The Instruction in Mining is given to students of the third year by a course of eighty lectures on the general character of the various deposits of the useful minerals, in the theory and practice of mining operations, such as prospecting, boring, sinking of shafts, driving of levels, different methods of working, hoisting, pumping, ventilation, etc. These lectures are illustrated by drawings; and by a set of models from Freiberg, Saxony, which show in detail the methods of working underground by underhand and overhand stoping, the timbering and walling of shafts and levels, the arrangements of pumps, man engines, ladder ways, hoisting ways, the sinking of shafts, etc.

In the fourth year, ore-dressing and metallurgy are taken up in a course of sixty lectures. This is followed by a series of continuous practical exercises in the concentration and smelting of ores in the Mining and Metallurgical Laboratories, and the student is thus afforded opportunities for acquiring a familiar knowledge of the subject, founded on actual experiment.

The Professors in this department hope to give each student of Mining and Metallurgy at least one chance during his course of study, to join a party organized for visiting some of the more interesting mining regions.

The valuable scientific library and the large geological collection of the late Prof. Henry D. Rogers of the University of Glasgow, presented to the Institute by Mrs. Rogers, are accessible to the students in Geology and Mining. This collection is made up chiefly of fossils and rock specimens from American localities, and is especially rich in coal-plant fossils. Accompanying this collection are a large number of diagrams and maps of great value for the lecture room. The collection of ores and vein-stones is already large and varied, and is constantly receiving additions from the various mining regions.

The Mining and Metallurgical Laboratories. These Laboratories are intended to furnish to the student in Mining and Metallurgy the means for studying experimentally the various processes of ore-dressing and smelting. Ores of different kinds may be here subjected, on a small scale, to the same modes of treatment as have been adopted at the best mining and metallurgical establishments.

The mining machinery is supplied with power from an upright tubular boiler, which is fed with hot water by a force-pump and steam water-heater, by a ten horse-power engine. There are two suites of milling apparatus; —

I. A small five-stamp battery of the form in use in Colorado and on the Pacific coast, an amalgamated plate, an amalgamating pan, a settler and concentrator of the kind used in the

Washoe process in California and Nevada, for the treatment of silver and gold ores.

II. A Blake crusher with jaw opening 2 × 5 inches, crushing rolls with automatic screens, a series of sorting V-boxes (German spitzlutte), two automatic machine jiggers, a Rittinger shaking-table, a Freiberg shaking-table, and a set of little finishing V-boxes.

These machines are all arranged to give up their overflow sand into hand buckets, and the overflow water into a large tank. The water from this tank is forced back into the feed tank and used over again. This arrangement makes it possible to perform an experiment without the loss of slime due to an overflow of waste water. Steam drying tables are at hand to dry the wet sand for the furnace. The laboratory also contains the following auxiliary apparatus: — a Whelpley and Storer pulverizer, an edge-stone mill, a Sturtevant blower, and Batchelder's dynamometer. The metallurgical laboratory contains a blast furnace, a reverberatory smelting furnace, a roasting furnace, a furnace for cupellation, furnaces for fusion, crucible and muffle assay furnaces, a blacksmith's forge, and a melting kettle.

The experimental work of the laboratory is carried on by the students under the immediate supervision of an instructor. A sufficiently large quantity of ore is assigned to each student, who first examines it for its component minerals, sorts and samples it, and determines its character and value by analysis and assays, and makes such other preliminary examinations as serve to indicate the proper method of treatment. He then treats the given quantity, makes a careful examination of the products at each step of the process, ascertains the amount of power, water, chemicals, fuel, and labor expended, wherever practicable, and thus learns approximately the effectiveness and economy of the method adopted.

The Institute is from time to time receiving ores of gold, silver, lead, copper, antimony, zinc, iron, etc., from various localities on this continent. These ores are worked, and reports

sent to those who contributed them; and it is hoped that by such coöperation the laboratory will continue to receive the necessary amount and variety of ores.

Models, etc., relating to the Engineering Courses. The collections under this head consist of models in wood, in metal, and in plaster, besides lithographs, photographs, and manuscript drawings, chiefly selected from the best collections of France, Germany and Switzerland, and, in some instances, made expressly for the school. They are arranged for convenience in the following groups. Some of these groups contain one or two hundred models, others only a few typical ones; it is, however, proposed to add from time to time such as may be required for the purpose of instruction.

