MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

FOURTEENTH

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION.

1878-1879.

BOSTON:
PRESS OF A. A. KINGMAN.
1878.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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1878.

CALENDAR.

School-year began	Monday, Sept. 30, 1878.
Second term begins	Tuesday, Feb. 4, 1879.
School-year ends	Saturday, May 31, 1879.
First Entrance Examinations . .	Monday, June 2, 1879, and Tuesday, June 3, 1879.
Second Entrance Examinations . .	Wednesday, Sept. 24, 1879, and Thursday, Sept. 25, 1879.
Examinations for Advanced Standing .	Friday, Sept. 26, 1879.
The next School-year will begin . . .	Monday, Sept. 29, 1879.

CONTENTS.

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

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

Chapter 183, *Acts and Resolves of* 1861.

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

Chapter 186, *Acts and Resolves of* 1863.

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

Chapter 247, *Acts and Resolves of* 1868.

CORPORATION

OF THE

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,

FOR THE YEAR 1878-9.

President,

WILLIAM B. ROGERS.

Treasurer,

JOHN CUMMINGS.

Committee on the School of Industrial Science,

JOHN AMORY LOWELL,
EDWARD ATKINSON,
THOMAS T. BOUVÉ,
HOWARD A. CARSON,
GEORGE B. EMERSON,
CHARLES L. FLINT,
CHARLES J. PAINE,
EDWARD S. PHILBRICK,
JOHN D. PHILBRICK,
WILLIAM B. ROGERS,

Treasurer, *ex-officio.*

Committee on Finance,

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

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.

Committee on the Society of Arts,

JOHN D. RUNKLE,
MARSHALL P. WILDER,
PHILLIPS BROOKS,
JAMES B. FRANCIS,
J. C. HOADLEY,
FRED. W. LINCOLN,
SAMUEL K. LOTHROP,
ALEXANDER H. RICE,
HENRY B. ROGERS.

On the Part of the Commonwealth,

HIS EXCELLENCY, GOVERNOR THOMAS TALBOT.

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

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

LEWIS W. 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.

SAMUEL KNEELAND, A.M., M.D.,
Professor of Physiology (till Jan. 1st).

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.

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

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

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

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

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.

LIEUT. ROBERT G. CARTER, U.S.A.,
Instructor in Military Tactics.

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.

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.

EDWARD A. HAMMATT, S.B.,
Assistant in Civil Engineering.

W. BUGBEE SMITH, A.B.,
Assistant in Mechanical Engineering.

CHARLES T. MAIN, S.B.,
Assistant in Mechanical Engineering.

ELMER FAUNCE, S.B.,
Assistant in the Mining and Metallurgical Laboratories.

ALBERT H. LOWE, S.B.,
Assistant in Quantitative Analysis.

FRANK H. MORGAN, S.B.,
Assistant in Quantitative Analysis.

THOMAS F. STIMPSON, S.B.,
Assistant in General Chemistry and Qualitative Analysis.

GEORGE F. UNDERWOOD,
Assistant in Architecture.

The instruction in Descriptive Geometry and Stereotomy is given by Prof. OSBORNE; that in Botany and Biology by Prof. ORDWAY; that in Mineralogy and Assaying by Prof. RICHARDS, and that in Descriptive Astronomy by Prof. CROSS.

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.
GEORGE H. HOWISON, A.M., *Secretary.*
WM. RIPLEY NICHOLS, S.B.
CHARLES P. OTIS, 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.
Allbright, William B., *S.B.*	Dorchester . . .	Boston St.
Blodgett, Aaron D., *S.B.* .	W. Newton . . .	1209 Washington St.
Cram, Arthur B., *B. S.* (*Penn. State College*). . .	Detroit, Mich. . .	611 Tremont St.
Cushing, Florence M., *A.B.* (*Vassar College*)	Boston	8 Walnut St.
Fisher, Charles H., *S. B.* .	Canton	113 Appleton St.
Glover, Marie O., *A. B.* (*Vassar College*). . . .	Brooklyn, N. Y. . .	Jamaica Plain.
Morse, Charles L., *S.B.* (*Illinoi sCollege*). . . .	Jacksonville, Ill. . .	102 Boylston St.
Schwamb, Peter, *S.B.* . .	Arlington	Arlington.
Scovel, Minor, *Ph.B.* (*Western Univer. Penn.*).	Pittsburgh, Pa. . .	375 Columbus Ave.
Smith, T. L., *B.S.* (*Iowa Agr. Coll.*) . . .	Watertown, Wis. .	337 Tremont St.
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.
Allen, Walter S.	V.	New Bedford	94 Chestnut St.
Braley, Samuel T.	II.	Brockton	Brockton.
Cabot, John W.	III.	Boston	10 Pembroke St.
Campbell, Harry H.	III.	W. Roxbury	W. Roxbury.
Coffin, Frederic S.	III.	Auburndale.	Auburndale.
Dunbar, W. Otis	II.	Canton	Canton.
Fabens, George W.	I.	Marblehead	Marblehead.
Gooding, Charles S.	II.	Brookline	Brookline.
Hartwell, Ernest G.	IV.	Waltham.	Waltham.
Hosea, Raphael M.	I.	Cincinnati, O.	117 Dartmouth St.
Howe, Horace J.	I.	Roxbury	37 Dale St.
Knapp, Frederick B.	I.	Plymouth	7 Walnut St.
Lane, Frederic H.	II.	Boston	623 Tremont St.
Loring, Frederic R.	VII.	Boston	8 Greenwich Park.
Macfarlane, William W.	V.	Montvale	Montvale.
Metcalf, Arthur H.	II.	Pawtucket, R. I.	317 Marlboro' St.
Miller, Edwin C.	II.	Boston	480 Columbus Av.
Owen, Edward H., Jr.	II.	Waltham	Waltham.
Pickering, William H.	VIII.	Boston	84 Mt. Vernon St.
Riggs, George F.	I.	Roxbury	37 Dale St.
Stantial, Frank G.	V.	Melrose	Melrose.
Stearns, William S.	I.	Cincinnati, O.	482 Columbus Av.
Waitt, Arthur M.	II.	Boston	22 Bedford St.

