M.I.T. ANNUAL CATALOGUES AND BULLETINS
1879/80
01 OF 01

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

FIFTEENTH

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION.

1879-1880.

THIRD EDITION.

BOSTON:
PRESS OF A. A. KINGMAN.
1880.

INSTITUTE BUILDING.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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CALENDAR.

School-year began	Monday, Sept. 29, 1879.
Second term begins	Tuesday, Feb. 3, 1880.
Degrees conferred	Thursday, May 27, 1880.
First Entrance Examinations . .	Monday, June 7, 1880, and Tuesday, June 8, 1880.
Second Entrance Examinations . .	Wednesday, Sept. 22, 1880, and Thursday, Sept. 23, 1880.
Examinations for Advanced Standing .	Friday, Sept. 24, 1880.
The next School-year will begin . . .	Monday, Sept 27, 1880.

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 fortn 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

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,

FOR THE YEAR 1879-80.

President,

WILLIAM B. ROGERS.

Treasurer,

JOHN CUMMINGS.

Committee on the School of Industrial Science,

JOHN AMORY LOWELL,
EDWARD ATKINSON,
HOWARD A. CARSON,
CHARLES L. FLINT,
CHARLES J. PAINE,
FRED. W. LINCOLN,
EDWARD S. PHILBRICK,
JOHN D. PHILBRICK,
HENRY B. ROGERS.

President and Treasurer, *ex-officio.*

Committee on Finance,

WILLIAM ENDICOTT, JR.,
JOHN M. FORBES,
HENRY P. KIDDER,
JAMES L. LITTLE,
SAMUEL D. WARREN,
DAVID R. WHITNEY.

President and Treasurer, *ex-officio.*

Committee on the Museum,

SAMUEL C. COBB,
CHARLES FAIRCHILD,
AUGUSTUS LOWELL,
HORACE McMURTRIE,
E. R. MUDGE,
M. D. ROSS,
STEPHEN P. RUGGLES,
NATHANIEL THAYER.

President, *ex-officio.*

Committee on the Society of Arts,

JOHN D. RUNKLE,
MARSHALL P. WILDER,
THOMAS T. BOUVÉ,
GEORGE B. EMERSON,
JAMES B. FRANCIS,
J. C. HOADLEY,
SAMUEL K. LOTHROP
ALEXANDER H. RICE.

President, *ex-officio.*

On the Part of the Commonwealth,

HIS EXCELLENCY, GOVERNOR JOHN D. LONG.

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

HON. JOHN W. DICKINSON, *Secretary of the Board of Education.*

LEWIS WM. TAPPAN, JR., *Bursar.*

OFFICERS OF INSTRUCTION.

WILLIAM B. ROGERS, LL.D., *President.*

JOHN D. RUNKLE, PH.D., LL.D., (absent in Europe),
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.

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

JAMES M CRAFTS, S.B., (absent in Europe),
Professor of Organic Chemistry.

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

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

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

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

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

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

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

CHARLES R. CROSS, S.B.,
Thayer Professor of Physics.

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

EUGENE LETANG,
Instructor in Architecture.

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

CHARLES KASTNER,
Lowell Instructor in Practical Design.

WEBSTER WELLS, S.B.,
Instructor in Mathematics.

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

HENRY K. BURRISON, S.B.,
Instructor in Mechanical Drawing.

CLARENCE W. FEARING, A.M.,
Instructor in the School of Mechanic Arts.

ELLEN H. RICHARDS, A.M., S.B.,
Instructor in Chemistry and Mineralogy in the Woman's Laboratory.

———— ———— *
Instructor in Military Tactics.

WILLIAM O. CROSBY, S.B.,
Assistant in Geology and Palæontology.

SILAS W. HOLMAN, S.B.,
Assistant in Physics.

JOHN B. HENCK, JR., S.B.,
Assistant in Physics.

HENRY M. WAITT, S.B.,
Assistant in Civil Engineering.

WM. HENRY BEECHING, S.B.,
Assistant in Mechanical Engineering.

FREDERIC R. LORING, S.B.,
Assistant in General Chemistry and Qualitative Analysis.

W. KELTENER ROBBINS, S.B.,
Assistant in Quantitative Analysis.

RICHARD W. LODGE,
Assistant in the Mining and Metallurgical Laboratories.

The instruction in Descriptive Geometry and Stereotomy is given by Prof OSBORNE; that in Mineralogy and Assaying by Prof. RICHARDS: that in Descriptive Astronomy by Prof. CROSS; and that in Botany and Biology by Prof. ORDWAY. The instruction in Quantitative Analysis in the Woman's Laboratory is also in charge of Prof. ORDWAY.

* The instruction in Military Tactics is given by Mr. Loring R. Millen.

FACULTY.

WILLIAM B. ROGERS, LL.D., *President.*
JOHN D. RUNKLE, PH.D., LL.D.
JOHN B. HENCK, A.M.
WILLIAM R. WARE, S.B.
WILLIAM P. ATKINSON, A.M.
GEORGE A. OSBORNE, S.B.
JOHN M. ORDWAY, A.M., *Chairman.*
ROBERT H. RICHARDS, S.B., *Secretary.*
WM. RIPLEY NICHOLS, S.B.
CHARLES P. OTIS, A. M., PH.D.
CHARLES H. WING, S.B.
ALPHEUS HYATT, S.B.
WILLIAM H. NILES, PH.B., A.M.
CHANNING WHITAKER, S.B.
CHARLES R. CROSS, S.B.
GAETANO LANZA, S.B., C.E.

STUDENTS.

GRADUATE STUDENTS.

NAME.	HOME.	RESIDENCE.
Andrews, Elisha B., *A. M.* (*Brown University*) . .	Newton Centre . .	Newton Centre.
Binney, Amos, Jr., *A. B.* (*Harvard College*) . . .	Newport, R. I. . . .	148 Chandler St.
Blodgett, Aaron D., *S. B.*	W. Newton . . .	W. Newton.
Burnham, William A., *A. B.* (*Harvard College*) . .	Boston	21 Com'wlth Av.
Cram, Arthur B., *B. S.* (*Penn. State College*) . .	Detroit, Mich. . . .	611 Tremont St.
Cushing, Florence M., *A.B.* (*Vassar College*) . . .	Boston	8 Chestnut St.
Glover, Marie O., *A. B.* (*Vassar College*). . . .	Brooklyn, N. Y. . .	Jamaica Plain.
Hartshorne, Wm. D., *C. E.* (*Lehigh University*) . .	Brighton, Md. . . .	88 G St., So. Boston.
Lindsay, Wm. B., *A. B.* (*Boston University*) . .	West Newton . . .	West Newton.
Noyes, Margaret, *Ph.B.* . . (*Boston University*) . .	Boston	47 Mt Vernon St.
Pickering, Wm. H., *S.B.* .	Boston	84 Mt. Vernon St.
Scovel, Minor, *Ph.B.* (*Western Univer. Penn.*).	Pittsburgh, Pa. . .	366 Columbus Av.
Stearns, Geo. H., *A. B.* (*Harvard College*) . . .	Cleveland, Ohio . .	28 Buckingham St.
Wentworth, Sarah E., *A. B.* (*Vassar College*) . . .	Danvers	Danvers.
Woodbridge, Samuel H., *A.M.* (*Williams College*) . .	Williamstown . . .	70 W. Cedar St.

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. Elect.

FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Almy, William F.	V.C.	Fall River	25 Rutland Sq.
Barton, George H.	III.	N. Sudbury	104 Appleton St.
Brown, Charles H.	I.	Boston	341 Shawmut Av.
Chase, Edwin E.	I.	Lowell	Lowell.
Clark, Fred. W.	III.	Chicago, Ill.	104 Appleton St.
Hamilton, George W.	I.	Boston	233 Shawmut Av.
Millen, Loring R.	III.	Savannah, Ga.	120 Chandler St.
Miller, William T.	X.	Boston	480 Columbus Av.
Small, Nathaniel C.	V. C.	Boston	73 Montgomery St.

THIRD YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Abbott, Ira	I.	Andover	Andover.
Allen, John H.	III.	Walpole	Walpole.
Atkinson, James S.	II.	Brookline	Brookline.
Binney, A., Jr., *A.B.*	V.C.	Newport, R. I.	148 Chandler St.
Bissell, David S.	III.	Pittsburgh, Pa.	27 Yarmouth St.
Briggs, Frank H.	X.	Boston	124 Marlborough St.
Came, Frank E.	I.	Malden	Malden.
Chase, Frank D.	III.	Dedham	Dedham.
Collins, Benjamin G.	II.	Edgartown	293 Columbus Av.
Cutler, Harry H.	II.	Boston	19 West Cedar St.
Darlington, F. Graef	I.	Pittsburgh, Pa.	383 Columbus Av.
Duff, John, Jr.	V.C.	Charlestown	14 Sheafe St., Ch'wn.
Foss, Harry A.	II.	Jamaica Plain	Jamaica Plain.
Glover, M. O., *A. B.*	V.C.	Brooklyn, N. Y.	Jamaica Plain.
Goddard, David S.	III.	Lowell	Lowell.
Koehler, Walter J.	V.A.	Roxbury	Beech Glen Av.
Lewis, Edwin J., Jr.	IV.	Boston	Adams St.
Lindsay, W. B., *A.B.*	V.A.	West Newton	West Newton.
Lund, James	V.A.	Charlestown	28 Seaver St.
Mansfield, Frank	I.	Melrose Highlands.	Melrose Highlands.

NAME.	COURSE.	HOME.	RESIDENCE.
Mower, George A.	II.	W. Newton	W. Newton.
Norris, Webster	III.	Charlestown	43 Soley St.
Parker, Theodore	I.	Quincy	Quincy.
Rindge, Samuel	II.	E. Cambridge	E. Cambridge.
Rollins, Frank W.	X.	Concord, N. H.	11 Yarmouth St.
Sargent, Winthrop O.	VI.	Malden	Malden.
Saville, George G.	I.	Quincy	Quincy.
Shed, Nathaniel W	V.c.	Roxbury	27 Fountain St.
Snead, William R.	IV.	Louisville, Ky.	383 Columbus Av.
Stearns, Harold E.	II.	Cincinnati, O.	133 Pembroke St.
Warren, Edward R.	VII.	Waltham	Waltham.
Wilkes, Charles M.	IV.	S. Manchester, Conn	201 W. Newton St.
Winslow, Arthur	III.	Boston	104 Chestnut St.
Young, Herbert A.	I.	Revere	Revere.

SECOND YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Ayer, Winslow, B.	I.	Bangor, Me.	13 Claremont Park.
Brackett, Albert C.	IV.	Newton	Newton.
Carson, Thomas B.	II.	Iowa City, Ia.	21 Dover St.
Darrow, Alfred L.	IV.	Boston	42 Sharon St.
French, Charles A.	III.	Boston	334 Marlboro' St.
Frost, Howard V.	V.c.	Belmont	Belmont.
Gerry, Lyman L.	I.	Stoneham	Stoneham.
Hall, Francis P.	V.c.	Dorchester	9 St. Charles St.
Heins, George L.	IV.	Philadelphia, Pa.	46 Pinckney St.
Jenkins, Charles D.	V.c.	Boston	66 G St., So. Boston.
Johnson, James W.	I.	Chelsea.	Chelsea.
Lowe, John F.	V.c.	Chelsea	Chelsea.
Manning, Harry G.	II.	Lynn	Lynn.
Mansfield, Geo. W.	III.	Melrose Highlands.	Melrose Highlands.
McClure, David, Jr.	III.	Oakland, Cal.	109 Myrtle St.
Morrison, Frank C.	I.	Boston	29 Common St.
Munn, Samuel M.	II.	Louisville, Ky.	Jamaica Plain.
Munroe, James P.	III.	Lexington	Lexington.
Neff, Harry M.	IV.	Denver, Col.	350 Columbus Av.
Noa, Frederic M.	III.	Roxbury	69 Bickford St.
Pitman, Charles B.	I.	Somerville	Central St., Som'vlle.