Descriptive Geometry and its Applications. A set of models in relief, illustrating the various problems of Descriptive Geometry, arranged upon sets of planes at right angles to each other, and containing the corresponding graphical solutions; a set of models illustrating linear perspective, and the theory and practice of shades, shadows and reflections; plaster models showing the intersections of cylinders, cones, and surfaces of revolution with each other, the penetrations made in each surface, and the common solid; models of brass and silk threads to illustrate the course on developable and warped surfaces.

Masonry and Stone Cutting. Models representing groined and cloistered arches, domes, staircases, etc., with detached voussoirs; models of right and oblique bridges, with their approaches and other accessory works.

Carpentry. Models of joints and mouldings; models of wooden and iron roof trusses, including a model illustrating Polonceau's system of iron roofs, centres for bridges, girders, etc.

Iron Bridges. A set of models illustrating the most recent constructions in iron bridges, beautifully executed by Bock, of Dresden.

Experimental Mechanics. Casts of Saint Venant's models, showing the changes of forms which bodies of various shapes

undergo, when subjected to forces causing flexure and torsion; a full sized model of the liquid vein observed and measured by Poncelet and Lesbros, in their hydraulic experiments. These models are duplicates of those made for the *Conservatoire des Arts et Mètiers*, at Paris.

Graphical Representation. Model representing the mean temperature of a place for the twenty-four hours of each day of the twelve months of the year; topographical models, showing contour lines, with accompanying topographical drawings.

Mechanism. Models showing the different methods of laying out teeth of wheels in the various cases of racks, outside and inside gearing, etc.; bevel and skew bevel wheels; an instrument for laying out teeth devised by Schröder; models of pulleys and wrapping connectors, belts, and chains; models of parallel motions, including Watt's parallelogram, applied to land and marine engines; Seward's parallel motion, fitted to the engines of the Gorgon, etc.; models of non-circular, and screw wheels; endless screws; wheels in trains; epicyclic trains; Ferguson's paradox; equation clock; system of Lahire, etc.; models of cams; of silent feed motions; regulating apparatus, for stopping, reversing, or modifying the motions of machines — these include governors, friction cones and clutches, reversing gear, Oldham's coupling, etc.

Resistance of Materials. A set of models illustrating the best forms of beams for resisting flexure, torsion, and compression under various conditions of stress; to which is added an apparatus for testing the deflections caused by loads applied in any manner to test their strength or stiffness.

Construction of Machines. These consist of a number of highly finished models of the parts of machines, such as screws, chains, hooks, riveting, axles, plumber blocks, steps and supports for shafts, wheels, pulleys, cranks, eccentrics, cross-heads, connecting rods, working beams, valves, pistons, etc.

Lifting Engines. These consist of the following working models:—Crab engine; Fairbairn's plate iron dock crane; hydraulic press.

Hydraulic Motors. A model of the water pressure engine at Alt Mordgrube, in Freiberg, Saxony, with the pumps and apparatus for draining mines; a model of Poncelet's water wheel; Fourneyron's turbine; Jonval's turbine; also Swain's and Leffel's inward flow turbines.

Steam Engines. Boilers and fire grates; steam cylinders, pistons, valves, etc.; slide valves and the mechanism showing the distribution of the steam; variable cut-off valves; Stephenson link motion; models of steam engines of various forms.

The Instruction in Architecture. It is the object of this Department to give to its students the instruction and discipline that cannot be obtained in architects' offices. The course is, however, practical as well as theoretical, and, besides the scientific study of construction and materials, it comprises the study of building processes, and of professional practice and procedure, as well as that of composition and design, and of the history of the art. It is calculated to meet the wants not only of young men who propose to pursue a comprehensive course of architectural study, but of those who are looking only for such an elementary training as shall qualify them for positions as draughtsmen.

Although the degree of Bachelor of Science is given in Architecture to all students who, at the conclusion of their fourth year, have passed the prescribed examinations and have executed in a satisfactory manner the drawings and designs required, the training of such students cannot be such as to entitle them to call themselves Architects. It is, however, complete in itself, and not only includes the scientific basis of professional work, giving what an architect needs to know of Mathematics, Chemistry, Physics, Geology, and Engineering, but gives also as much of more strictly technical knowledge and artistic skill as can properly be attempted in a school of science.