THIRD YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Almy, William F.	V.	Fall River	355 Columbus Av.
Barton, George H.	III.	N. Sudbury.	Chelsea.
Blake, George	II.	Belmont	96 Appleton St.
Brown, Charles H.	I.	Boston	341 Shawmut Av.
Chase, Edwin E.	I.	Lowell	Lowell.
Clark, Fred. W.	III.	Chicago, Ill.	44 Cortes St.
Hamilton, George W.	I.	Boston	15 Dover St.
Millen, Loring R.	III.	Savannah, Ga.	Brookline.

STUDENTS.

NAME.	COURSE.	HOME.	RESIDENCE.
Miller, William T.	IX.	Boston	480 Columbus Av.
Potter, Edward C.	III.	Chicago, Ill.	119 Pembroke St.
Ross, John H.	IX.	Jamaica Plain	Jamaica Plain.
Scovel, Minor, *Ph.B.* (*Western Univ., Pa.*)	I.	Pittsburgh, Pa.	375 Columbus Av.
Small, N. Cogswell	V.	Boston	73 Montgomery St.

SECOND YEAR

NAME.	COURSE.	HOME.	RESIDENCE.
Abbott, Ira	I.	Andover	Andover.
Atkinson, James S.	II.	Brookline	Brookline.
Bissell, David S.	III.	Pittsburgh, Pa.	33 St. James Av.
Brown, Edmund H.	II.	Fisherville, N. H.	W. Roxbury.
Came, Frank E.	I.	Malden	Malden.
Chase, Frank D.	III.	Dedham	Dedham.
Collins, Benjamin G.	II.	Edgartown	76 Waltham St.
Cutler, Harry H.	IV.	Boston	19 West Cedar St.
Darlington, Graef	I.	Pittsburgh, Pa.	5 St. James Av.
Duff, John, Jr.	V.	Charlestown	14 Sheafe St.
Foss, Harry A.	II.	Jamaica Plain	Jamaica Plain.
Goddard, David S.	III.	Lowell	Lowell.
Johnson, James W.	II.	Boston	78 E. Chester Park.
Koehler, Walter J.	V.	Boston	Beech Glen Av.
Lewis, Edwin J., Jr.	IV.	Boston	Adams St.
Lund, James	V.	Charlestown	548 Main St.
Mansfield, Frank	I.	Melrose Highlands.	Melrose Highlands.
Mower, George A.	II.	W. Newton	W. Newton.
Noble, Frank C.	I.	Boston	106 Lexington St.
Norris, Webster	III.	Charlestown	43 Soley St.
Parker, Theodore	I.	Quincy	Quincy.
Rindge, Samuel	II	E. Cambridge	E. Cambridge.
Rollins, Frank W.	IX.	Concord, N. H.	355 Columbus Av.
Saville, George G.	I.	Quincy	Quincy.
Shed, Nathaniel W.	V.	Boston	27 Fountain St.
Snead, William R.	IV.	Louisville, Ky.	166 W. Newton St.
Stearns, Harold E.	II.	Cincinnati, O.	33 St. James Av.
Warren, Edward R.	VII.	Waltham	Waltham.

NAME.	COURSE.	HOME.	RESIDENCE.
Wilkes, Charles M.	IV.	S. Manchester, Conn.	166 W. Newton St.
Winslow, Arthur	III.	Boston	104 Chestnut St.
Young, Herbert A.	I.	Revere	Revere.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Adams, Edward R.	Honolulu, Hawaiian Is.	Reading.
Ayer, Winslow B.	Bangor, Me.	15 Joy St.
Brackett, Albert C.	Newton	Newton.
Carson, Thomas B.	Iowa City, Ia.	21 Dover St.
Cheney, Frank, Jr.	S. Manchester, Conn.	Jamaica Plain.
Darrow, Alfred L.	Hartford, Conn.	42 Sharon St.
French, Charles A.	Boston	334 Marlboro' St.
Frost, Howard V.	Belmont	Belmont.
Gerry, Lyman L.	Stoneham	Stoneham.
Guild, C. Humphreys	Providence, R. I.	570 Columbus Av.
Hall, Francis P.	Dorchester	9 St. Charles St.
Hersey, Walter H.	Haverhill	Haverhill.
Jackson, Alfred B.	Chelsea	Chelsea.
Jenkins, Charles D.	Boston	66 G St.
Lewis, Lloyd G.	Lynn	Lynn.
Low, John F.	Chelsea	Chelsea.
Lynch, Clarence C.	Dorchester	Dorchester.
Manning, Harry G.	Lynn	Lynn.
Mansfield, G. W.	Melrose Highlands.	Melrose Highlands.
Morrison, Frank C.	Boston	29 Common St.
Munn, Samuel M.	Louisville, Ky.	166 W. Newton St.
Munroe, James P.	Lexington	Lexington.
Noa, Frederic M.	Boston	69 Bickford St.
Rhodes, Martin R.	Trempeleau, Wis.	14 Ashland Place.
Ripley, William T.	Rutland, Vt.	510 Columbus Av.
Ross, Henry F.	Jamaica Plain	Jamaica Plain.
Snelling, Grenville T.	New York, N. Y.	Boston Highlands.
Snow, Henry E.	Boston	287 Columbus Av.
Snow, Walter B.	Watertown	Watertown.
Thompson, Edgar B.	Woburn	Woburn.
Walker, Arthur W.	Malden	Malden.
Walker, Joseph H.	Cambridge	Cambridge.
Wardwell, Charles J. A.	Lake Village, N. H.	72 W. Cedar St.
Warren, George E.	Exeter, N. H.	Exeter.
Wentworth, Charles D.	Danvers	Danvers.
Wesson, David	Brookline	Brookline.