NAME.	COURSE.	HOME.	RESIDENCE.
Rice, Carrie L.	V.C.	E. Boston.	27 Saratoga St.
Ripley, William T.	II.	Rutland, Vt.	79 Waltham St.
Ross, Henry F.	III.	Jamaica Plain	Jamaica Plain.
Snelling, Grenville T.	IV.	New York, N. Y.	18 Hawthorn St.
Snow, Walter B.	II.	Watertown	Watertown.
Walker, Arthur W.	II.	Malden	Malden.
Warren, George E.	II.	Exeter, N. H.	Exeter, N. H.
White, Anthony C.	VIII.	Taunton	123 Chelsea St., E.B.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Alexander, Winthrop.	Roxbury	Waban St.
Bardwell, Herbert T.	Springfield	10 Wigglesworth St.
Brown, Crawford R.	S. Boston.	660 Broadway.
Bryant, George H.	Brockton.	Brockton.
Capen, George H.	Canton	Canton.
Chase, Harvey S.	Haverhill.	Haverhill.
Davis, Frank E.	Somerville	Winter Hill.
Eppendorff, John G.	Brooklyn, N. Y.	165 W. Canton St.
Foran, George J.	E. Boston	54 Princeton St.
Fuller, William B.	Swampscott	Swampscott.
Gale, Horace B.	Natick	Natick.
Gibbons, Robert T.	Boston	120 Boylston St.
Guild, Charles H.	Providence, R. I.	56 Chandler St.
Gustin, George H.	Dorchester	Adams St.
Hanson, Herbert F.	Dover, N. H.	136 St. James Av.
Harriman, Frederic O.	Boston	545 Shawmut Av.
Hutchings, James H.	Boston	68 Carver St.
Kwong, Yung Chung.	Canton, China	13 Cortes St.
Low, Hamilton F.	Concord, N. H.	546 Tremont St.
Mansfield, Harvey M.	Wakefield	Wakefield.
Marshall, Dunbar.	Boston	9 Brimmer St.
Paddock, Benjamin S.	Omaha, Neb.	55 Chestnut St.
Rice, Frederick B.	Wilmington, N. C.	7 Burroughs Place.
Richards, Franklin B.	Somerville	30 Beacon St.
Sawyer, Frederick J.	Dover, N. H.	136 St. James Av.
Schmidt, Albert F.	Racine, Wis.	Woburn.

NAME.	HOME.	RESIDENCE.
Scott, Robert W.	Great Falls, N. H.	Columbus Av.
Smith, George A.	Arlington	Arlington.
Tenney, Frank	Boston	64 Rutland St.
Thompson, Edgar B.	Woburn	Woburn.
Tompkins, Charles H., Jr.	Staten Island, N. Y.	317 Marlborough St.
Underwood, George R.	Boston	643 Tremont St.
Vose, Julien W.	Boston	29 Worcester Sq.
Walkley, Edwin N.	Plantsville, Conn.	189 Warren Av.
Wardwell, Charles J. A.	Lake Village, N. H.	72 West Cedar St.
Wild, Herbert H.	Billerica	Billerica.
Woods, Harry F.	San Francisco, Cal.	Cambridge.

SPECIAL STUDENTS.

The abbreviations used in the following list, which includes all students who are not in the full regular courses, are : —

Arch.	Architecture.	Eng.	English.	Mil.	Military Drill.
Astr.	Descriptive Astronomy.	Fr.	French.	Min.	Mineralogy.
Biol.	Biology.	Geol.	Geology.	Min. Eng.	Mining Engineering.
Bot.	Botany.	Germ.	German.	Persp.	Perspective.
Build. M.	Building Materials.	Ital.	Italian.	Phys.	Physics.
Chem.	Chemistry.	Math.	Mathematics.	S. S.	Shades and Shadows.
Civ. Eng.	Civil Engineering.	Mech.	Mechanics.	Shop.	Shopwork.
Draw.	Drawing.	Mech. Eng.	Mechanical Engineering.	Span.	Spanish.
Desc. Geom.	Descriptive Geometry.	Met.	Metallurgy.	Ster.	Stereotomy.
		Met. Lab.	Metallurgical Laboratory.	Zool.	Zoology.

NAME.	HOME.	RESIDENCE.
Ames, Clara P.	Jamaica Plain	Jamaica Plain.
Astr., Min., Chem., Draw., Eng.		
Andrews, Elisha B., *A. M.*	Newton Centre	Newton Centre.
Phys.		
Baldwin, H. Furlong	Waterbury, Md.	178 W. Canton St.
Draw., Chem., Shop., Math., Germ.		
Baldwin, William H.	Baltimore, Md.	178 W. Canton St.
Fr., Draw., Chem., Shop., Germ.		
Ballou, Hattie A.	Boston	10 Berwick Park.
Chem.		
Barnes, Edith	Northboro	Northboro.
Biol., Min.		
Bigelow, Prescott	Boston	6 Marlborough St.
Math., Eng., Fr.		
Blair, Howard K.	Boston	31 Upton St.
Chem., Min., Germ., Phys., Mil.		
Bliss, Henry W.	Boston	11 Marlborough St.
Math., Chem., Eng., Shop.		
Boon, Harry M.	Fort Wayne, Ind.	Woburn.
Math., Eng., Draw., French.		

NAME.	HOME.	RESIDENCE.
Boyden, Dwight F. . . . Math., Chem., Draw.	Boston	Hotel Huntington.
Brown, Edmund H. . . . Mech. Eng., Draw., Mech., Phys., Germ.	Fisherville, N. H. . .	27 Yarmouth St.
Brown, Frank N. . . . . Phys.	Newton	Newton.
Buck, C. W. . . . . Assaying.	Cambridge	Cambridge.
Burgess, William P. . . Arch., Germ.	Dedham	Dedham.
Burnham, W. A., *A. B.* . Chem., Math.	Boston	21 Commonw'lth Av
Chase, Charles M. . . . Arch., Eng., Astr., Desc. Geom., Fr., Phys.	Lowell	Lowell.
Chapman, James E. . . . Eng., Germ., Shop., Astr.	Canton	Canton.
Cheney, Frank, Jr. . . . Shop., Math., Desc. Geom., Phys., Chem., Astr., S.S.	S. Manchester, Conn.	Jamaica Plain.
Cheney, Margaret S. . . Biol., Chem.	Jamaica Plain . . .	Jamaica Plain.
Cheong, Mon Cham . . . Mech. Eng., Phys., Math., Chem., Draw.	Canton, China . . .	13 Cortes St.
Cloudman, F. A. . . . . Chem.	Cumberland Mills, Me.	Boston.
Clark, Grace May . . . . Eng., Germ.	Roxbury	69 St. James St.
Cochran, Frederic B. . . Arch., Germ., Astr., Eng., Phys.	Boston	16 James St.
Cochran, Helen . . . . Eng.	Louisville, Ky. . . .	150 Charles St.
Cram, Arthur B., *B. S.* . . Arch., Phys.	Detroit, Mich. . . .	611 Tremont St.
Cumner, Harry W. . . . Math., Chem., Phys., Astr., Zool., Eng., Draw., Mil.	Manchester	54 Montgomery St.
Davis, Alfred V., Jr. . . . Chem., Fr., Math., Eng.	Pass Christian, Miss.	9 Brimmer St.
Duker, Herman H. . . . Arch.	Baltimore, Md. . . .	291 Columbus Av.
Emery, Francis F., Jr., . Math., Phys., Mech. Eng., Draw.	Boston.	17 Union Park.
Fletcher Katherine S. . . Eng.	E. Somerville . . .	E. Somerville.
Foote, Orlando K. . . . Arch., Eng., Desc. Geom., Phys.	Morrisville, N. Y. . .	25 Worcester St.
Gardiner, Edward G. . . Phys., Draw., Chem., Geol., Eng., Zool., Germ.	Boston	289 Marlboro' St.
Gill, Clara E. . . . . Min., Phys., Germ., Chem.	Brockton	Brockton.
Gill, M. Susan . . . . . Chem.	Marblehead	Marblehead.
Gilmore, William . . . . Math., Chem., Eng., Draw., Mil.	N. Easton	N. Easton.
Hammett, William A. . . Phys., Mech. Eng., Math., Chem., Draw.	E. Somerville . . .	13 Cortes St.
Harriman, Charles A. . . Arch., Phys.	Boston	4 Davis St.

NAME.	HOME.	RESIDENCE.
Hartshorne, William D., *C. E.* Chem.	Brighton, Md. . . .	88 G St., S. Boston.
Herrick, Rufus F. . . . . Chem., Draw., Germ., Shop.	Winchester	Winchester.
Hill, Arthur E. . . . . Arch.	Andover	Andover.
Hunt, Clyde D. V. . . . Math., Eng., Fr., Draw., Mil.	Weathersfield, Vt. .	277 Columbus Av.
Hunting, Walter C. . . . Arch., Germ.	Boston	613 Tremont St.
Johnson, Archibald . . . Math.	Bermuda Islands . .	27 Auburn St.
Kauffman, William . . . Arch.	Bellefontaine, O. . .	350 Columbus Av.
Kendall, Jeanie E. . . . Chem.	Boston	212 W. Canton St.
Leitelt, Adolph, Jr. . . . Draw., Mech. Eng., Math.	Grand Rapids, Mich. .	385 Columbus Av.
Leitelt, Joseph . . . . . Math.	Grand Rapids, Mich.	385 Columbus Av.
Lewis, Lloyd G. . . . . Germ., Eng., Astr., Math., Shop.	Lynn	12 Lewis St., Lynn.
Litch, John G. . . . . Chem., Math., Germ., Eng.	Roxbury	126 Warren St.
Marble, Albion M. . . . Arch.	Fall River	169 W. Newton St.
Mason, Howell R. . . . . Math., Draw., Eng.	Chelsea	Chelsea.
McColl, Frank P. . . . . Arch.	Newton	Newton.
Newell, Jeanie . . . . . Chem.	Cambridge	Cambridge.
Noble, Frank C. . . . . Civ. Eng., Draw., Mech., Phys., Geol., Zool., Eng.	E. Boston	106 Lexington St.
Norman, Hugh K. . . . Phys., Chem., Min., Met.	Boston	343 Beacon St.
Noyes, Arthur A. . . . Met. Lab.	Boston	31 Warren Av.
Noyes, Margaret, *Ph. B.* Eng.	Boston	47 Mt. Vernon St.
O'Grady, Thomas, Jr. . . Arch., Desc. Geom., Phys.	Boston	82 Conant St.
Palmer, Alice W. . . . . Draw., Min., Eng. Geol., Phys., Chem.	Roxbury	Bellevue St.
Palmer, Mary . . . . . Chem.	S. Boston	787 Broadway.
Pester, Richard . . . . Arch., Math., Sp., Desc. Geom.	Brooklyn, E. D., N. Y.	628 Tremont St.
Pike, Clara M. . . . . Chem.	Norton	Norton.
Plumb, Joseph D. . . . . Fr., Eng., Shop.	Roxbury	115 Seaver St.
Revere, William B. . . . Mech. Eng., Eng., Draw., Astr.	Boston	40 Commonw'lth Av.
Reynolds, George W. . . Met. Lab., Draw.	Providence, R. I. . .	Providence, R. I.