The more strictly professional work begins in the second year, the first half of which is given to the study of the Five

Orders, and their applications, and to Greek and Roman Architectural history. At the same time the students of the third year attend a series of lectures upon ornament, composition, and the theory of architecture. In the last half of the year the historical studies are continued, and both classes, for convenience, attend the same exercises. The mediæval period, from the fall of the Roman Empire to the fall of Constantinople, and the modern period, including that of the Renaissance, are taken up in alternate years, so that each class is carried over the whole ground.

In the same way the study of specifications and working drawings, which runs through the third and fourth years, is pursued by the two classes together, carpentering and its related subjects occupying one year, and masonry and stone-work the next. In the fourth year the study of full-sized ornament and detail is taken up and the studies of the preceding years reviewed. During the third and fourth years the students are constantly practiced in original design, the character of the problems given out and the time allowed for their completion varying according to the advancement of the class and the kind of drawings required. The work done last year under this head comprised:— 1, a porch; 2, a driveway; 3, a grand staircase; 4, a bell tower; 5, a fountain; 6, a lamp post; 7, the restoration of a Pompeian house; 8, a chimney piece; 9, a memorial library; 10, the same in perspective; 11, the entrance to a museum; 12, a school house; 13, an artist's house; 14, a Catholic church; 15, a design for waterworks in a public park. The last was made the subject of the graduating thesis, in which were presented calculations of the strength and stability of the principal parts of the structure. Each set of drawings is examined and criticised before the class.

Special exercises are also had in shades, shadows, perspective, and the perspective of shadows, and in tracing, sketching, modelling, and drawing with charcoal and crayons. Opportunity is also afforded to sketch, measure, and draw out buildings already erected. The principal railway stations in Boston, the fronts

of a dozen dwelling houses, and the steeples of Park Street church, the Old South, Hollis Street church, and Christ church in Salem Street, besides a large number of dormer windows and doorways were last year made the subject of this exercise.

Special students in Architecture are received into a special course, occupying two years, and embracing all the subjects mentioned in the three preceding paragraphs. If not proficient in free-hand drawing and in practical geometry they will be required to make themselves so during the first half of the year, in addition to their other exercises. Such students, upon passing the entrance examination, will be permitted to pursue any other studies taught in the school which they are prepared to pursue to advantage. The fee for this special course is the same as for the regular courses.

The Boston Society of Architects "wishing to do its part in the work of professional education," has established, by consent of the Corporation of the Institute, two prizes, of the value of fifty dollars each, for the best work done during the year. These were last year awarded to Mr. Frederick W. Stickney, of Lowell, and to Mr. William C. Richardson, of Lawrence.

The Architectural Museum. A large number of photographs, prints, drawings, and casts, have been collected for this Department, by means of a special fund raised for the purpose. This collection includes a number of English and French water-colors, mostly of architectural subjects, several lithographic publications issued by architectural students in England and on the continent, and photographs from the competition drawings for the Foreign Offices, the Law Courts, and the National Gallery in London, and others from French competitions for public buildings, and from the *Concours* of the *Ecole des Beaux-Arts*.

The collection of casts comprises both architectural details and specimens of carving and sculpture illustrating various periods of art. It includes a large and valuable collection of

sculptures from the choir of Lincoln Cathedral, and contains also several models of temples and other buildings, lent to the School by the Boston Athenæum.

To these collections the following additions have been made, mostly by gift: —

A considerable collection of photographs, lithographs and drawings, presented to the Institute by French, English and American architects, taken from their own works, including sets of actual working drawings, with details and specifications.

A complete series of drawings, mostly presented by the late Ernst Benzon, Esq., of London, formerly a merchant of Boston, illustrating the course of Architectural instruction in the *Ecole des Beaux-Arts* in Paris: — *Esquisses-Esquisses*, *Projets Rendus*, *Projets d'ordre*, *Projets de Construction*, *Grand Prix de Rome*, *Envoi de Rome*.

Specimens of modern English and American stained glass and tile-work, partly purchased, and partly presented by the makers, with cartoons and drawings illustrating the processes of manufacture.

The publications of the Royal Institute of British Architects, and of the *Société Centrale des Architectes*, in Paris, and the miscellaneous papers of the Architectural Publication Society, have been presented by the authorities of these institutions. A considerable library is in course of formation.