SPECIAL STUDENTS.

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

Mathematics, *Math.*; Drawing, *Dr.*; English, *E.*; French, *Fr.*; German, *Ger.*; Italian, *It.*; Spanish, *Sp.*; Logic, *Log.*; Philosophy of Science, *P.S.*; Physics, *Phys.*; Descriptive Astronomy, *D.A.*; Descriptive Geometry, *D.G.*; Stereotomy, *St.*; Perspective, *Per.*; Botany, *Bot.*; Biology, *Bi.*; Mineralogy, *Miner.*; Metallurgy, *Met.*; Geology, *Geol.*; Zoology, *Z.*; Mechanics, *Mech.*; Civil Egineering, *C.E.*; Mechanical Engineering, *M.E.*; Mining Engineering, *Min.*; Architecture, *Arch.*; Chemistry, *C.*; Shopwork, *S.W.*; Building Materials, *B. M.*; Military Drill, *Mil.*

NAME.	HOME.	RESIDENCE.
Aiken, Wm. M. . . . . *Arch., It.*	Charleston, S. C. . .	4 Spruce St.
Alden, Frank E. . . . . *Fr., P.S., Phys., Arch., B.M.*	W. Roxbury . . .	W. Roxbury.
Allbright, William B., *S.B.* *C.*	Dorchester	Boston St.
Allen, John H. . . . . *Math., Ger., Phys., D.A., Miner., C.*	Walpole	Walpole.
Ames, Clara P. . . . . *Phys., Geol., Bi., C.*	Boston	32 Upton St.
Ames, Frank A. . . . . *Math., Ger., D.A., D.G., St., C., C.E.*	Canton	Canton.
Anderson, N. M. . . . *Math., Phys., D.A., D.G., C., S.W.*	Columbus, O. . . .	33 St. James Av.
Armes, Jennie M. . . . *Geol., Pal., C.*	Greenfield	E. Cambridge.
Atkinson, Anna C. . . . *C.*	Brookline	Brookline.
Batchelder, J. Fred. . . *Ger., Phys., Met., Geol., Mech., Min., C., B.M.,*	Tokio, Japan . . .	90 Myrtle St.
Blair, Howard K. . . . . *Math., Dr., Fr., C., Mil.*	Boston	31 Upton St.
Bogarte, M. E. . . . . *C.E.*	Valparaiso, Ind. . .	23 Pinckney St.
Brandt, Oscar E. . . . . *Arch.*	Cincinnati, O. . . .	148 Warren Av.
Briggs, Frank H. . . . . *E., Ger., Bot., Miner., Geol., C.*	Boston	124 Marlboro' St.
Brunner, Arnold W. . . *Arch., Fr.*	New York, N. Y. . .	60 W. Newton St.
Burns, Silas R. . . . . *Arch.*	Troy, O.	611 Tremont St.
Case, Mabel B. . . . . *C.*	Boston	120 Commonw'lth Av.
Chapman, George F. . . *Math., Dr., D.G., M.E., C., S.W.*	Canton	Canton.
Chapman, James E. . . . *Math., Dr., E., Log., C., Mil.*	Canton	Canton.

NAME.	HOME.	RESIDENCE.
Cheney, Margaret S. . . *C., Bi., Bot.*	Jamaica Plain . . .	Jamaica Plain.
Cheong, Mon Cham . . . *Math., Dr., E., M.E., S.W.*	Hong-Kong, China .	9 Boylston Pl.
Cochran, Frederic B. . . *Math., Dr., C., Mil.*	Boston	16 James St.
Copeland, Ella F. . . . . *C.*	Cambridge	Cambridge.
Cram, Arthur B. (*B.S., Penn. State Coll.*) . . . . . *Arch.*	Detroit, Mich. . . .	611 Tremont St.
Crowell, Samuel . . . . *E., Ger., Log., Z., Arch.*	Dennis	30 Upton St.
Curtis, Walter . . . . *Fr., Ger.*	Boston	12 St. James Av.
Cushing, Florence M., *A. B.* (*Vassar College*) . . . . *C.*	Boston	8 Walnut St.
Deering, James E. . . . *Math., Dr., C., Mil.*	Evanston, Ill. . . .	482 Columbus Av.
Duker, Herman H. . . . *Arch.*	Baltimore, Md. . . .	277 Columbus Av.
Emery, Francis F., Jr., . *E., Phys., D.A., Arch., M.E., C., S.W., Mil.*	Boston	17 Union Park.
Fisher, Charles H., *S.B.* . *Met., Miner., C.E., C.*	Canton	113 Appleton St.
Fisher, William B. . . . *C., Met., Geol., Min.*	Brookline	Brookline.
Foote, Orlando K. . . . *Arch.*	Morrisville, N. Y. . .	46 Chandler St.
Gardiner, Edward G. . . *E., Ger., Phys., D.A., Bot., Miner., Geol., C.*	Boston	289 Marlboro' St.
Gilbert, Cass . . . . . *Arch.*	St. Paul, Minn. . .	157 W. Brookline St.
Glover, Marie O., *A. B.* (*Vassar College*) . . . *Phys., Miner., C.*	Brooklyn, N. Y. . .	Jamaica Plain.
Gooding, Fred. M. . . . *Math., Dr., Fr., D.G., M.E., C., S.W.*	Waltham	Waltham.
Goodwin, William B. . . *E., Ger.*	Lowell	Lowell.
Hammett, William A. . . *Math., Dr., E., M.E., S.W.*	Somerville	Somerville.
Harriman, Charles A. . . *Arch.*	Boston	4 Davis St.
Hooker, Edward D. . . . *Dr., E., Ger., Geol., C., Mil.*	Cambridge	Cambridge.
Hunt, William P. . . . . *Miner.*	Boston	Savin Hill.