NAME.	HOME.	RESIDENCE.
Rogers, James S. . . . Arch.	Baltimore, Md. . .	289 Columbus Av.
Rosing, William H. V. . . Phys., Math., Mech. Eng., Draw., Shop., Desc. Geom.	Hyde Park, Ill. . . .	11 Yarmouth St.
Sargent, Sullivan A. . . . Arch.	Newport, R. I. . . .	7 West Cedar St.
Schofield, Charles E. . . Mech. Eng., Phys., Shop.	Macon, Ga. . . .	11 Yarmouth St.
Scovel, Minor, *Ph. B.* . . Civ. Eng., Mech., Math., Geol., Eng., Germ.	Pittsburgh, Pa. . .	366 Columbus Av.
Snedeker, Charles A. . . Arch., Germ., Phys.	Brooklyn, N. Y. . .	66 Clarendon St.
Stearns, Arthur H. . . . Fr., Math., Chem., Draw., Astr., Shop.	Cincinnati, O. . . .	29 Greenwich Pk.
Stearns, George H., *A. B.* . Min., Chem., Met. Lab.	Cleveland, O. . . .	28 Buckingham St.
Stebbins, Alfred, Jr. . . Min., Chem., Civ. Engin., Draw.. Math., Phys., Eng., Germ.	Roslindale	Forest Hills.
Stevens, Alice Atkinson. Chem., Biol., Germ.	Roxbury	105 Munroe St.
Strickland, Frank V. . . Phys., Math., Mech. Eng., Draw., Mil.	Bangor, Me.	13 Claremont Park.
Sweet, Henry N. . . . . Fr.	Boston	545 Shawmut Av.
Symonds, Andrew H. . . Arch., Phys., Desc. Geom.	Gardner	12 Boylston Pl.
Tryon, Thomas . . . . Arch., Eng., Desc. Geom., Fr.	Hartford, Conn. . .	66 Clarendon St.
Tyler, Artemas L. . . . Chem., Germ., Min.	Lowell.	Lowell.
Upton, King . . . . . Chem., Germ., Draw.	Peabody	Peabody.
Wakefield, Frank H. . . . Draw., Eng., Math.	Hopkinton	Hopkinton.
Walton, Evelyn M. . . . Chem., Met., Phys.	Saugus	Saugus.
Welch, Edward M. . . . Arch., Eng.	Hartford, Conn. . .	81 Dartmouth St.
Wentworth, Charles D. . . Math., Draw., Fr., Eng. Shop.	Danvers	Danvers.
Wentworth, Sarah E., *A. B.* Chem.	Danvers	Danvers.
Westcott, James H. . . . Arch., Germ.	Saratoga Sp'gs, N. Y.	66 Clarendon St.
Willard, John W. . . . . Assay.	Boston	57 Tremont St.
Williams, Janet W. . . . Min., Chem.	Newton Lower Falls .	Newton Lower Falls.
Woodbridge, Sam'l H., *A. M.* Chem., Phys.	Williamstown . . .	70 W. Cedar.
Woodward, Lizzie J. . . . Eng., Germ., Chem.	Roxbury	5 Lambert Av.
Zimmermann, William . . Arch., Desc. Geom., Phys.	Thiensville, Wis. .	368 Columbus Av.

STUDENTS IN THE SCHOOL OF MECHANIC ARTS.

SECOND YEAR.

NAME.		HOME.	RESIDENCE.
Abbott, Arthur P.	sp.	Dexter, Me.	20 Oak St.
Ames, William H.		No. Easton	No. Easton.
Barnard, M. Pennock		Kennett Square, Pa.	1 Hawthorn Av.
Bosson, Frederick N.	sp.	Chelsea	203 Washington Av.
Curwen, George E.	sp.	Salem	331 Essex St., Salem.
Dunn, Elbridge G. J.	sp.	St. John, N. B.	200 Trenton St., E.B.
Francis, George T.	sp.	Chestnut Hill	Chestnut Hill.
Kendall, Joseph S.		Boston	53 Allen St.
Patch, Oscar L.	sp.	Lexington	93 Traverse St.
Sanborn, Arthur W.		Somerville	Somerville.
Torrey, Joseph	sp.	Bath, Me.	309 Columbus Av.
Wendell, Benjamin T.	sp.	Jamaica Plain	Jamaica Plain.
West, Arthur W.	sp.	Salem	Salem.
Whidden, Joseph E.	sp.	S. Abington	S. Abington.

FIRST YEAR.

NAME.		HOME.	RESIDENCE.
Bent, Elmer M.		Cochituate	Cochituate.
Blanchard, Carlton S.	sp.	Harrison Square	Harrison Square.
Bunce, Walter H.		Hartford, Conn.	81 Dartmouth St.
Choate, Parker C.		Salem	13 Roslyn St., Salem.
Coburn, George A.		Hopkinton.	Hopkinton.
Codman, Charles F.		Boston	347 Columbus Av.
Dorsey, James T.		Hartford, Conn.	12 Ferdinand St.
Dougal, William M.		Georgetown, D. C.	115 Warren Av.
Evans, Albert D.		Boston	254 Cabot St.
Francis, Henry A.	sp.	Pittsfield	10 Derne St.
Frost, Walter E.		Neponset	Neponset.
Hopkins, Charles F.		Park Ridge, N. J.	Waltham.
Kelley, Ernest F.		Bath, Me.	13 Allston St.
Keyes, John M.		Concord	Concord.
Lewis, Braham J.		Boston	4 Columbus Sq.
Moore, George M.		Pawtucket, R. I.	Pawtucket.
O'Brien, Charles J.		Jamaica Plain	Jamaica Plain.
Philbrick, Arthur		Newton Centre.	Newton Centre.
Pope, Harry M.		Boston	96 Boylston St.
Proctor, James A.		E. Boston	179 Webster St.
Robinson, Edward S		Boston	50 Vernon St.
Rotch, Abbott L.	sp.	Boston	3 Commonwealth Av.
Simmons, Charles P		Boston	27 Warren St.

NAME.	HOME.	RESIDENCE.
Sise, Lyman	Medford	Medford.
Stephenson, Charles H	Hingham	Hingham.
Storrow, Samuel . . . sp.	Boston	417 Beacon St.
Ward, Harold	Boston	62 Commonw'lth Av.
Whitney, Asa Williams.	Philadelphia, Pa.	16 Ashburton Place.

STUDENTS IN THE LOWELL SCHOOL OF PRACTICAL DESIGN.

NAME	HOME.	RESIDENCE.
Baker, Maria Therese	Newtonville	Newtonville.
Benner, Winthrop E.	Lowell.	Lowell.
Boardman, James B.	Saugus	Saugus.
Bradford, Marcia A.	Roxbury	88 Walnut Av.
Burnes, Lizzie F.	Roxbury	12 Prentiss St.
Capen, Alice R.	Jamaica Plain	Jamaica Plain.
Collins, Leila D.	Boston.	13 Gray St.
Cook, Mary T. F.	E. Boston	181 Princeton St.
Doolittle, Abraham L.	S. Boston	551 Eighth St.
Eames, Minnie H	Andover	Andover.
Fiske, Laura I.	Shelburne.	Shelburne.
French, Abbie A	Franklin Falls, N. H.	2 Rollins Pl.
French, Grace A.	Franklin Falls, N. H.	2 Rollins Pl.
Frost, Ella C. ,	Buffalo, N. Y.	Savin Hill.
Kiander, Gustave B.	Boston.	17 Kendall St.
Leeman, Clara M.	Haverhill	Haverhill.
Lewis, Clarence H.	Watertown	Watertown.
Lewis, Cora E.	Forest Hills	Forest Hills.
Little, Philip.	Boston.	2 Commonwealth Av
McBarron, John T.	Boston	630 Shawmut Av.
Millen, Jennie E	Boston.	32 Hanson St.
Ordway, Louise M.	Jamaica Plain	Jamaica Plain.
Peck, Ida M.	Lancaster, N. Y.	87 Appleton St.
Peck, Harry H.	Boston.	Boston.
Putnam, Otis C.	Malden	Malden.
Sheldon, Delia	Beverly	Beverly.
Simmons, Reuben	Boston.	13 Orange St.
Smyth, Addie Kent	E. Boston	E. Boston.
Tainter, Frank L.	Newtonville	Newtonville.
Tower, Frederic R.	Braintree.	Braintree.
Valentine, Lucy Winter.	Boston	52 Chestnut St.
Weston, Delphina	Boston	3 Highland Park.
White, Henry S.	Boston.	183 W. Brookline St
Whitmore, Edward F.	Putnam, Conn	109 Chandler St.

SUMMARY.

Graduate Students	15
Regular Students, fourth year	9
" " third "	34
" " second "	29
" " first "	37
Special Students	91
Students in the School of Mechanic Arts	42
Students in the Lowell School of Practical Design	34
	291
Deduct names counted twice	12
Total	279

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, history and political economy, French, and German. These studies and exercises are so arranged as to offer a liberal and practical education in preparation for active pursuits, as well as a thorough training for most of the scientific professions.

Five Regular Courses of a distinctly professional character, further details of which will be found on pages 22–28, have been established, as follows: —

I. A Course in Civil and Topographical Engineering.
II. " " " Mechanical Engineering.
III. " " " Mining Engineering, or Geology and Mining.
IV. " " " Building and Architecture.
V. " " " Chemistry.

Regular Courses have also been established as follows: —

VI. A Course in Metallurgy.
VII. " " " Natural History.
VIII. " " " Physics.
IX. " " " Science and Literature.
X. An Elective Course.

Of these latter courses, the one in Metallurgy is similar to that in Chemistry, but has more particular reference to the pro-

duction and working of the metals. The course in Natural History affords an appropriate general training for those whose ulterior object is the special pursuit of geology, mineralogy, botany, zoölogy, pharmacy, or rural economy. It is specially suitable for those who intend subsequently to enter the medical profession. The course in Physics is based on the mathematical and physical sciences, and offers a suitable preparation for persons desirous of fitting themselves to teach physical science. The course in Science and Literature embraces a larger element of literary and historical study than the strictly technical ones, and is specially intended to furnish a liberal preparation for business pursuits. The Elective Course requires an amount of scientific study equivalent to that prescribed in any of the others, but of a more general nature; and is established for such as may not desire to adopt a distinctly scientific profession. Details respecting these courses may be obtained on application to the Secretary.

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

Each of these courses extends through four years, and for proficiency in any one of them the degree of S.B., Bachelor of Science, is conferred.

Students who find it advantageous to take fewer studies in any year than are prescribed in a single course, may continue in the school a fifth year to make up the studies required for a degree.

Advanced courses of study may be pursued, and the granting of the degree of Doctor of Science has been authorized by a vote of the Corporation.

Provision is also made for persons who desire to pursue special portions only of any of the regular courses.

At the request of the Woman's Education Association of Boston, and with their generous coöperation, special laboratories have been provided for the instruction of women. The de-

sign is to afford them facilities for the study of Chemical Analysis, Industrial Chemistry, Mineralogy, and Biology. The instruction is arranged for such students as may be able to devote their whole time to the work, as well as for those who, by reason of other engagements, can spend only a few hours a week in these exercises. Instruction will also be given to women in other subjects so far as suitable arrangements can be made for them.

The Institute also provides afternoon and evening 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 56.

REGULAR COURSES.

ALL COURSES. — FIRST YEAR.

FIRST TERM.	SECOND TERM.
Algebra finished.	Plane Trigonometry.
Geometry reviewed.	Spherical Trigonometry.
General Chemistry.	General Chemistry.
Rhetoric.	Qualitative Analysis.
English Composition.	English History.
French.	English Literature.
Mechanical Drawing.	French.
Free Hand Drawing.	Mechanical Drawing.
Military Drill.	Free Hand Drawing.
	Military Drill.

I. CIVIL ENGINEERING.

SECOND YEAR.

FIRST TERM.

Use of Instruments.
Surveying.
Field Practice.
Pen and Colored Topography.
Plotting from notes.
Analytic Geometry.
Descriptive Geometry.
Physics.
Descriptive Astronomy.
English History and Literature.
German.

SECOND TERM.

Railroad Curves.
Levelling.
Field Practice.
Plan Drawing.
Stereotomy.
Differential Calculus.
Physics.
Physical Geography
Dynamical Geology.
English History and Literature.
German.

THIRD YEAR.

FIRST TERM.

Earth Work.
Location and Construction of Roads, Railroads, and Canals.
Field Practice.
Drawing from Models and actual Structures.
Integral Calculus.
General Statics.
Stresses in Frames.
Physical Laboratory.
Lithology and Structural Geology.
Zoölogy.
Palæontology.
Constitutional History.
German.

SECOND TERM.

Hydraulics.
Water Supply.
Drainage.
River and Harbor Improvements.
Field Practice.
Projections and Perspective.
Bridges and Roofs (Descriptive).
Strength of Materials.
General Laws of Kinematics and Dynamics.
Physical Laboratory.
Historical Geology.
Political Economy.
German.

FOURTH YEAR.

FIRST TERM.

Geodesy.
Practical Astronomy.
Hydrography.
Structures of Stone, Wood, and Iron.
Designing of Roofs and Bridges.
Structure Drawing.
Locomotive Engines.
Strength of Materials completed.
Metallurgy.
Applied Physics.

SECOND TERM.

Structures of Stone, Wood, and Iron.
Graphical Statics.
Pumping Engines.
Water Wheels.
Engineering Projects.
Machine Drawing.
Dynamics completed.
Thesis Work.
Building Materials.

II. MECHANICAL ENGINEERING.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Shop Work.	Comparative Motions.†
Shades and Shadows.	Toothed Wheels.†
Analytic Geometry.	Aggregate Motions.†
Descriptive Geometry.	Miscellaneous Mechanisms.†
Physics.	Graphical Kinematics of Machines.†
Descriptive Astronomy.	Shop Work.
English History and Literature.	Differential Calculus.
German.	Physics.
	Physical Geography.
	Dynamical Geology.
	English History and Literature.
	German.