The Instruction in Natural History. This will be given with the aid of the collections and library of the Boston Society of Natural History, which, by an agreement between the Society and the Institute, are freely open to the students. These collections rank among the first in the country for extent and value, and in many departments are unsurpassed; the library is rich in works on Natural Science, many of them finely illustrated, and embraces the leading American and European journals and periodicals on Natural History. It is believed that the facilities thus afforded to the students of the Institute are

ample for the most thorough instruction in Zoology, Palæontology, and other branches of Natural Science. This instruction will be given by the Professors of the Institute and partly in the lecture room and Palæontological laboratory of the Natural History Society, whose building is upon the same square.

Botany is more generally required than heretofore, as affording the proper and natural introduction to the study of Zoology, Palæontology, and Biological Chemistry; and as being the science best calculated to train the mind for close observation, accurate description, and systematic classification. The instruction is given by lectures, recitations, and practical exercises in the examination of living plants and tissues. The numerous conservatories in Boston and vicinity furnish the means of studying hand specimens in many of the natural orders, and the wild flowers of early spring are usually obtained before the end of the school year.

The Instruction in Physical Geology and Geography. This department of instruction has been organized for the purpose of giving the student a knowledge of geography in its more advanced and scientific relations. Geography has now become something more than a knowledge of the mere outward appearances of the earth's surface; in the modern science, geographical features are the external expressions of the structures which lie beneath them. As we cannot fully understand the significance of these features till we know how they were formed, Physical Geology is here associated with Geography.

The instruction given during the second half of the second year, is analytical; beginning with the earth as a whole, then resolving it into its more extensive divisions, and continuing on to those which are more limited. The features and their origins are thus presented in their natural relations.

As this course begins at the time when the students are fairly entering upon their more scientific and professional studies, it gives them broader views of the interdependence of the different branches of science, and thus prepares them for a better appreciation of their true values.

The course in Political and Industrial Geography given during the second half of the fourth year is synthetic in character. At that time the influences of geographical features, climates, etc., upon the distribution of plants and animals, also their direct and indirect influences upon the life, industries, and advancement of man are taught, with the hope of contributing to the completeness, unity, and utility of the entire course of study.

The Instruction in Military Science and Tactics. In conformity with the requirements of the Act of Congress of July 2, 1862, and of the Act of the General Court of Massachusetts in furtherance thereof, the Institute provides instruction in military science and tactics. An officer of the U. S. Army is detailed by the U. S. Government as Professor of Military Science and Tactics. During the first year all students are required to attend three times a week an exercise in tactics, unless specially excused. For these exercises they are organized as a battalion of two companies, and are required to provide themselves with a uniform consisting of a dark blue double breasted sack-coat, black gutta-percha buttons, pantaloons, cap, and silver cap ornament. These uniforms are manufactured from measures and by contract, to secure uniformity of material and manufacture, as well as cheapness. The whole cost will not exceed twenty-five dollars. The uniform must be worn at times of instruction, and being inconspicuous, may be worn at other times if the student chooses to do so. Arms and equipments are lent to the School by the United States. During the second year all regular students, and all special students who take one or more studies, in addition to the special ones, are required to attend one lecture a week, for twenty-four weeks, upon military science, pertaining chiefly to the duties of officers in disciplining, feeding, clothing, camping, marching troops, and the general sanitary measures necessary to maintain them in health. Whilst this instruction would be of service to the country in the emergency of a war,

it will also be useful to the graduates of the Institute, when, as Engineers, they are called upon to take charge of large bodies of laborers. The matter of attendance at drill is under the control of the Professor; but excuses of general application can be granted by the Faculty only. Applications to be excused from drill will be granted when based on the following grounds, viz. : —

1st. Being an Alien.

2d. Being a College Graduate.

3d. Being over twenty-one.

4th. Having a surgeon's certificate of disability.

5th. Being able to pass an examination satisfactory to the Department.

Only the first and second classes mentioned, can, however, be exempt from the instruction of the second year.

A large drill-hall, conveniently located, which includes a well equipped gymnasium, is used by all classes in the Institute.

Excursions. In aid of the practical studies of the school, and as a means of familiarizing students with the actual details of work, they are required, in term time, to make visits of inspection to machine-shops, engines, mills, furnaces, and chemical works, and to important buildings and engineering constructions within convenient reach.