NAME.	HOME.	RESIDENCE.
Iasigi, Albert W.	Boston	43 Mt. Vernon St.
E., Phys., Bi., Geol., Mech., S.W.		
Johonnot, J. Oliver . . .	Newton	Newton.
Ger., Met., C.		
Johnson, Charles B. . . .	Concord	Concord.
Math., Dr., Fr., D.G., Per., M.E., C.		
Johnston, Clarence H. . .	St. Paul, Minn. . .	157 W. Brookline St.
Arch.		
Joslin, Belle H.	Keene, N. H. . . .	34 Newbury St.
C.		
Little, David M.	Boston	2 Commonw'lth Av.
Math., E., Geol., C.		
Lodge, Richard W. . . .	Boston	1423 Washington St.
Bi., C. and regular studies of fourth year, Course VI.		
Marble, Albion M. . . .	Fall River	169 W. Newton St.
Arch., Fr.		
McCombs, Frank M. . . .	St. Louis, Mo. . .	29 Greenwich Park.
Arch.		
Miller, George S.	Boston.	381 Dorchester St.
C.		
Minns, S.	Boston	14 Louisburg Square.
C.		
Morse, Charles L., (*S. B., Illinois Coll.*)	Jacksonville, Ill. . .	102 Boylston St.
C.E.		
Newell, Jeanie H.	Cambridge	Cambridge.
C.		
Norris, Wilfred A. . . .	Chelsea	Chelsea.
Arch., Ger.		
O'Grady, Thomas, Jr. . .	Boston	82 Conant St.
Arch.		
Palmer, Alice W.	Boston	Bellevue St.
Math., Phys., Bi., C.		
Paxton, Blitz W.	San Francisco, Cal. .	33 St. James Av.
Ger., Met., Geol., Min., C.		
Peabody, Lucia M. . . .	Boston Highlands .	St. James St.
C.		
Pike, Clara M.	Norton	Norton.
C.		
Prouty, Ira J.	Keene, N. H. . . .	71 Charles St.
C.		
Reed, Charles A.	Avon, N. Y. . . .	46 Chandler St.
Arch.		
Rosing, William H. V. . .	Hyde Park, Ill. . . .	355 Columbus Av.
Math., Dr., Per., M.E., C., S.W., Mil.		
Sampson, Percival H. . .	Boston.	76 Marlboro' St.
Math., E., Fr., Ger., C.		

NAME.	HOME.	RESIDENCE.
Sargent, Sullivan A. . . . *Arch.*	Boston	7 W. Cedar St.
Schwamb, Peter, *S.B.* . . *Met., Miner., C.*	Arlington	Arlington.
Seabury, B. Hammett . . *Arch.*	Newport, R. I. . .	22 Chester Park.
Smith, T. L., *B.S.* (*Iowa Agr. Coll.*) . . . *Arch., M.E.*	Watertown, Wis. . .	337 Tremont St.
Stebbins, Alfred, Jr. . . *Math., E., C.*	Forest Hills	Forest Hills.
Stevens, Alice Atkinson . *C., Bot.*	Boston	105 Munroe St.
Strickland, Frank V. . . *Math., Dr., Fr., C., Mil.*	Bangor, Me.	15 Joy St.
Taylor, James K. . . . . *Arch.*	St. Paul, Minn. . .	536 Broadway.
Tedford, Lalia C. . . . *Miner., Geol., C.*	Boston	106 Bremen St.
Tryon, Thomas . . . . *Arch., Math., E.*	Hartford, Conn. . .	241 Boylston St.
Tyler, Artemas L. . . . *E., Fr., C., Mil.*	Lowell	11 Gray St.
Walker, Hattie A. . . . *Z., Geol., C.*	Jamaica Plain . . .	Jamaica Plain.
Wallace, George R. . . . *Math., Dr., D.A., D.G., St., C.E., C.*	Fitchburg	24 Somerset St.
Walton, Evelyn M. . . . *Math., Fr., Phys., Bi., Geol., C.*	Saugus Centre. . .	Saugus.
Warren, Herbert . . . . *Arch., Fr., It.*	Hillside	Roxbury.
White, Laura R. . . . . *Arch.*	Manchester, Ky. . .	Mt. Pleasant.
Willard, John W. . . . *Miner.*	Boston.	57 Tremont St.
Wood, John P. . . . . *Math., Dr., E., C., Mil.*	Philadelphia, Pa. . .	25 Highland Av.
Woodbridge, Sam'l H. (*A.M. Williams Coll.*) . . . . *Phys.*	Williamstown . . .	70 West Cedar St.
Zimmermann, William . . *Arch.*	Thiensville, Wis. .	32 Cortes St.