THIRD YEAR.

FIRST TERM.	SECOND TERM.
Thermodynamics.*	Kinematics of Machines: — Pairs, Notation, Analysis, Synthesis, Graphical Kinematics.†
Characteristic Features of Typical Steam and other Heat Engines.*	Shop Work.
Setting Machinery.*	Perspective.
Transmission, Measurement, and Regulation of Power.*	Stereotomy.
Machine Drawing.*	Strength of Materials.
Steam Engineering Laboratory.*	General Laws of Kinematics and Dynamics.
Integral Calculus.	Physical Laboratory.
General Statics.	Political Economy.
Stresses in Frames.	German.
Physical Laboratory.	
Constitutional History.	
German.	

FOURTH YEAR.

FIRST TERM.	SECOND TERM.
Combustion of Fuel.*	Thermodynamics of Steam and other Heat Engines.
Steam Generators.*	Pumping Engines, Hydraulic Motors and Machines.
Mechanism of the Steam Engine.*	Proportion, Adjustment, and Design of Motors, Machines, and Regulators.
Machine Design.*	Steam Engineering Laboratory.
Machine Drawing.*	Machine Design.
Abstracts from Memoirs.	Machine Drawing.
Steam Engineering Laboratory.*	Shop Work.
Shop Work.	Dynamics Completed.
Strength of Materials completed.	Stability of Structures.
Hydraulics.	Building Materials.
Metallurgy.	Thesis Work.
Lithology.	
Zoölogy.	
Palæontology.	
Chemical Laboratory.	

The first term studies marked with an (*), and also the second term studies marked with a (†) are taken in alternate years, two classes taking them together.

III. MINING ENGINEERING.

SECOND YEAR.

FIRST TERM.

Blowpipe Analysis.
Crystallography.
Determinative Mineralogy.
Qualitative Chemical Analysis, Lectures and Laboratory work.
Use of Surveying Instruments.
Surveying.
Field Practice.
Plotting from notes.
Analytic Geometry.
Physics.
German.

SECOND TERM.

Quantitative Chemical Analysis, Lectures and Laboratory work.
Differential Calculus.
Physics.
Physical Geography.
Dynamical Geology.
English History and Literature.
German.

THIRD YEAR.

FIRST TERM.

Quantitative Chemical Analysis.
Drawing.
Integral Calculus.
General Statics.
Stresses in Frames.
Physical Laboratory.
Lithology.
Constitutional History.
German.

SECOND TERM.

Mining Engineering, Sinking, Timbering, Hoisting, Pumping, Ventilating, &c.
Assaying by Fire and by Wet Methods.
Quantitative Chemical Analysis.
Strength of Materials.
General Laws of Kinematics and Dynamics.
Physical Laboratory.
Historical Geology.
Political Economy.
German.

FOURTH YEAR.

FIRST TERM.

Quantitative Chemical Analysis.
Mining Laboratory : — work upon Gold, Silver, Copper, and Lead Ores in quantity.
Mining Engineering continued.
Metallurgy, Lectures.
Drawing.
Strength of Materials completed.
Dynamics completed.
Memoirs.

SECOND TERM.

Quantitative Chemical Analysis.
Mining Laboratory as in 1st term.
Ore dressing, Lectures.
Shopwork.
Thesis Work.
Building Materials.

For information regarding the alternative course of Geology and Mining apply to the Secretary.

IV. ARCHITECTURE.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Greek and Roman Architectural History.	Mediæval Architectural History.
The Orders and their applications.	Perspective.
Drawing.	Blackboard Drawing.
Tracing and Sketching.	Drawing.
Analytic Geometry.	Sketching.
Physics.	Differential Calculus.
Descriptive Geometry.	Physics.
Descriptive Astronomy.	Botany, Systematic and Structural.
English History and Literature.	Physical Geography.
German.	Dynamical Geology.
	English History and Literature.
	German.

THIRD YEAR.

FIRST TERM.	SECOND TERM.
Theory of Decoration; Color, Form and Proportions; Conventionalization; Symbolism.	Modern Architectural History.
Original Design.	The Decorative Arts; Stained Glass, Fresco Painting, Tiles, Terra Cotta, etc.
Sketching.	Original Design.
Specifications; Masonry, etc.	Sketching.
Integral Calculus.	Specifications; Plumbing, etc.
General Statics.	Strength of Materials.
Stresses in Frames.	General Laws of Kinematics and Dynamics.
Lithology and Structural Geology.	Bridges and Roofs (Descriptive).
Physical Laboratory.	Stereotomy.
Constitutional History.	Physical Laboratory.
German.	Political Economy.
	German.

FOURTH YEAR.

FIRST TERM.	SECOND TERM.
The History of Ornament.	The Theory of Architecture.
Blackboard Drawing.	Style and Composition.
Original Design.	Original Design.
Sketching.	Sketching.
Specifications; Carpentry, etc.	Specifications; Contracts, etc.
Strength of Materials completed.	Building Materials.
Stability of Structures.	Flow of Gases.
Shop Work.	Thesis Work.
Applied Physics.	

The Lectures on Mediæval and Modern History, those on Ornament and Decoration, and those on Specifications, are given in alternate years, two classes taking them together.

V. CHEMISTRY.—A.

SECOND YEAR.

FIRST TERM.

Qualitative Analysis, Lectures and Laboratory work.
Blowpipe Analysis.
Crystallography.
Analytic Geometry.
Physics.
English History and Literature.
German.

SECOND TERM.

Quantitative Analysis, Lectures and Laboratory work.
Chemical Philosophy.
Differential Calculus.
Physics.
English History and Literature.
German.

THIRD YEAR.

FIRST TERM.

Quantitative Analysis, Laboratory work.
Quantitative Analysis, Special Methods.
Work with the Microscope.
Physical Laboratory.
Constitutional History.
German.

SECOND TERM.

Quantitative Analysis, Laboratory work.
Industrial Chemistry.
Drawing.
Physical Geography.
Dynamical Geology.
Physical Laboratory.
Political Economy.
German.

FOURTH YEAR.

FIRST TERM.

Organic Chemistry, Lectures.
Organic Chemistry, Laboratory work.
Metallurgy, Lectures.
History of Chemistry and Allied Sciences.
Abstracts of Memoirs.
Applied Physics.
Optional Studies.

SECOND TERM.

Studies for this term, including Thesis work, will be specially assigned to each student.

For Courses B and C, see next page.

V. CHEMISTRY.—B and C.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Qualitative Analysis, Lectures and Laboratory work.	Quantitative Analysis, Lectures and Laboratory work.
Blowpipe Analysis.	Chemical Philosophy.
Crystallography.	Botany, Systematic and Structural.
Determinative Mineralogy.	Physical Geography.
Descriptive Astronomy.	Dynamical Geology.
Physics.	Physics.
English History and Literature.	English History and Literature.
German.	German.

THIRD YEAR.

FIRST TERM.	SECOND TERM.
Quantitative Analysis, Laboratory work.	Quantitative Analysis, Laboratory work.
Quantitative Analysis, Special Methods.	Industrial Chemistry.
Biology.	Drawing.
Physical Laboratory.	Physical Laboratory.
Lithology.	Historical Geology.
Constitutional History.	Political Economy.
German.	German.

FOURTH YEAR. — FIRST TERM.

COURSE B.	COURSE C.
Organic Chemistry, Lectures.	Organic Chemistry, Lectures.
Organic Chemistry, Laboratory work.	Organic Chemistry, Laboratory work.
Metallurgical Laboratory.	Industrial Chemistry, Laboratory work.
Metallurgy, Lectures.	Metallurgy, Lectures.
Abstracts of Memoirs.	Abstracts of Memoirs.
Applied Physics.	Applied Physics.
Optional Studies.	Optional Studies.

FOURTH YEAR. — SECOND TERM.

Studies for this term, including Thesis work, will be specially assigned to each student.

Candidates for the degree in Chemistry may elect either of the courses A, B, or C. Course A is for those who wish to continue the study of mathematics beyond the first year. Course B is for those who prefer a larger amount of the natural sciences; and Course C for those whose aim is the pursuit of Industrial Chemistry.

ADVANCED COURSES.

The particular course of study, which a candidate for the degree of Doctor of Science wishes to pursue, must be submitted to the Faculty in writing, and must meet their approval.

The minimum term of residence of candidates for this 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.

Final examinations will be held and the candidate will be required to present at least one printed thesis on some subject embraced in his course.

CONDITIONS OF ADMISSION.

Regular Courses. To be admitted as a regular student of of the first year's class, the applicant 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 Geometry.

French — Grammar through irregular verbs[1]; and the first two books of Voltaire's "Charles XII", or an equivalent;

English grammar and composition;

Geography.

In general, the training given in the best high schools and academies, will be a suitable preparation for this school.

To be admitted as a regular student of the second year's class, the applicant must be at least seventeen years of age,

[1] Part I. of Otto's French Grammar represents what is required.

and besides passing the examination for admission to the first year's class, must pass a satisfactory examination in the first year's studies; 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 Faculty that they are prepared to pursue the proposed 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 may be excused 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, as it gives a better understanding of the various terms used in science, and greatly facilitates the acquisition of the modern languages. Those who intend to take a course in Natural History will find it advantageous to acquire also the elements of Greek.

Special students will be allowed to enter special divisions of either of the courses,—as, for example, the 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. Information respecting the requirements for admission to each special course of study may be obtained on application to the Secretary. Examinations for the above mentioned class of students will be held at the times of the regular entrance examinations as stated below.

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 pass the entrance examination, as given above, and present themselves for further examination at 9 A. M., on the Friday following the second entrance examination.

Applications for admission to the regular or special courses 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.

Advanced Courses. Graduates 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.

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. 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 oral examination in connection with the ordinary exercises, written examinations are held from time to time.

Near the close of the months of January and May, genera examinations are held. The standing of the student at these examinations in each distinct subject is reported to his parent

or guardian. 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. Conditioned students must appear for re-examination at 9 A.M., on the Friday preceding the first Monday in October.

The Instruction in Mathematics. Great importance is attached to the study of mathematics both as a means of mental discipline and as affording a necessary basis for farther instruction in the professional courses. In the first year all regular students finish Algebra, and complete Solid Geometry, Plane and Spherical Trigonometry. In the following years, instruction is given in Analytic Geometry, and in the Differential and Integral Calculus.

The Instruction in Modern Languages. The special 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, since many important sources of information, such as periodicals and works for consultation and reference, are accessible only in French or German. French, (some knowledge of which is required for admission to the school,) is continued through the first year. German is commenced at the beginning of the second year, and continued for a period of two years. To this extent these languages are studied by all regular students. They may, however, be continued as elective studies.

The elements of Italian and Spanish are taught in optional classes in the third and fourth years, for the benefit of those who may have special reasons for studying those languages.

The Instruction in English and History. In this department all regular students receive a course of instruction extending through the first three years, in Rhetoric and Criticism, in English Literature, and in Modern History. Practice in English

composition is required throughout the course. The study of the History of English Literature is accompanied by the critical reading of English texts, and in the instruction in History particular attention is given to the subjects of Political Science and Political Economy.

The Instruction in Drawing. During the first year, instruction is given to all regular students in the principles of Free Hand and Mechanical Drawing, and a large amount of time is devoted to practice in the drawing room, to enable the student to acquire the necessary skill and to prepare him for his future work. In subsequent years, Drawing is continued in connection with the professional studies.

The Instruction in Descriptive Geometry and Stereotomy. The exercises in Descriptive Geometry 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 Chemistry. In the laboratories provision is made for teaching General Chemistry, Qualitative Analysis, Quantitative Analysis, Organic Chemistry, Assaying, Determinative Mineralogy, Metallurgy, and Industrial Chemistry, the use of the blow-pipe, as well as the use of the microscope, spectroscope, and other optical apparatus.

Instruction in General Chemistry is given to all regular students by recitations and lectures, and by practical exercises in the laboratory, where every one is provided with a desk and the necessary apparatus, and is required to perform, under the supervision of the professor, a large number of experiments, selected to illustrate the laws of chemical action and the properties and relations of all the more important chemical elements. This is followed by a systematic course of instruction in Qualitative Analysis, with laboratory practice.