In the vacations more extended excursions are made for the survey of mines, and for the study of metallurgical works and noted specimens of engineering. During the past summer a three weeks' expedition was organized and carried out by the Professors of the Mining and Metallurgical departments.

The party visited some of the mining regions of New Brunswick and Novia Scotia. Among the points visited were the Albertite mine in Hillsborough ; the Goggins coal mines ; the Acadia iron mines and works at Londonderry ; the coal mines of New Glasgow ; the conglomerate gold diggings at Gays River ; the quartz gold mines at Waverly and Montgomery ; the gypsum at Windsor ; the trappean minerals at Cape Blom-

edon; the antimony mines at Lake George, New Brunswick, and the Katahdin iron mines and works near Moosehead Lake, Maine.

THE SOCIETY OF ARTS.

One of the primary objects of the founders of the Institute of Technology, as shown by the extract from the charter given on page 4, was the establishment of a Society of Arts. This Society was organized in 1861, and now numbers about 350 members. It holds regular meetings at its rooms in the Institute Building, on the second and fourth Thursdays of each month from November to May inclusive. At these meetings are presented communications on various subjects of applied science, with the exhibition of machines and apparatus illustrating important inventions in the mechanic and useful arts. Students of the school may be present at these meetings, by permission of the Secretary of the Institute.

THE BOSTON PUBLIC LIBRARY.

The professors and students of the Institute are allowed the full use of this extensive library. Copies of the complete catalogues of the Library are kept at the Institute for convenience of reference, and the Library Building is near at hand. The Library now contains nearly 300,000 volumes; and its reading-room is supplied with all the best scientific and technical periodical publications. New books of value are promptly bought, on proper application to the authorities of the Library. No college or school in the country has better facilities in these respects than those which the Trustees of the Boston Public Library have put at the disposal of the officers and students of the Institute of Technology.

THE THOMAS SHERWIN SCHOLARSHIP.

This scholarship for regular students has been founded by the English High School Association, in memory of the late Thomas Sherwin, who, for more than thirty years, was the distinguished master of the English High School of the City of Boston. Mr. Sherwin was also an active and influential member of the Corporation of the Institute. The pupil to receive the benefit of this Scholarship "is to be a graduate of the English High School in the city of Boston."

ADVANCED SCHOLARSHIPS.

Five advanced scholarships, of $200 each, have been established, and will be awarded to such applicants as are recommended by the Faculty.

DIPLOMAS AND CERTIFICATES.

The diploma or certificate is intended to be not only a reward to the student for his diligence and attainments, but an assurance to the public of his knowledge and skill in the particular department to which it relates.

The degrees or diplomas corresponding to the ten Regular Courses of the School are as follows: —

I. A Degree in Civil and Topographical Engineering.
II. " " " Mechanical Engineering.
III. " " " Geology and Mining Engineering.
IV. " " " Building and Architecture.
V. " " " Chemistry.
VI. " " " Metallurgy.
VII. " " " Natural History.
VIII. " " " Physics.
IX. " " " Science and Literature.
X. " " " Philosophy.

To be entitled to either of these degrees, the student must have passed a satisfactory examination in all the prescribed studies and exercises of the four years; and in addition, a final, or degree examination, embracing all the subjects which particularly relate to his course. He must, moreover, prepare a dissertation on some subject included in his course of study, or an account of some research made by himself, or an original report upon some machine, work of engineering, industrial works, mine, or mineral survey, or an original architectural design accompanied by an explanatory memoir. This thesis or design must be approved by the Faculty.

The examinations for these degrees are held in the month of May, and are partly oral and partly in writing.

The title of the degree in these courses is S. B., or Bachelor of Science, in the department of ————————.

The degree of S. D., or Doctor of Science, is awarded for proficiency in Advanced Courses of study.

Besides the degrees or diplomas of the Regular Courses and of the Advanced Courses, certificates of attainment in special subjects are given to such students as on examination are found to have the required proficiency in them.

REGULATIONS OF THE SCHOOL.

School-year. The school-year begins on the last Monday in September, and ends on the Saturday preceding the first Monday in June. On legal holidays the exercises of the School are suspended. There is a recess of one week ending at 9 A.M., on the first Tuesday in February.