STUDENTS IN THE SCHOOL OF MECHANIC ARTS.

SECOND YEAR.

NAME.	HOME.	RESIDENCE.
Carret, Charles R.	Trinidad, Cuba	200 Trenton St.
Chandler, Chas. P.	New Gloucester, Me.	E. Somerville.
Goss, W. F. M.	Barnstable	64 W. Cedar St.
Lawrence, James W.	Boston	1423 Washington St.
Montgomery, Harry M.	Boston	Waltham.
Parker, Charles S.	Boston	33 Worcester Sq.
Revere, William B.	Boston	40 Commonw'lth Av.
Smith, George A.	Arlington	Arlington.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Abbott, Arthur P.	Dexter, Me.	Malden.
Abbott, Frederick B.	Boston	11 Commonw'lth Av.
Abbott, Walter G.	Dexter, Me.	Malden.
Ames, William H.	No. Easton	No. Easton.
Barnard, Pennock	Kennett Square, Pa.	82 Montgomery St.
Bigelow, Prescott	Boston	6 Marlboro' St.
Bosson, Frederick N.	Chelsea	Chelsea.
Brigham, Augustus P.	Salem	Salem.
Cartwright, David J.	Everett	Everett.
Chapman, George H., Jr.	Winchester	Winchester.
Childs, Sumner W.	Natick	Natick.
Clarke, Herman	Philadelphia, Pa.	Belmont.
Curwen, George E.	Salem	Salem.
Day, Henry B.	S. Framingham	S. Framingham.
Dean, Josiah S.	Boston	935 Broadway.
Drew, Louis L.	Providence, R. I.	44 Howard Av.
Dunn, Elbridge G.	St. John, N. B.	200 Trenton St.
Evans, Albert D.	Boston	254 Cabot St.
Fowler, Frank D.	Dayton, O.	277 Columbus Av.
Hoyt, Fred. A.	S. Newmarket, N. H.	Stratham.
Francis, George T.	Chestnut Hill	Chestnut Hill.
Jackson, Robert T.	Boston	89 Charles St.
Kendall, J. Sewall	Boston	53 Allen St.
Kenney, C. Harry	Philadelphia, Pa.	47 Concord Sq.
Langdon, George W.	Cambridge	13 Follen St.
Matthews, George T.	Dayton, O.	277 Columbus Av.
Patch, Oscar L.	Lexington	Lexington.
Perez, Fernando	Cuba	46 L St.

NAME.	HOME.	RESIDENCE.
Riddell, Charles W.	Jamaica Plain	Jamaica Plain.
Sabin, Herbert M.	Fisherville, N. H.	W. Roxbury.
Sanborn, Arthur W.	E. Somerville	E. Somerville.
Torrey, Joseph	Bath, Me.	290 Columbus Av.
Wells, John W.	Brookline	Brookline.
Wendell, Benjamin T.	Jamaica Plain	Jamaica Plain.
West, Arthur W.	Salem	Salem.
Whidden, Joseph E.	S. Abington	S. Abington.

STUDENTS IN THE LOWELL SCHOOL OF PRACTICAL DESIGN.

NAME.	HOME.	RESIDENCE.
Abbott, Helen E.	Andover	Andover.
Albro, George A.	Jamaica Plain	Jamaica Plain.
Baker, Therese.	Newtonville	Newtonville.
Bean, Elizabeth C.	Boston	2 Glenwood Place.
Boardman, James B.	Saugus	Saugus.
Bradford, Marcia A.	Charlestown	5 Cordis St.
Burnes, L. F.	Roxbury	Roxbury.
Burnett, Arthur F.	Boston	66 Clarendon St.
Cook, Mary T. F.	Boston	181 Princeton St.
Cox, Charles C.	Arlington	Arlington.
Doolittle, Abraham L.	Boston	551 Eighth St.
Frost, C. Mabel	Boston	544 Tremont St.
Frost, Ella C.	Buffalo, N. Y.	Brookline.
Gendrot, Julia A.	Melrose	Melrose.
Gilbert, Marcus H.	Boston	48 Maverick St.
Gray, Alice	Andover	Andover.
Kiander, Gustave B.	Boston	17 Kendall St.
Lewis, Clarence H.	Watertown	Watertown.
McBarron, John T.	Boston	630 Shawmut Av.
Meierhardt, H. W.	Boston	1 Warrenton Pl.
Murdock, Walter A.	Jamaica Plain	Jamaica Plain.
Ordway, Louisa M.	Jamaica Plain	Jamaica Plain.
Pierce, William H. C.	Medford	Medford.
Putnam, Otis C.	Malden	Malden.
Sawyer, Henry A.	Boston	18 Monument Ct.
Sheldon, Fidelia	Beverly	Beverly.
Tower, Fred R.	Braintree	Braintree.
White, Henry L.	Boston	183 W. Brookline St.
Winslow, Adelia I.	Boston	Hotel Eliot.
Woods, Frank P.	Calais, Me.	58 Chandler St.
Young, J. Edson	Groton	Cambridge.

SUMMARY.