In the second year those who require a fuller knowledge of chemistry continue Qualitative Analysis and take up Chemical Philosophy, Assaying, and Mineralogy with the use of the Blowpipe.

The principal subjects of study in the third and fourth years are Volumetric and Gravimetric Analysis, Organic Chemistry, Gas Analysis, the Preparation of Chemical Products, Metallurgy, and Industrial Chemistry. A large portion of the time is allotted to work in the laboratories. In the third year, lectures are given on Quantitative Analysis, and on Physiological and 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 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.

Arrangements will be made for the accommodation of students who wish to devote themselves to special subjects, such as Toxicology, Food and Water Analysis, Gas Analysis, Dyeing, Tanning, and other chemical arts.

Special provision has been made for giving women ample opportunities for laboratory work in Chemistry, Mineralogy, and Biology. Each study may be pursued by itself, or in connection with studies in other departments of the Institute.

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 application.

The Institute possesses an extensive and constantly increasing collection of physical apparatus.

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 those with the microscope and 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 handling minute, or delicate objects; and still others exercise the reasoning faculties, and show how to apply mathematics to concrete problems. This course, therefore, has a use beyond the direct value 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. Original investigation is stimulated as far as possible, and the result has been a considerable number of published memoirs.

Besides the above, candidates for a degree in Physics pursue the following practical courses: —

Microscopy. —Theory of the microscope; application to study of various objects; test-objects; modes of illumination; applications of polarized light, use of micro-spectroscope; measurement with different forms of micrometer; focal length and angular aperture of objectives; preparation of objects.

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, etc.

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

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

In addition to the laboratory work, students in this department receive instruction in General Physics throughout the third and fourth years, and gain a familiarity with standard works on various branches of the subject, both in their own and in foreign languages.

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 scientific memoir or lecture.

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

The Instruction in Theoretical and Applied Mechanics. This instruction, which is given to all regular students of the courses of Engineering and Architecture, is begun about December 1st of the third year. During the third year the subjects studied are the composition and resolution of forces, the principles governing the determination of the stresses in the different members of trusses, centre of gravity, parallel projections, moment of inertia of plane surfaces, the ordinary principles of the strength of materials, and the laws of internal stress; also during the last month of the year the general laws of

Kinematics and Dynamics are discussed mathematically, such as the equations of uniform, and varying motion, the circular pendulum, the conical pendulum, moment of inertia, radius of gyration, centre of percussion, etc. In this course the methods of the differential and integral calculus are freely used whenever they are the most convenient.

In the fourth year's classes the subjects pursued by the students of each professional course are arranged with reference to the special wants of that course, and then two or more classes are taught together whenever the instruction to be given covers the same ground. This instruction embraces the mathematical principles of the following subjects, viz.: stability of arches and retaining walls, completion of those parts of strength of materials not fully discussed already, as well as further discussion of the stresses in trusses; arched ribs, Hydraulics, Thermodynamics, and further study of Dynamics; the object being to give to the students such knowledge of the mathematical principles of these subjects as they need in order to pursue with advantage the investigations in their own professional departments.

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, plane-table, etc., is taught mainly by actual work in the field. The field-work embraces land surveying, levelling, laying out curves, both circular and parabolic, the detailed survey of a railway line, and staking it out ready for construction, topographical work with the plane-table, and hydrographical surveying. These surveys are plotted and represented on finished plans. The necessary computations of areas, earth-work, etc., are also made. Instruction in all these subjects is given in the class, and drawing rooms.

In the remaining subjects peculiar to this department, as set

down in the Course of Instruction, the principal text-books used are Rankine's Civil Engineering, Rankine's Applied Mechanics, Loomis's Practical Astronomy, and Du Bois's Graphical Statics. The instruction from text-books is supplemented by lectures on many of the subjects and by suitable explanations and illustrations, together with a series of examples for practice, on which papers are handed in by the students. Considerable time is given to drawing from models and from actual structures, such as abutments, bridges, water-works, etc. Original designs on the same subjects, accompanied with working drawings, are made.

An observatory, erected on the Institute building, from which a large number of Coast Survey stations are visible, is used in connection with the instruction in geodesy. Observations are also made for the determination of the meridian, time, latitude, and longitude, in connection with the study of practical astronomy.

The Instruction in Mechanical Engineering is given by means of lectures and recitations, and by practice in the drawing rooms, and in the Laboratory of Steam Engineering. Occasional excursions are made to enable the students to witness running machinery, and manufacturing processes.

The instruction in the Kinematics of Machines treats of the motions, and changes of motion which occur in machines, of those problems in machine design which relate to motions that machines are to produce, and of the comparative examination of equivalent mechanisms.

The first term instruction in Machine Design treats of those dimensions of elements of machines that depend upon the force which a pair of elements may transmit, or upon the work-shop processes by which the elementary parts are produced. The second term instruction in Machine Design involves the application of principles of kinematics and dynamics of machines, in determining stresses and their fluctuations

in machines and motors, and applications of the principles of strength of materials, and work-shop practice to the proper proportioning of the various parts.

The instruction in Mill-work treats of placing machinery in the manufactory, and of the distribution, measurement, and regulation of force and power.

The instruction in Steam Engineering treats of the fundamental laws of thermodynamics, and their application to steam and other heat engines, of the combustion of fuel, of steam generators and their construction, of the mechanism of the steam engine, and of the characteristic features of typical steam, and other heat engines. The instruction in designing the parts of the steam engine is given under the head of Machine Design.

The instruction in Hydraulic Motors and Machines treats of water-wheels and water pressure engines and machines.

The practice in Drawing is carried on in conjunction with the lectures and text book study. It comprises tracing, copying, sketching from the structure, machine or motor, scale drawing from sketches, and the representation by curves of results of experiments or of mathematical investigations; to which is added the reproduction of drawings by the "Blue Process."

The Laboratory of Steam Engineering affords an opportunity of becoming acquainted by experiment, with fundamental laws which underlie the practice of Steam Engineering. It also provides practice in adjusting, testing, and managing steam machinery and apparatus.

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, and on 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, Sax-

ony, which show in detail the methods of working underground by underhand and overhand stoping, the timbering and walling of shafts and levels, the arrangement 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.

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.

The Mining and Metallurgical Laboratories. These laboratories furnish to students 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 mode of treatment as have been adopted at the best mining and metallurgical establishments.

The mining laboratory is supplied with two suites of milling apparatus: —

I. A five-stamp battery, a set of amalgamating plates, a mercury saver, buddles for concentrating tailings, an Attwood's amalgamator, and an amalgamating pan.

II. A Blake crusher, crushing rolls with automatic sizing screens, a Spitzkasten, four automatic machine jigs, an elevator, two end percussion tables (the Freiberg Stossherd), a side percussion table (Rittinger's Stossherd), a settling tank, and a cen-

trifugal pump, which throws the water from the settling tank back to the feed tank. The same water is thus used over and over again to avoid loss in slimes.

This laboratory also contains the following auxiliary apparatus: — a steam engine and boiler, a Whelpley and Storer pulverizer, an edge-stone mill, a Root blower, and a Sturtevant blower. 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, a melting kettle, and an eliquation furnace.

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. Each student is assisted in working his ore by his classmates, who have an opportunity in this way to run the boiler, engine, machines, and furnaces.

The Institute is from time to time receiving ores of gold, silver, lead, copper, antimony, zinc, iron, etc., from various localities. These ores are worked, and reports sent to those who contribute them; and it is hoped that by the co-operation of those who wish to have examinations made, 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 drawings collected in the United States and in Europe.

They illustrate the following subjects :—General Descriptive Geometry, Linear Perspective, Shades, Shadows and Reflections, Masonry and Stone Cutting, Joints, Girders and Trusses for Wood and Iron Structures, Furnaces and Boilers, Steam and Water Motors, Machines and their details.

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 so arranged as 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.

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 and fourth years attend a series of lectures upon ornament and composition, or upon the theory of architecture. In the same way the study of specifications and working drawings is pursued by the two classes together, carpentry and its related subjects occupying one year, and masonry and stone-work the next. In the last half of the year the historical studies are continued, the second and third year classes attending 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.

During the third and fourth years the students are constantly practiced in original design. Each set of drawings is examined and criticised before both classes.

Special exercises are also had in shades, shadows, perspective, and the perspective of shadows, and in tracing and sketching, and drawing upon the blackboard, and in sketching, measuring, and drawing out buildings already erected. A volunteer class has been formed for reading *Hatfield's Transverse Strains.*

Special students in Architecture are received into a special course, occupying two years, and embracing all the subjects mentioned in the three preceding paragraphs. Such students may also take any other studies which they are found prepared to pursue to advantage. If not proficient in free-hand drawing and in practical geometry they are required to make themselves so during the first half of the year, in addition to their other exercises. No other examinations are required for this special two years' course, but those who are intending to enter upon it are strongly recommended to prepare themselves for and to pass the regular examinations for entering the school (see page 29), and they will not be permitted to take up any studies for which this preparation is required until they do so. The fee for this special course is two hundred dollars a year, the same as for the regular courses.

The Boston Society of Architects has established two prizes of the value of fifty dollars each, for students in this department who at the end of the year, exhibit the best year's work. The prizes are given in books. They were last year awarded to Mr. Arnold W. Brunner, of New York, N. Y., and to Mr. Cass Gilbert, of St. Paul, Minnesota.

The Architectural Museum. Several thousand photographs, prints, drawing, and casts, have been collected for this Department, by means of a special fund raised for the purpose.

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*.

The publications of the Royal Institute of British Architects, and of the *Société Central des Architectes*, in Paris, have been presented by the authorities of these institutions. The library contains nearly four hundred volumes.

Since the end of last year a chief part of the collection of casts of architectural sculpture and detail belonging to the department has been deposited in the Museum of Fine Arts, along with the architectural collections belonging to the Museum. The students of the department have free access to them at all times, and as the Museum building is close at hand, no inconvenience results from the change. The space thus gained will be filled with specimens of metal-work, tile-work, glass-work, and wood-work, partly purchased, but mostly deposited with the department by the manufacturers, forming a museum of sanitary and building appliances.

The Instruction in Natural History. This is given with the aid of the collection 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 Zoölogy, Palæontology, and other branches of Natural Science.

Botany is required in some of the courses as affording the proper and natural introduction to the study of Biology, Zoölogy, and Palæontology, 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 Biological laboratory has been furnished with a variety of microscopes and accessory apparatus, and affords uncommon facilities for both preparatory and advanced study. The working library of the professor in charge, which contains many valuable monographs as well as the more comprehensive works, is at the service of the students.

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 nse for iustruction is placed in the study room of the Mining department, and is thus ready for reference at any time.

The Instruction in Zoölogy and Palæontology, including the history of ancient animal life, and the study of the distinctive and characteristic fossils of the different formations, is given 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 Physical Geography and Geology. This course of instruction begins in the second term of the second year with forty-five lessons in Physical Geography including Dynamical Geology. These lessons treat of the principal features of the earth's surface, their characteristics, classification, geographical relations, and of the changes which they have experienced within the historic period through the more important agencies, such as winds, frost, rain, rivers, glaciers, tides, volcanoes, earthquakes, plants and animals. This course is so arranged as to give the student a good general knowledge of Physical Geography, and at the same time it is an important preparation for the course in Historical Geology, given the next year.

Thirty lessons in Structural Geology, including a systematic course in Lithology, are next given during the first term of the third year. In this course oral instruction and laboratory work are combined, the aim being to place in the hands of each student a specimen of each type discussed. The principal structural features characterizing large masses of rocks, embracing stratification, joint structure, faults, folds, slaty cleavage, veins, dykes, etc., are taught in as practical a manner as circumstances will allow. This instruction is supplemented by frequent excursions to localities of geological interest in the vicinity of Boston. A course of fifteen lessons in Chemical Geology and the history of the crystalline formations is then given, which comprises the origin, alteration, and decay of rocks, the history of vein-stones and ore deposits, of rock salt and mineral waters, and of coal and petroleum, also a general sketch of the chemical history of the globe.

These are succeeded by forty-five lessons in Historical Geology, given during the second term of the third year. In this course the physical history of the earth is taught as it is revealed by present changes, which have been studied in the course in Physical Geography, also by the structure and composition of the rocks, as taught in the course in Structural Geology, and by the fossilized remains of animals and plants, the nature of which has been learned in the course in Zoology and Palaeontology. The geological positions and conditions of occurrence of ores and other economic products are taught in connection with the geological formations in which they are found, and the instruction is made as practical in character as its limits will admit. A collection of specimens and a series of pictorial representations are employed in the illustration of this branch. During the summer vacation excursions of several weeks are often made to regions where the fossiliferous formations are well developed.