Bond or Deposit. Every student is required, on entering the school, either to give a bond for two hundred dollars to pay all charges accruing under the regulations of the school; or to deposit, if he prefer so to do, the sum of two hundred dollars

with the Secretary of the Institute, to be accounted for at the end of the school-year, or whenever the depositor leaves the school, in case he leaves it before the end of the year. This deposit must be renewed at the beginning of each year. The bond must be executed by two bondsmen, satisfactory to the Secretary of the Institute, one of them being a citizen of Massachusetts; and it must be filed within ten days after the date at which the student joins the school.

Fees. The fee for regular students is $200 per year, payable by students who have given bonds, $125 at the beginning, and $75 at the middle (first Tuesday in February) of the school-year. For one-half, or any less fraction of the school-year, the fee is $125. Students not candidates for a degree pay, in general, the full fee; but when a few branches only are pursued, and the time required for instruction is limited, some deduction may be made. The fee for students in the advanced courses is the same as that for regular students.

Attendance. Regular students are expected to attend all the exercises of their several courses. Students not candidates for a degree are expected to attend all the exercises in the subjects they have selected. A monthly return of absences and tardinesses is made by the Secretary of the Faculty to the parent or guardian of every student not of age. Tardiness consists in entering a lecture room, drawing room, or laboratory, more than five minutes after the hour designated for the beginning of the exercise. Students are, in general, expected to devote themselves to the work of the school between the hours of 9 A. M., and 5 P. M. (4 1–2 P. M., in winter), except during the interval for dinner. There are no exercises on Saturday afternoon, and the building is closed.

Discipline. While within the limits of the Institute, students are expected to behave with decorum, to obey the regulations of the school, and to pay a due respect to its officers. They are required to avoid all running, loud talking, whistling,

or other noise in the halls and passages of the building. Every student will be held responsible for the furniture which he uses, and the cost of repairing any damage thereto will be charged to him. In case of injury to the building, or to any of the furniture, apparatus, or other property of the Institute, the damage will be charged to the student or students known to be immediately concerned; but if the persons who caused the damage are unknown, the cost of repairing the same will be assessed equally upon all the students of the school. Conduct inconsistent with the good order of the school, if repeated after admonition, will be followed by the dismissal of the offender.

Residence and Expenses. As the exercises of the school begin at nine o'clock in the morning, and end at half past four or five o'clock in the afternoon, students may conveniently live in any of the neighboring cities or towns on the lines of the various railroads, if they prefer to do so.

The cost of board and rooms in Boston, and the neighboring cities and towns, need not exceed from six to eight dollars a week. The cost of board at the Institute restaurant is three dollars and fifty cents per week, which, with conveniently located rooms, need not exceed five dollars per week.

The cost of books, drawing instruments, paper, etc., exclusive of chemical breakage, is from twenty-five to thirty-five dollars a year.

FREE COURSES OF INSTRUCTION.

The Trustee of the Lowell Institute has established, under the supervision of the Institute of Technology, courses of instruction, generally in the evening, open to students of either sex, free of charge.

This department of the school will embrace a number of distinct courses, more or less varied from year to year by the omission or interchange of particular subjects, but including in

their entire scope instruction in mathematics, physics, drawing, chemistry, geology, natural history, physiology, English, French, German, history, navigation and nautical astronomy, architecture, and engineering.

The subjects, and the extent of the several courses, will be made known in October of each year.

As it is the object of this branch of the school to provide substantial teaching, rather than merely popular illustration of the subjects, it is expected that all persons attending these courses will come with a serious purpose of improvement, and that they will cheerfully comply with such rules as may be prescribed in regard to attendance and to order in the class or lecture-room.

The conditions of attendance on these gratuitous courses are as follows: —

1. Candidates must have attained the age of eighteen years.
2. Their applications must be made in writing, addressed to the Secretary of the Faculty, specifying the course or courses they desire to attend; mentioning their present or prospective occupations; and, where the course is of a nature demanding preparation, stating the extent of their preliminary training.
3. The number of students in each class is necessarily limited. The selection will be made under the direction of the Faculty.

The courses for 1875–76 are on the following subjects: —

I. *General Chemistry.* Twenty-four laboratory exercises, of two hours each, on Wednesday and Saturday afternoons, at 2½ oclock, by Prof. Nichols, beginning Nov. 3.

II. *Qualitative Analysis.* Twenty-four laboratory exercises, of two hours each, on Wednesday and Saturday afternoons, at 2½ o'clock, by Prof. Nichols, beginning Nov. 3.