Graduate Students	11
Regular Students, fourth year	23
" " third "	13
" " second "	31
" " first "	36
Special Students	85
Students in the School of Mechanic Arts	44
Students in the Lowell School of Practical Design	31
	274
Deduct names counted twice	10
Total	264

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. " " " Geology and Mining Engineering.
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 course 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. This course 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 courses, 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 other courses, 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, laboratories have been provided for the special 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 the Lowell Institute. Fuller details are given on page 53.

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.	SECOND TERM.
Use of Instruments.	Railroad Curves.
Surveying.	Levelling.
Field Practice.	Field Practice.
Pen and Colored Topography.	Plan Drawing.
Plotting from notes.	Stereotomy.
Analytic Geometry.	Differential Calculus.
Descriptive Geometry.	Physics.
Physics.	Physical Geography.
Descriptive Astronomy.	Dynamical Geology.
English History and Literature.	English History and Literature.
German.	German.

THIRD YEAR.

FIRST TERM.	SECOND TERM.
Earth Work.	Hydraulics.
Location and Construction of Roads, Railroads, and Canals.	Water Supply.
Field Practice.	Drainage.
Drawing from Models and actual Structures.	River and Harbor Improvements.
Integral Calculus.	Field Practice.
General Statics.	Projections and Perspective.
Stresses in Frames.	Bridges and Roofs (Descriptive).
Physical Laboratory.	Strength of Materials.
Lithology and Structural Geology.	General Laws of Kinematics and Dynamics.
Zoölogy.	Physical Laboratory.
Palæontology.	Historical Geology.
Constitutional History.	Political Economy.
German.	German.

FOURTH YEAR.

FIRST TERM.	SECOND TERM.
Geodesy.	Structures of Stone, Wood, and Iron.
Practical Astronomy.	Graphical Statics.
Hydrography.	Pumping Engines.
Structures of Stone, Wood, and Iron.	Water Wheels.
Designings of Roofs and Bridges.	Engineering Projects.
Structure Drawing.	Machine Drawing.
Locomotive Engines.	Dynamics completed.
Strength of Materials completed.	Thesis Work.
Metallurgy.	Building Materials.
Applied Physics.	

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.†
English History and Literature.	Shop Work.
German.	Differential Calculus.
	Physics.
	Physical Geography.
	Dynamical Geology.
	English History and Literatnre.
	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.
English History and Literature.
German.

SECOND TERM.

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

THIRD YEAR.

FIRST TERM.

Quantitative Chemical Analysis.
Biology.
Drawing.
Integral Calculus.
General Statics.
Stresses in Frames.
Physical Laboratory.
Lithology.
Zoölogy.
Palæontology.
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 bulk.
Mining Engineering continued.
Metallurgy, Lectures.
Drawing.
Strength of Materials completed.
Dynamics completed.

SECOND TERM.

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

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.
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;

Geometry, plane, solid, and spherical;

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, general examinations are held. Each examination in a distinct subject is marked on a scale of 100, and the marks of each student are reported to his parent or guardian. These returns are intended to enable the parent or guardian to judge of the pro-

ficiency of his son or ward in each department of instruction. The examinations of January and May form the basis of admonition or advice from the Faculty in the case of students who are not profiting by their connection with the school. 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, make a rapid review of Solid Geometry, and complete Plane and Spherical Trigonometry. In the following years, instruction is given in Analytic Geometry, and in Differential and Integral Calculus.

The Instruction in Modern Languages. The object of the instruction in French and German is to enable the student to avail himself of the literature in these languages relating to his particular department of professional study, since many important sources of information, such as periodicals and works for consultation and reference, are accessible only in one or the other of these languages. But although the object is the practical one of learning, in the shortest time, to read with readiness a foreign scientific work, it is believed that this can be satisfactorily accomplished only by a thorough and systematic training in the forms, laws, and usages of the language; since it is only in this way that the essentials of *accuracy* and *strength* can be attained, and the acquisition be a permanent one. It is not understood by this, however, that these forms, laws, and usages are to be learned by themselves as detached facts; on the contrary, they are to be constantly studied and practised as parts of an actual organism, the language, and on this depends the value and interest of the work. French 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. French and German may be continued as elective studies after they are finished in the professional courses.

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 making a beginning in those languages.

The Instruction in English and History. In this department all regular students will receive a course of systematic instruction, extending over three continuous years, in Rhetoric and Criticism, in English Literature, and in Modern, especially English and American, History. In connection with the Rhetoric, continuous practice in English composition will be required throughout the course. The study of the History of English Literature will be accompanied by the critical reading of English texts, and in the instruction in History particular attention will be given to the subjects of Political Science and Political Economy.

The Instruction in Drawing. 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 of all the more important chemical elements. This is followed by a systematic course of instruction in Qualitative Analysis, with laboratory practice, as well as oral and written examinations.

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 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 on 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 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, Saxony, 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 Edinburgh, 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 the 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 modes 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 Atwood'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 centrifugal 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, and a melting kettle.

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

The Institute is from time to time receiving ores of gold, silver, lead, copper, antimony, zinc, iron, etc., from varions localities on this continent. These ores are worked, and reports sent to those who contribute them; and it is hoped that by the coöperation 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 the class.

Special exercises are also had in shades, shadows, perspective, and the perspective of shadows, and in tracing and sketching, and drawing upon the blackboard. Opportunity is also afforded to sketch, measure, and draw out buildings already erected.

Special students in Architecture are received into a special course, occupying two years, and embracing all the subjects mentioned in the three preceding paragraphs. If not proficient in free-hand drawing and in practical geometry they will be required to make themselves so during the first half of the year, in addition to their other exercises. Such students may also take any other studies which they are found prepared to pursue to advantage. 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. Alfred S. Higgins of Boston, and to Mr. Alexander W. Longfellow, Jr., of Portland, Maine.