The Instruction in Political and Industrial Geography provides for an advanced course of geographical study in the fourth year. In it are taught the influences of geographical position, physical features, climates, etc., upon the resources of districts and countries, and upon the extent, character, and prosperity of nations. Instruction in Meteorology is included in this course.

The Instruction in Shop Work. Shops or laboratories have been recently provided, and furnished with the more important hand and machine tools, so that the student may acquire a direct knowledge of the nature of metals, and woods, and some manual skill in the use of tools.

Practical instruction in the nature of the materials of construction and in the typical operations concerned in the arts, is considered a very valuable adjunct to the theoretical treatment of professional subjects. Students in the course of Mechanical

Engineering are required to devote a considerable amount of time to work in Carpentry, Wood Turning, Pattern Making, Moulding and Casting, Forging, Chipping and Filing, and Planing and Turning the metals, the design being to learn principles, and not to manufacture articles for sale or use.

Students in other departments will be allowed to take shop work, when the time can be arranged so as not to interfere with their regular studies.

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 tactics. During the first year all students are required to attend three times a week an exercise in tactics, unless specially excused. A written and drill examination are held at the end of the year. For the drill exercises they are required to provide themselves with a uniform consisting of dark pantaloons, cap with silver ornament, and double-breasted sack with black gutta-percha buttons. 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 drill, and being inconspicuous, may be worn at other times if the student chooses. Applications to be excused from drill may be granted by the Faculty when the student is an alien, a college graduate, or over twenty-one years of age, when he has a surgeon's certificate of disability, or is able to pass an examination satisfactory to the Department.

The large drill-hall includes a well-equipped gymnasium, 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 inspec-

tion 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 geological features, and for the study of metallurgical works and noted specimens of engineering.

During the past summer a party of students of Mining and Mineralogy, with two of the professors, visited places of special interest in Nova Scotia. Opportunity was thus given for a study of the Albertite mine, the bituminous limestone and the white plaster at Hillsboro, N. B.; of the Joggins coal mine, which is under the superintendence of a former student of the Institute; of the remarkable exposure of carboniferous strata in the Joggins bluff; of the grindstone quarry and manufactory at Joggins; of the trap formation at Cape Blomidon, at Partridge Island, the Five Islands, and the Two Islands, near Parrsboro, as well as farther west at Margaretville; of the Acadia iron mine, and the rolling mill and furnaces of the Canada Steel Co.; of the Albion and Acadia coal mines at Stellarton; of the Oldham gold mines; and the plaster and limestone deposits at Windsor.

OCCASIONAL LECTURES.

In addition to the instruction given by the permanent corps of teachers, gentlemen in active life who are eminent in their respective professions, will, from time to time, be invited to give courses of lectures on subjects of practical importance. Mr. Edward S. Philbrick, C. E., of Boston, has consented to give a course of evening lectures on Sanitary Engineering during the present school year.

THE BOSTON PUBLIC LIBRARY.

The professors and students of the Institute are allowed the full use of this library, which now contains over 360,000 volumes. Its reading-room is supplied with the best scientific and technical, as well as literary periodical publications, of different countries, and 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 given to the officers and students of the Institute of Technology.

SCHOLARSHIPS.

A 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."

Two scholarships were founded by the late James Savage, LL.D., the benefit of which is given to meritorious students on recommendation of the Faculty.

ADVANCED SCHOLARSHIPS.

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

DEGREES AND DIPLOMAS.

The degrees corresponding to the regular courses are as follows: —

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

The diploma is intended as an evidence of the student's diligence and attainments. In any of the first nine courses it is also an assurance to the public of his knowledge and skill in the particular department therein mentioned. In the Elective course it shows that the student has faithfully and successfully pursued the full course of studies, assigned or approved by the Faculty.

To be entitled to any one of these degrees, the student must have passed satisfactory examinations in all the prescribed studies and exercises; 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.

Persons who have been admitted to departments of instruction in the school may, should they so desire, be examined for a degree, and, if found qualified to pass, under the prescribed conditions, they will be entitled to the appropriate diploma.

The examinations for degrees are held in the month of May. The title of the degree in each of the courses is S. B., or Bachelor of Science, in ————————.

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

Besides the diplomas of the Regular and 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 first term begins on the last Monday in September. There is a recess of one week after the semi-annual examinations, and the second term begins on the first Tuesday in February. On legal holidays the exercises of the school are suspended.

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 Bursar, 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 Bursar, 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, $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. Payment is also required of the cost of apparatus broken or used up in the laboratories.

Special students 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. Special students are expected to attend all the exercises in the subjects they have selected, unless excused by special vote of the Faculty. Students entering a lecture room, drawing room, or laboratory, more than five minutes after the hour designated for the beginning of the exercise will be marked tardy. Students are, in general, expected to devote themselves to the work of the school between the hours of 9 A. M. and 4 1-2 P. M., except during the interval for dinner. There are no exercises on Saturday afternoon, and the rooms are 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. 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 general good order of the school, if repeated after admonition, will be followed by suspension or dismissal. It is the aim of the Faculty so to administer the discipline of the school as to maintain a high standard of integrity and a scrupulous regard for truth, and the attempt of any student to present as his own the work of another, or to pass any examination by improper means, is regarded as a most

serious offense, and renders the offender liable to immediate expulsion.

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, and conveniently located rooms may be found at a cost of two dollars and upwards additional per week.

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

SCHOOL OF MECHANIC ARTS.

A School of Mechanic Arts, in which special prominence is given to *manual* instruction, has been established for those who wish to enter upon industrial pursuits, rather than to become scientific engineers.

The school is designed to afford such students as have completed the ordinary grammar school course, an opportunity to continue the elementary scientific and literary studies, together with mechanical drawing, while receiving instruction in the use of the typical tools for working iron, and wood.

The shop work is conducted upon a plan designed at the Imperial Technical School of Moscow, Russia, and carried out there with most satisfactory results. Its exact and systematic method affords the direct advantages of training the hand and eye for accurate and efficient service with the greatest economy of time; and the instruction in the use of tools and materials has also proved a valuable aid in intellectual development.

The shop courses of the school are as follows: —

First year: I, Carpentry and Joinery; II, Wood Turning; III, Pattern Making; IV, Foundry Work.

Second year: I, Iron Forging; II, Vise Work; III, Machine Tool Work.

The full course includes two years of theoretical and practical studies combined, and students, who successfully complete it, will receive a certificate. Students will be received for shorter times and for special portions of the course. When it is desired such provisions will be made for advanced and specific shopwork as are consistent with due attention to the regular classes.

Students in this school are recommended to attend the exercises in Military Drill, and hours will be so arranged as to allow them to do so without detriment to their studies.

Applicants for the regular course must be at least fifteen years of age, and must pass a satisfactory examination in Arithmetic, Geography, and English Composition.

The tuition is $150 a year, with no extra charge for the use of tools or materials used in the regular exercises. Special students, taking shop work only, will be charged $70. The student is entitled to the products of his work. Students, while on the premises of the Institute, are expected to remain in the study room, except when at recitations or in the work shops. A monthly return of absences is made to the parent or guardian.

FIRST YEAR.

FIRST TERM.	SECOND TERM.
Shop Work, — Carpentry.	Shop Work, — Wood Turning, Pattern Making, Foundry Work.
Algebra commenced.	Plane Geometry.
English Composition.	English Composition.
Mechanical Drawing.	Mechanical Drawing.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Shop Work, — Forging.	Shop Work, — Vise Work, Machine Tools.
Algebra completed.	Geometry
Elementary Physics.	Physics.
English Composition.	English Composition.
Mechanical Drawing.	Mechanical Drawing.

The beginning and ending of the school year and the days of entrance examinations are the same as in the School of Industrial Science. See Calendar, page 2.

SCHOLARSHIPS OF THE MASS. CHARITABLE MECHANICS ASSOCIATION.

The two scholarships, founded by this Association, are awarded to sons of present or past members of the Association, on recommendation by the President and Secretary of the Association.

The scholarship entitles the student to free tuition in the School of Mechanic Arts.

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.

These courses are more or less varied from year to year by the omission or interchange of particular subjects, but include in their entire scope instruction in mathematics, mechanics, 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 these courses to provide substantial teaching, rather than merely popular illustration of the subjects treated, 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, when the course is of a nature demanding preparation, stating the extent of their preliminary training.

The number of students in each class is necessarily limited.

The courses for 1879–80 are on the following subjects: —

I. *Practical Applications of Graphical Statics.* Twelve lectures by Prof. Lanza, on Mondays and Wednesdays, at 7½ P. M., beginning Nov. 24.

II. *Middle High German. The Nibelungenlied.* Twelve lectures by Prof. Otis, on Tuesdays and Fridays, at 7½ P. M., beginning Feb. 3.

III. *Heat.* Twelve lectures by Prof. Cross, on Mondays and Thursdays, at 7½ P. M., beginning Nov. 24.

IV. *French Verbs.* Chiefly a practical outline of their forms and characteristic uses. Twelve lessons by M. Jules Luquiens, on Tuesdays and Thursdays, at 7½ P. M., beginning Nov. 25.

V. *English History and Literature.* Twelve lectures by Prof Atkinson, on Mondays and Fridays, at 7½ P. M., beginning Jan. 2.

VI. *Shades and Shadows and the Perspective of Shadows.* Six lectures and six lessons for practising draughtsmen, by Prof. Ware, on Mondays and Wednesdays, at 7½ P. M., beginning Jan. 5.

VII. *Logarithms and Trigonometry.* Twelve lectures by Prof. Osborne, on Mondays and Thursdays, at 7½ P. M., beginning Feb. 2.

VIII. *Kinematics of Machines.* Twelve lectures by Prof. Whitaker, on Wednesdays, at 7½ P. M., beginning Feb. 4.

LOWELL SCHOOL OF PRACTICAL DESIGN.

The Trustee of the Lowell Institute has made provision for a course of free instruction in Practical Design for Manufactures, open to a limited number of pupils of both sexes. Students are received at the beginning of the school year in September, 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, formerly Director of the Atelier Lebert in Paris, and for fourteen years designer at the Pacific Mills. Mr. Kastner is a nephew and pupil of M. Jean Baptiste Lebert, *Dessinateur*, of Mulhouse in Alsace.

This school is provided with pattern looms for illustrating the practical applications of designs for woven goods.

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 drawing instruments. Applicants may present themselves September 24th and 25th.

GRADUATES AND THEIR OCCUPATIONS.

The Roman numerals in the column marked "Course" denote the Course in which the Graduate received the Degree of S.B.

1868.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ELLERY C. APPLETON, Allentown, Pa.	III.	Civil Engineer. Lehigh Coal and Navigation Co.
WHITNEY CONANT, Louisville, Ky.	III.	Not heard from.
* FRANK R. FIRTH.	I.	Died June 9, 1872.
ELI FORBES, Clinton, Mass,	IX.	Chemist at the Lancaster Mills.
CHARLES C. GILMAN, Marshalltown, Marshall Co., Iowa.	III.	Chief Engineer Central Iowa Railroad.
CHARLES E. GREENE, Ann Arbor, Mich.	I.	Prof. of Civil Engineering, University of Michigan.
ALBERT F. HALL, Boston, Mass.	II.	Draughtsman in the employ of the Geo. F. Blake Manuf. Co.
WILLIAM E. HOYT, 9 Burroughs Pl., Boston, Mass.	I.	Agent of the Chester Manufacturing Co. of Philadelphia, Penn.
ROBERT H. RICHARDS, Boston, Mass.	III.	Professor of Mining Engineering, Mass. Institute of Technology.
WALTER H. SEARS, 7 Exchange Pl., Boston, Mass.	I.	Civil and Hydraulic Engineer.
CHARLES A. SMITH, St. Louis, Mo.	I.	Prof. of Civil and Mechanical Engineering at Washington University.
JOSEPH STONE, Manchester, N. H.	I.	Agent of the Manchester Mills.
BRYANT P. TILDEN, West Sullivan, Me.	III.	Superintendent of the Sullivan Silver Mining Co.
JAMES P. TOLMAN, 66 Chauncy St., Boston. Mass.	III.	Superintendent, Silver Lake Co.