III. *Philosophy.* Eighteen lectures for beginners, on *Kant's Critique of Pure Reason*, on Monday and Wednesday evenings, at 7½ o'clock, by Prof. Howison, beginning Nov. 8.

IV. *Physiology and the Laws of Health.* Eighteen lectures, on Tuesday and Friday evenings, at 7½ o'clock, by Prof. Kneeland, beginning Nov. 9.

V. *Heat and its Applications.* Eighteen lectures, on Tuesday and Friday evenings at 7½ o'clock, by Prof. Ordway, beginning Nov. 9.

VI. *Perspective and the Perspective of Shadows, with Applications.* Eighteen lessons, on Wednesday evenings, at 7½ o'clock, by Prof. Ware, beginning Nov. 3.

VII. *Light in its Relation to Color.* Eighteen lectures, on Wednesday and Saturday afternoons at 3 o'clock, by Prof. Cross. Time of beginning announced on cards.

VI. *Elementary German.* Eighteen lessons, on Monday and Wednesday evenings, at 7½ o'clock, by Prof. Otis, beginning Nov. 22.

The Trustee of the Lowell Institute has also made provision for a course of free instruction in Practical Design for Manufactures, open to pupils of both sexes. Students are received at the beginning of the school year in October, to whom is taught the art of making patterns for Prints, Delaines, Silks, Paper-Hangings, Carpets, Oil-Cloths, etc.

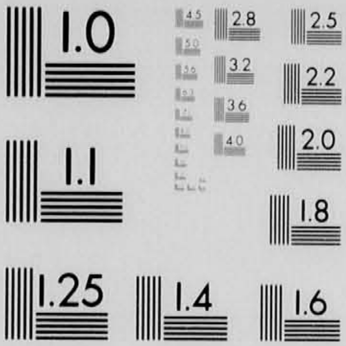
The Course embraces: — 1. Original Design, or Composition of Patterns; 2. Secondary Design, or Variation of Patterns; 3. The Making of Working Drawings; 4. Technical Manipulations.

Instruction is given personally to each student over his work, with occasional general exercises. Students supply their own instruments and materials.

The class is under the personal direction of Mr. Charles Kastner, for fourteen years designer at the Pacific Mills, formerly Director of the Atelier Lebert in Paris, and nephew and pupil of M. Jean Baptiste Lebert, *Dessinateur*, of Mulhouse in Alsace.

Applicants for admission to the above Course are required to bring specimens of their work, exhibiting an acquaintance with Free-hand Drawing, and some familiarity with the use of mathematical instruments.

For circulars giving fuller information, address the Secretary of the Institute.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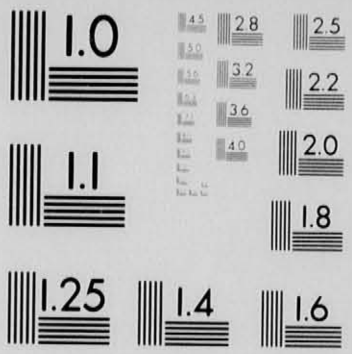
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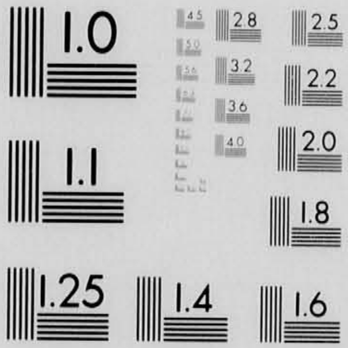
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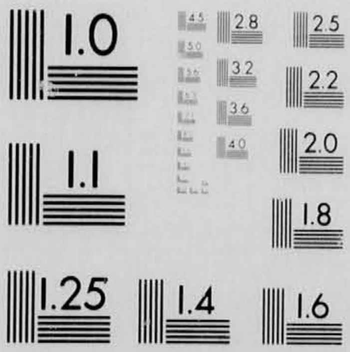
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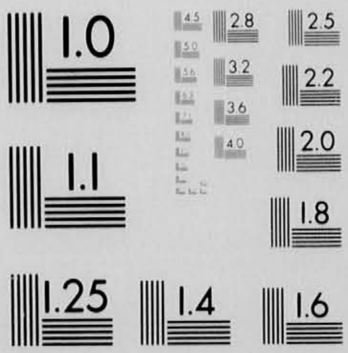
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