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

The collection of casts comprises architectural details and specimens of carving and sculpture, illustrating various periods of art. It includes a valuable collection of sculptures from Lincoln Cathedral, and a large number of casts of Moorish ornamental details, presented by the Spanish Government, through the Spanish Commissioner at the Philadelphia Centennial Exhibition.

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

A considerable collection of photographs, lithographs and

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

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

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

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

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 more generally required than heretofore, 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 examin-

ation 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 use for instruction 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 with forty-five lessons in Physical Geography and Dynamical Geology. These treat of the geographical relations of the principal features of the earth's surface and their geological origin as learned from a study of present changes produced by the more important agencies, such as the internal heat and the secular cooling of the earth, solar heat and light, the ocean and atmosphere, oceanic currents and tides, frost, winds, rain, rivers, glaciers, volcanoes and earthquakes, plants and animals.

Next is given a course of thirty lessons in Structural Geology, including a systematic course in Lithology, in which oral instruction and laboratory work are combined, the aim being to place in the hands of each student a specimen of each type taught; also an account of the principal structural features characterizing large masses of rocks, embracing stratification, joint structure, faults, folds, slaty cleavage, veins, dykes, etc. This is followed by a course of fifteen lessons in Chemical Geology and the history of the crystalline formations, the former comprising the origin, alteration, and decay of rocks, the history of vein-stones and ore deposits, of rock salt and mineral waters; and the formation of coal and petroleum, together with a general sketch of the chemical history of the globe.

These are succeeded by a course of forty-five lessons in Historical Geology, treating of the physical history of the earth as indicated by the nature, extent, and distribution of the rocks formed during the different periods, including the gradual development of continents and their biological history. The students have placed before them specimens and good illustrations of the characteristic fossils of the different formations; they may thus acquire the requisite practical knowledge and definite ideas of the gradual introduction and development of life on the earth.

The instruction in Structural Geology is supplemented by frequent excursions to the many points of geologic interest in the vicinity of Boston; and during the summer vacation an ex-

cursion of several weeks will usually be made to regions where the fossiliferous formations are well developed.

The Instruction in Political and Industrial Geography is synthetic in character. The influence of geographical features, climates, etc., upon the distribution of plants and animals, also their direct and indirect influence upon the life, industries, and advancement of man are taught, with the hope of contributing to the completeness, unity, and utility of the entire course of study.

The Instruction in 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. For these exercises they are required to provide themselves with a uniform consisting of dark blue pant-

aloons, cap with silver ornament, and double-breasted sack-coat 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. The matter of attendance at drill is under the control of the Instructor; but excuses of general application can be granted by the Faculty only. Applications to be excused from drill may be granted when based on the following grounds, viz.: —

1st, being an alien; 2d, being a college graduate; 3d, being over twenty-one years of age; 4th, having a surgeon's certificate of disability; 5th, being 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 inspection to machine-shops, engines, mills, furnaces, and chemical works, and to important buildings and engineering constructions within convenient reach.

In the vacations more extended excursions are made for the survey of mines and geological features, and for the study of metallurgical works and noted specimens of engineering.

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. Edward S. Philbrick, C. E., of Boston, has consented to give a course of evening lectures on Sanitary Engineering in the coming school year 1879–80.

THE SOCIETY OF ARTS.

One of the primary objects of the founders of the Institute of Technology, as shown by the extract from the charter given on page 4, was the establishment of a Society of Arts. This Society was organized in 1861, and now numbers about 220 members. It holds regular meetings at its rooms in the Institute Building, on the second and fourth Thursdays of each month from November to May inclusive. At these meetings are presented communications on various subjects of applied science, with the exhibition of machines and apparatus illustrating important inventions in the mechanic and useful arts. Students of the school may be present at these meetings, by permission of the Secretary of the Institute.

THE BOSTON PUBLIC LIBRARY.

The professors and students of the Institute are allowed the full use of this library which now contains over 300, 000 volumes. Its reading-room is supplied with all the best scientific and technical periodical publications, 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 put at the disposal of 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, of $200 each, 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. " " " Geology and Mining Engineering.
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. A monthly return of absences and tardinesses is made, by the Secretary of the Faculty, to the parent or guardian of every student not of age. Tardiness consists in entering a lecture room, drawing room, or laboratory, more than five minutes after the hour designated for the beginning of the exercise. Students are, in general, expected to devote themselves to the work of the school between the hours of 9 A. M., and 5 P. M. (4 1-2 P. M., in winter), except during the interval for dinner. There are no exercises on Saturday afternoon, and the building is closed.

Discipline. While within the limits of the Institute, students are expected to behave with decorum, to obey the regulations of the school, and to pay a due respect to its officers. 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 in 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. By its exact and systematic method, the instruction in the use of tools and materials has 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, 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 stating the amount and quality of work done. Students will be received for shorter times and for special portions of the course.

Applicants must be at least fifteen years of age, and must pass a satisfactory examination in: — Arithmetic, Geography, and English Composition.

Tuition $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 to Equations of the 2d Degree.	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.	Physics.
Elementary Physics.	English Composition.
English Composition.	Mechanical Drawing.
Mechanical Drawing.	

The beginning and ending of the school year and the days of 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 on competitive examination to sons of present or past members of the Association.

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, physics, drawing, chemistry, geology, natural history, physiology, English, French,

German, history, navigation and nautical astronomy, architecture, and engineering.