1869.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM H. BAKER, Fitchburg, Mass.	I.	Civil Engineer.
HOWARD A. CARSON, Boston, Mass.	I.	Consulting and Constructing Engineer for Sewers.
J. RAYNER EDMANDS, 46 Federal St., Boston, Mass.	II.	Employed at the Observatory of Harvard University.
WM. RIPLEY NICHOLS, Boston, Mass.	V.	Professor of General Chemistry Mass. Institute of Technology.
CHANNING WHITAKER, Boston, Mass.	II.	Professor of Mechanical Engineering, Mass. Institute of Technology.

1870.

* EDWARD K. CLARK.	II.	Died Sept. 10, 1878.
CHARLES R. CROSS, Boston, Mass.	IX.	Professor of Physics, Mass. Institute of Technology.
RUSSELL H. CURTIS, Rock Island, Ill.	I.	Lawyer.
CHARLES W. HINMAN, 32 Hawley St., Boston, Mass.	III.	State Inspector of Gas.
SAMPSON D. MASON, St. Paul, Minn.	I.	Treasurer and Chief Engineer, Detroit, Eel River, and Illinois R. R.
N. FREDERICK MERRILL, Salem, Mass.	V.	Chemist.
THEODORE F. TILLINGHAST, New Bedford, Mass.	I.	President of the Wamsutta Needle Co.
EDMUND K. TURNER, Boston, Mass.	I.	Assistant Superintendent and Chief Engineer, Fitchburg Railroad.
DANIEL W. WILLARD, 39 E. 18th St. N. Y. City.	II.	Architect.
LAWRENCE F. J. WRINKLE, Virginia City, Nevada.	III.	Mining Engineer.

1871.

FOSTER E. L. BEAL, Ames Agr. Coll., Iowa.	I.	Prof. of Civil Engin'g and Act'g Prof. of Zoology & Comp'tive Anatomy.
ADDISON CONNOR, South Framingham, Mass.	I.	Civil Engineer on Boston Water Works.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
* Henry M. Cutler.	I.	Died May 16, 1877.
Elmer Faunce, 4 Pemberton Sq., Boston, Mass.	III.	Chemist.
Edw. H. Foote, 10 No. Market St., Boston, Mass.	I.	In Business.
Frank L. Fuller, 7 Exchange Pl., Boston, Mass.	I.	Civil Engineer.
Henry M. Howe, Capelton, P. Q.	III.	Mining Engineer of Orford Nickel and Copper Co.
Albert H. Howland, 12 West St., Boston, Mass.	I.	Civil Engineer.
G. Russell Lincoln, Steelton, Dauphin Co., Pa.	III.	Chemist at the Pennsylvania Steel Works.
William A. Pike, Orono, Maine.	I.	Professor of Engineering — Maine StateCollege.
George H. Pratt, So. Boston, Mass.	V.	Chemist at the Bayside Alkali Works.
Edward W. Rollins, Denver, Col.	III.	Mining Engineer.
Walter W. Smith, Dayton, Ohio.	II.	Builder of Steam Pumps and Hydraulic Machinery (Smith, Vaile & Co.)
Chas. F. Stone, Waltham, Mass.	III.	Lawyer.
* Almarin Trowbridge, Jr.	II.	Died Dec. 5, 1878.
Isaiah S. P. Weeks, Walla Walla, Washington Ter.	I.	Civil Engineer on Northern Pacific R. R.
Randall Whittier, 150 Chandler St., Boston, Mass.	V.	In Business.

1872.

C. Frank Allen, Santa Fé, New Mexico.	I.	In charge of Engineer's office, New Mexico and So. Pacific R. R.
B. E. Brewster, Cheyenne, Wyoming Ter.	III.	Sheep raising.
William B. Dodge, Beverly, Mass.	I.	Private Tutor.
Frederic A. Emmerton, Joliet, Ill.	V.	Chemist at the Joliet Iron and Steel Co.'s Works.
James A. Herrick, Pittsburgh, Pa.	V.	Resident Engineer with Park Bros. & Co., Black Diamond Steel Works.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JAMES M. HODGE, Plymouth, Mass.	III.	Agent of Baker White Brass Co.
BRADFORD H. LOCKE, Central City, Colo.	III.	Mining Engineer.
CHARLES S. MINOT, 39 Court St., Boston, Mass.	V.	Engaged in physiological and histological research.
WALTER SHEPARD, Dorchester, Mass.	I.	Assistant Engineer Boston and Albany R. R.
RICHARD H. SOULE, Baltimore, Md.	II.	Sup't of the Motive Power, North Central Railway, B. & P. R.R.
CLARENCE S. WARD, 62 Sears' Building, Boston, Mass.	III.	Lawyer.

1873.

AMORY AUSTIN, 40 Kilby St., Boston, Mass.	V.	Not heard from.
GEORGE W. BLODGETT, 52 Kilby St., Boston.	I.	Manufacturing Electrician.
WILLIAM E. BROTHERTON, Cincinnati, Ohio.	V.	Collection Clerk of the National Lafayette and Bank of Commerce.
* SAMUEL A. FABENS, JR.	I.	Died March 14, 1875.
SAMUEL M. FELTON, JR., Pittsburg, Pa.	I.	General Superintendent of Pittsburg, Cincinnati and St. Louis R. R.
FREDERICK L. FISHER, Boston, Mass.	I.	Insurance Agent and Broker, 35 Kilby St., Boston; and Medway, Mass.
FREDERICK GUILD, JR., 8 Exchange Place, Boston, Mass.	I.	Foreign Shipping and Commission Merchant.
WILLIAM D. HARRIS, Lucerne, P. Q., Canada.	I.	Proprietor and Superintendent of the Sigma (phosphate) Mine.
CLARENCE L. HOWES, Hanover, Mass.	I.	Physician.
WILLIAM P. JEWETT, Dorchester, Mass.	I.	Civil Engineer, Savin Hill Ave., Dorchester.
WILLIAM A. KIMBALL, 75 Franklin St., New York City.	II.	In Business.
* WILLIAM C. MAY.	V.	Died March 11, 1878.
FRANK B. MORSE, Angel's Camp, Cal.	I.	Assayer, Robinson's Ferry, Anegl's Camp, Calavaras County, Cal.
HENRY A. PHILLIPS, Kendallville, Ind.	IV.	Employed on Lake Shore and Mich. Southern R. R.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
GEORGE PHILLIPPS, Marshfield, Mass.	III.	Superintendent of an Antimony Mine.
HENRY L. RIPLEY, Boston, Mass.	II.	2d Lieut. U. S. Army, 24th Infantry.
ROBERT A. SHAILER, Wilmington, Del.	I.	Assistant Engineer Edge Moor Iron Co.
C. EDWARD STAFFORD, Steelton, Dauphin Co., Pa.	III.	Sup't. Open hearth furnace, Steel Works.
ELLEN H. S. RICHARDS, Boston, Mass.	V.	Inst'r in Chemistry in the Woman's Laboratory of the Mass. Inst. of Tech
SAMUEL E. TINKHAM, Boston, Mass.	I.	Assistant in City Engineer's Department.
FRANK W. VERY, Allegheny, Pa.	V.	Assistant Astronomer Allegheny Observatory.
WEBSTER WELLS, Boston, Mass.	I.	Instructor in Mathematics in the Mass. Institute of Technology.
RANDALL WHITTIER,	I.	(See record of class of 1871.)
FRANCIS H. WILLIAMS, 15 Arlington St., Boston, Mass.	V.	Physician.
LOUIS F. WOOD, 56 Broad St., Boston, Mass.	V.	Chemical and Color Manufacturer.

1874.

HERBERT BARROWS, Reading, Mass.	I.	Not heard from.
GEORGE H. BARRUS, 553 Shawmut Ave., Boston, Mass.	II.	Expert in Steam Eng'ing and Ag't for Dixwell Pyrometer & Superheater.
WILLIAM T. BLUNT, 8 Pemberton Sq., Boston, Mass.	I.	Assistant Engineer U. S. Mississippi Commission.
GEORGE E. DOANE, Middleboro, Mass.	I.	Clerk.
WILLIAM B. DOWSE, 35 Bedford St., Boston, Mass.	IV.	Of the firm of Chauncy Rubber Co. Mfrs. of Rubber Clothing.
JOSEPH S. EMERSON, Honolulu, Hawaiian Islands.	I.	Civil Engineer.
ELIOT HOLBROOK, Providence, R. I.	I.	Civil Engineer, 283 Westminster St.
AECHIRAU HONGMA, Tokio, Japan.	I.	Civil Engineer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHARLES P. HOWARD, Hartford, Conn.	I.	With J. L. Howard & Co., dealers in Rail'y and Car Builders' Supplies.
FRANK H. JACKSON, Maple Hill, Kansas.	III.	Stock raising.
* WILLIS H. MYRICK.	II.	Died Oct. 17, 1875.
HERBERT B. PERKINS, Appleton, Wis.	I.	Prof. of Mathematics and Astronomy in Lawrence University.
FRANK H. POND, 214 North 8th St., St. Louis, Mo.	II.	Mechanical Engineer.
EDWARD S. SHAW, 10 Kirkland Pl., Cambridge, Mass.	I.	Civil Engineer employed in designing Bridges and Roofs.
FRANCIS H. SILSBEE, Victory Mills, Saratoga Co., N. Y.	II.	Superintendent of the Saratoga Victory Mills.
* ARTHUR W. SWEETSER.		Died Oct. 17, 1875.
ROBERT C. WARE, Erie, Whiteside Co., Ill.	X.	Stock raising.
STEPHEN H. WILDER, Cincinnati, Ohio.	IX.	Not heard from.

1875.

SAMUEL E. ALLEN, 28 Chauncy St., Boston, Mass.	I.	Engaged in the manufacture of silk goods.
JAMES L. ARNOTT, Thompsonville, Ct.	IX.	Not heard from.
AMOS J. BOYDEN, 28 School Street, Boston, Mass.	IV.	Architect.
MOSES D. BURNETT, Ocala, Marion Co., Fla.	III.	Of the firm Robinson, Burnett & Co., Milling business.
HENRY K. BURRISON, Boston, Mass.	I.	Instructor in Drawing in the Mass Institute of Technology.
CHRISTOPHER A. CHURCH, New Bedford, Mass.	I.	Not heard from.
FRANK S. DODGE, Makawao, Maui, Hawaiian Is.	I.	Assistant Engineer Hawaiian Engineer Corps.
EDGAR S. DORR, Mt. Auburn, Mass.	I.	Unemployed.
WILLIAM C. EDES, San Francisco, Cal.	I.	Employed on the Southern Pacific Railroad.
CHAS. W. GOODALE. Black Hawk, Col.	III.	Agent for Boston and Colorado Smelting Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
EDWARD A. W. HAMMATT, Newton Centre, Mass.	I.	Draughtsman for American Tool and Mach. Co., 84 Kingston St., Boston
EDW. A. HANDY, Cañon City, Col.	I.	Civil Engineer.
* JAMES H. HEAD.	II.	Died August 18, 1875.
THOMAS HIBBARD, West Roxbury, Mass.	II.	Mechanical Engineer, Atlantic Works, East Boston.
* WILLIAM F. HUNTINGTON.	I.	Died August 7, 1877.
LEONARD P. KINNICUTT, Cambridge, Mass.	V.	Private Assistant to Prof. Wolcott Gibbs of Harvard University.
JAMES A. KNAPP, Hanover, Mass.	II.	Of the firm of J. B. Knapp & Son, Manufacturers of Boots and Shoes.
WILFRED LEWIS, Philadelphia, Pa.	II.	Mechanical Engineer with Wm. Sellers & Co., Philadelphia, Pa.
SAMUEL J. MIXTER, Vienna, Austria.	VIII.	Physician.
BENJAMIN A. OXNARD, Brooklyn, N. Y.	III.	Superintendent of Fulton Sugar Refinery.
THOMAS D. PLIMPTON, Hyde Park, Mass.	II.	Employed in the manufacture of woolen goods.
WILLIAM A. PRENTISS, Holyoke, Mass.	IX.	Of the firm of Geo. W. Prentiss & Co., Manufacturers of Iron Wire.
FRANCIS T. SARGENT, New York, N. Y.	II.	Proprietor of the Sand blast process.
WELLAND F. SARGENT, 125 Dearborn St., Chicago.	I.	Assistant Engineer Chicago and Eastern Illinois R. R.
WILLIAM H. SHOCKLEY, New Bedford, Mass.	III.	Engaged in Mining in California.
JAMES B. STANWOOD, 317 West 4th St., Cincinnati, O.	II.	Head Draughtsman and Engineer with Lane & Bodley.
H. L. J. WARREN, Crescent City, Del Norte Co., Cal.	III.	Mining Engineer, Big Flat Gravel Mining Co.
WILLIAM R. WEBSTER, Philadelphia, Pa.	III.	Not heard from.