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

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

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

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

The courses for 1878–79 are on the following subjects: —

I. *Descriptive Astronomy.* Twelve lectures by Prof. Cross, on Monday and Wednesday evenings, at 7½ o'clock, beginning Nov. 18.

II. *Elementary Logic.* Twelve lessons by Prof. Howison, on Saturday afternoons, at 3½ o'clock, beginning Nov. 9.

III. *Physiology as related to the Diseases and Deformities of Civilization.* Twelve lectures by Prof. Kneeland, on Tuesday and Friday evenings, at 7½ o'clock, beginning Nov. 12.

IV. *Graphical Treatment of the Strength of Structures and Machines.* Twelve lectures by Prof. Lanza, on Monday and Wednesday evenings, at 7½ o'clock, beginning Nov. 11.

V. *English History and Literature.* Twelve lectures by Prof. Atkinson, on Wednesday and Friday evenings, at 7½ o'clock, beginning Jan. 1.

VI. *Elementary German.* Twelve lessons by Prof. Otis, on Tuesday and Friday evenings, at 7½ o'clock, beginning Jan. 7.

VII. *Determinative Mineralogy.* Twelve laboratory exercises by Prof. Richards, on Saturday afternoons, at 2¼ o'clock, beginning Nov. 9.

VIII. *The Elements of Architecture.* Twelve lectures by Prof. Ware, on Monday and Wednesday evenings, at 7½ o'clock, beginning Dec. 30.

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.

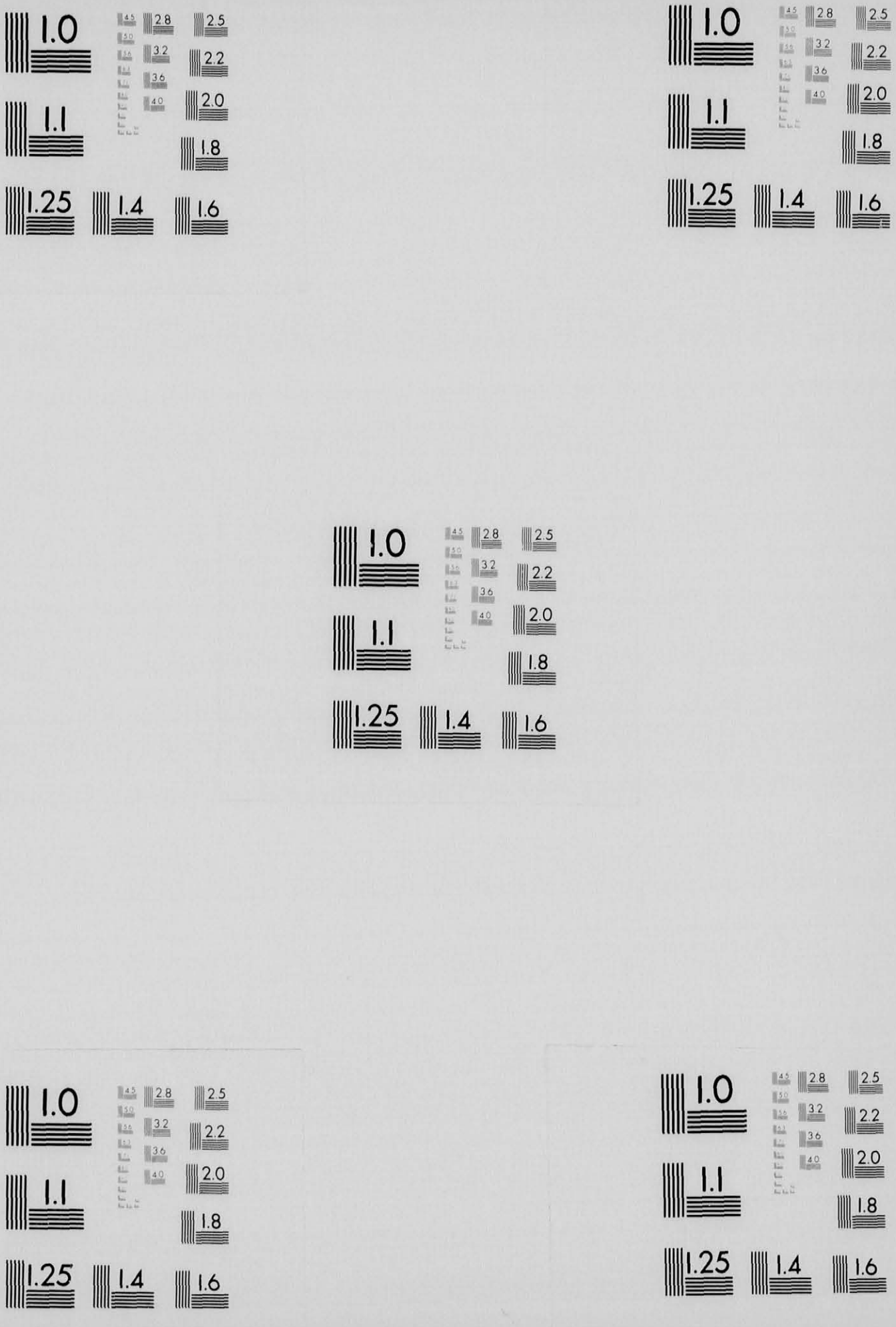
The course embraces: — 1. Original Design, or Composition of Patterns; 2. Secondary Design, or Variation of Patterns; 3. The Making of Working Drawings; 4. Technical Manipulations.

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.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