1876.

CHARLES F. ALLEN, Cincinnati, Ohio.	III.	Travelling.
THOMAS ASPINWALL, JR., Brookline, Mass.	I.	Civil Engineer — 7 Exchange Place, Boston

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM P. ATWOOD, Lowell, Mass.	V.	Chemist at the Hamilton Print Works.
THOMAS W. BALDWIN, Bangor, Maine.	I.	City Engineer and Superintendent of Sewers.
WALTER B. BARROWS, Uruguay, Argentine Republic.	VII.	Professor of Chemistry and Physics.
AARON D. BLODGETT, 52 Kilby St., Boston, Mass.	II.	Electrician.
JOSHUA B. F. BREED, 482 Fourth St., Louisville, Ky.	I.	Not heard from.
HARRY T. BUTTOLPH, Buffalo, N. Y.	I.	Civil Engineer.
WILLIAM O. CROSBY, Boston, Mass.	VII.	Assistant in Geology and Paleontology in Mass. Inst. of Technology.
FREDERICK K. COPELAND, Winchester, Mass.	I.	Unemployed on account of ill health.
WILLIS E. DAVIS, San Francisco, Cal.	IX.	Employed by Davis & Cowell, Manufacturers of Santa Cruz Lime.
*CLARENCE L. DENNETT.	II.	Died June 5, 1878.
CHARLES R. FLETCHER, Boston, Mass.	V.	Lecturer on Chemistry in Boston University and Mass. State Assayer.
JOHN R. FREEMAN, Lawrence, Mass.	I.	Assistant Engineer Essex Water Power Co.
FRANCIS E. GALLOUPE, Providence, R. I.	II.	R. I. Locomotive Works.
*ROBERT H. GOULD.	VI.	Died Nov. 19, 1878.
JOHN B. HENCK, JR Boston, Mass.	VIII.	Assistant in Physics in the Mass. Inst. of Technology.
FRANK W. HODGDON, Arlington, Mass.	I.	Assistant Engineer with the Harbor and Land Commissioners of Mass.
SUMNER HOLLINGSWORTH, So. Braintree, Mass.	II.	Superintendent of Paper Mills.
SILAS W. HOLMAN, Boston, Mass.	VIII.	Assistant in Physics in the Mass. Inst of Technology.
ALFRED E. HUNT, Nashua, N. H.	III.	Chemist and Supt. of the Steel Dept. o Nashua Iron & Steel Co.
WILLIAM W. JACQUES, Baltimore, Md.	VIII.	Consulting Engineer — Fellow by courtesy of the Johns Hopkins Univ.
SAMUEL JAMES, JR., Silver City, New Mexico.	III.	Assayer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ALFRED C. KILHAM, St, Louis, Mo.	II.	Employed in the repair shops of the Missouri P. R. R., St. Louis, Mo.
THEODORE J. LEWIS, Altoona, Pa.	II.	Assistant Chemist of Pennsylvania Railroad Company.
ALBERT H. LOW, Leadville, Col.	V.	Assayer.
CHARLES T. MAIN, Manchester, N. H.	II.	Draughtsman at the Manchester Mills.
ARTHUR L. MILLS, Everett, Mass.	I.	Civil Engineer.
WILLIAM E. NICKERSON, Somerville, Mass.	V.	Chemist.
D. W. PHIPPS, 31 Leverett St., Boston, Mass.	X.	Student in Boston University Law School.
CHARLES F. PRICHARD, Pontiac, Mich.	II.	Superintendent of the Pontiac Gas Works.
HENRY RAEDER, JR., Hyde Park, Mass.	I.	Civil Engineer.
CHARLES L. RICH, Stowe, Vt.	I.	Principal of the Stowe High School.
T. W. ROBINSON, Leadville, Colorado.	III.	Engaged in Smelting.
CHARLES A. SAWYER, 58 Ashland Block, Chicago, Ill.	IX.	Lawyer.
THEODORE E. SCHWARZ, Georgetown, Colo.	III.	Mining Engineer and Expert.
JULIUS H. SUSMANN, 42 Upton St., Boston, Mass.	III.	In Business.
WALTER D. TOWNSEND, Yokohama, Japan.	III.	With the American Clock and Brass Co.
CHARLES N. WAITE, Manchester, N. H.	V.	Chemist at the Manchester Mills.
HENRY M. WAITT, Mass. Inst. Technology, Boston.	I.	Assistant in Civil Engineering.
ROBERT C. WARE.	X.	(See record of class of 1874.)
HENRY B. WOOD, Woburn, Mass.	I.	In Business.

1877.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JOHN ALDEN, Pacific Mills, Lawrence, Mass.	V.	Chemist at the Pacific Mills.
GEORGE BARTOL, Cleveland, Ohio.	III.	Chemist at the Otis Iron and Steel Works.
CHARLES S. BATCHELDER, Napa City, Cal.	V.	Bookkeeper in the Pacific Bank.
J. WILLIAMS BEAL, South Scituate, Mass.	IV.	Architectural Draughtsman.
WILLIAM H. BEECHING, Boston, Mass.	II.	Assistant in Mechanical Engineering in the Mass. Inst. of Technology.
HENRY H. CARTER, 55 St. James St., Roxbury, Mass.	I.	Assistant Engineer; Improved Sewerage of Boston.
GEORGE W. CAPEN, Canton, Mass.	IV.	Architectural Draughtsman, with J. P. Rinn, Architect, Boston.
WILLIAM E. CHAMBERLIN, Paris, France.	IV.	Student in the Ecole des Beaux-Arts, Paris.
* GEORGE R. CHAPMAN.	II.	Died Jan. 21, 1879.
LINUS FAUNCE, Steubenville, Ohio.	II.	With the P. C. and St. L. Railway Co.
CHARLES H. FISHER, Stoughton, Mass.	II.	Of the firm of Beals & Fisher, Manufacturers of woolen knit goods.
WILLIAM C. FLINT, 53 Lafayette St., Salem, Mass.	III.	In Business.
PIERCE P. FURBER, Minneapolis, Minn.	IV.	Architectural Draughtsman with Haglin & Corser, Architects.
MARTIN GAY, West New Brigh'n, Staten Isl., N.Y.	I.	Leveller in Department of Public Works of New York City.
JOSEPH P. GRAY, Lowell, Mass.	I.	Not heard from.
EDMUND GROVER, N. Boston, N. H.	I.	Not heard from.
RICHARD A. HALE, Lawrence, Mass.	I	Assistant Engineer with the Essex Water Power Co.
JOHN E. HARDMAN, Leadville, Col.	III.	Engaged in Smelting.
HENRY D. HIBBARD, Nashua, N. H.	III.	Chemist with the Nashua Iron and Steel Co.
WALTER JENNEY, 525 Broadway, So. Boston, Mass.	III.	Chemist at Stephen Jenney & Co.'s Coal Oil Works.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JOSEPH KIRK, Manchester, N. H.	II.	Draughtsman with the Amoskeag Manufacturing Co.
GEORGE W. KITTREDGE, North Andover, Mass.	I.	Surveyor.
CHARLES F. LAWTON, Tucson, Arizona.	I.	Transitman on the Atchison, Topeka and Santa Fé R. R.
BENJAMIN C. MUDGE, Wash. Mills, Lawrence, Mass.	I.	Mechanical Engineer at the Washington Mills.
CECIL R. PEABODY, Sapporo, Japan.	II.	Prof. of Engineering in the Agricultural College at Sapporo, Japan.
ARTHUR L. PLIMPTON, 7 Hawthorne St., Roxbury, Mass.	I.	Assistant Engineer on Improved Sewerage of Boston.
HARRY C. SOUTHWORTH, Hancock, Houghton Co., Mich.	III.	Mining Engineer.
* CHARLES E. STEWART.	I.	Died October 7, 1877.
THOMAS F. STIMPSON, Providence, R. I.	III.	Chemist with the Silver Spring Bleaching and Dyeing Co.
GEORGE F. SWAIN, 73 Königgrätzer Strasse, Berlin, Prussia.	I.	Student of Engineering.
FRANK E. WIGGIN, Cordoba, Argentine Republic, S. A.	I.	Assistant Observer at the National Observatory.
FREDERICK W. WOOD, Steelton, Dauphin Co., Pa.	III.	Assist. Superintendent Open-hearth furnace Pennsylvania Steel Co.

1878.

WILLIAM B. ALLBRIGHT, Chicago, Ill.	V.	Chemist with of N. K. Fairbank, 18th and Blackwell Sts., Chicago.
CHARLES M. BAKER, 117 Commonw'th Ave., Boston, Mass.	IV.	With Baker & Morrill, 40 Equitable Building, Boston.
TAKUMA DAN, Osaka, Japan.	III.	Professor of Chemistry, Osaka University.
CHARLES S. EATON, 115 Central St., Lowell, Mass.	IV.	Architect.
ALFRED S. HIGGINS, 173 Warren Ave., Boston, Mass.	IV.	Architectural Draughtsman, with Peabody & Stearns, 60 Devonshire St.
JULIAN A. KEBLER, Burlington, Iowa.	I.	On the Engineer corps of the Chicago, Burlington and Quincy R. R.
FRANK H. MORGAN, Springfield, Mass.	V.	Chemist with Newell Bros. Manufacturing Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
EVERELL J. NICHOLS, Madison, Wis.	I.	Instructor in Civil Engineering, Wisconsin University.
FREDERICK H. PRENTISS, 16 Bulfinch St., Boston.	II.	Proprietor of the Gravatype process for reproduction of engravings,etc.
JAMES RITCHIE, Zanesville, Ohio.	I.	Employed by H. F. Walling, Surveyor, in making Maps.
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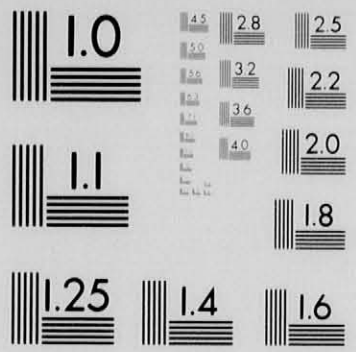
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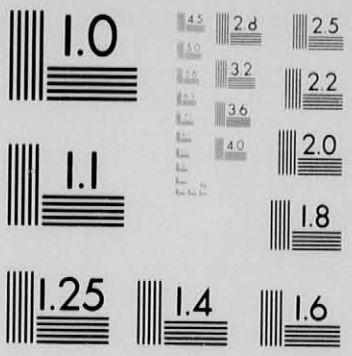
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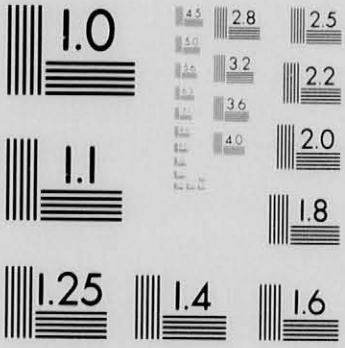
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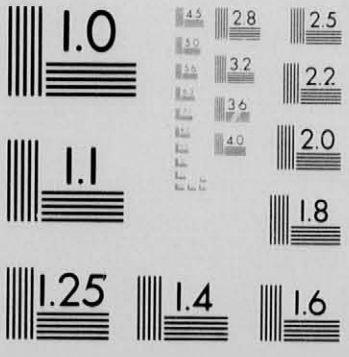
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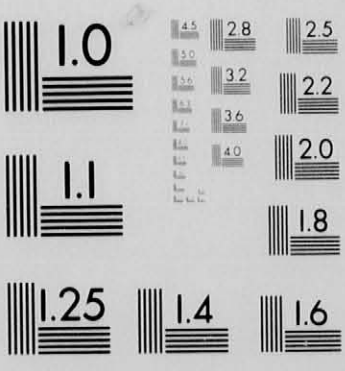
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