M.I.T. ANNUAL CATALOGUES AND BULLETINS
1886/87 01 OF 02

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

TWENTY-SECOND

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION,

AND A LIST OF THE ALUMNI.

1886-1887.

BOSTON:
RAND AVERY COMPANY.
Franklin Press.
1886.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

TWENTY-SECOND

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION,

AND A LIST OF THE ALUMNI.

1886-1887.

BOSTON:
RAND AVERY COMPANY.
Franklin Press.
1886.

GENERAL SUMMARY OF STUDENTS.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

STUDENTS.

School of Industrial Science	637
School of Mechanic Arts	38
School of Design	63
Total	738

CALENDAR FOR 1886-87.

School year began	Monday, Sept. 27, 1886.
Second term will begin	Tuesday, Feb. 1, 1887.
Degrees conferred	Tuesday, May 31, 1887.
First Entrance Examinations	Thursday, June 2, 1887, and Friday, June 3, 1887.
Second Entrance Examinations	Tuesday, Sept. 20, 1887, and Wednesday, Sept. 21, 1887.
Examinations for Advanced Standing	Thursday, Sept. 22. 1887.
School year of 1887–88 will begin	Monday, Sept. 26, 1887.

CALENDAR FOR 1887-88.

School year will begin	Monday, Sept. 26, 1887.
Second term will begin	Tuesday, Jan. 31, 1888.
Degrees conferred	Tuesday, May 29, 1888.
First Entrance Examinations	Thursday, May 31, 1888, and Friday, June 1, 1888.
Second Entrance Examinations	Tuesday, Sept. 18, 1888, and Wednesday, Sept. 19, 1888.
Examinations for Advanced Standing	Thursday, Sept. 20, 1888.
School year of 1888–89 will begin	Monday, Sept. 24, 1888.

CONTENTS.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Historical Sketch. The foundation of the Massachusetts Institute of Technology was laid in a report by Professor William B. Rogers, entitled "Objects and Plan of an Institute of Technology, including a Society of Arts, a Museum of Arts, and a School of Industrial Science." A charter for the institution thus projected was granted by the Legislature of Massachusetts in an Act dated April 10, 1861. In this charter, the threefold plan outlined by Professor Rogers, who became the first President of the Institute of Technology, was preserved.

Of the three integral parts of the Institute, the SOCIETY OF ARTS was first organized, and has continued ever since to hold semi-monthly meetings from October to May of each year. A more detailed account of this society, with lists of its officers, will be found on page 132.

THE SCHOOL OF INDUSTRIAL SCIENCE was opened in February, 1865, in temporary rooms in Mercantile Building, Summer Street, Boston, with twenty-seven pupils, of whom fourteen graduated with the diploma of the Institute of Technology in 1868. The growth of this school since its opening is shown in the lists of its graduates. Its present organization and condition, with an account of its courses of study and research, and with registers of its officers and students, will be found on pages 11 to 14. The first building of the Institute of Technology, now known as the Rogers Building, was erected on land conceded by the State, and was occupied by the chemical department in the spring of 1866. In the fall of the same year the whole School of Industrial Science,

together with the Society of Arts, was removed to the same structure.

Two subsidiary schools have been organized under the control of the Corporation of the Institute: one, the Lowell School of Practical Design, whose object and organization, with a list of present students, will be found on pages 126 to 129; the other, the School of Mechanic Arts, a full account of which will be found on pages 118 to 123.

Less formal action has been taken for carrying out the purposes of the founders of the Institute of Technology in the establishment of a MUSEUM OF ARTS. Varied and valuable collections have been made, which, taken together, would constitute no inconsiderable foundation for such a museum; but, thus far, this material has been divided, so that the portions especially relating to individual departments of study and research might be placed within easy reach of the students and teachers respectively concerned therewith.

Buildings. The buildings now occupied are, (1) the Rogers Building, on Boylston Street, devoted to the engineering departments and to instruction in mathematics, mechanics, geology, mineralogy, and physiology; (2) the New Building, corner of Boylston and Clarendon Streets, mainly devoted to the departments of chemistry, physics, civil engineering, and architecture, and to instruction in language, literature, and history; (3) a series of laboratories, drawing and recitation rooms, at the foot of Garrison Street, mainly devoted to work in the mechanic arts and to the instruction of the Mechanic Arts School and the Lowell School of Design; (4) a gymnasium and drill hall, on Exeter Street.

MEMBERS OF THE CORPORATION.

President.

FRANCIS A. WALKER.

Treasurer.

JOHN CUMMINGS.

Secretary.

LEWIS WM. TAPPAN, JUN.

MARSHALL P. WILDER.
HENRY B. ROGERS.
JAMES B. FRANCIS.
EDWARD ATKINSON.
JOHN D. RUNKLE.
CHARLES L. FLINT.
ALEXANDER H. RICE.
M. DENMAN ROSS.
FREDERICK W. LINCOLN.
JAMES L. LITTLE.
WILLIAM ENDICOTT, JUN.
JOHN M. FORBES.
EDWARD S. PHILBRICK.
THOMAS T. BOUVÉ.
SAMUEL D. WARREN.
AUGUSTUS LOWELL.
HOWARD A. CARSON.
CHARLES J. PAINE.
CHARLES FAIRCHILD.
DAVID R. WHITNEY.

SAMUEL C. COBB.
HENRY D. HYDE.
ALEXANDER S. WHEELER.
FRANCIS H. WILLIAMS.
BENJAMIN P. CHENEY.
JAMES P. TOLMAN.
HOWARD STOCKTON.
ELIOT C. CLARKE.
CHARLES T. HUBBARD.
NATHANIEL THAYER.
CHARLES F. CHOATE.
HENRY SALTONSTALL.
HENRY L. PIERCE.
HIRAM F. MILLS.
PERCIVAL LOWELL.
STANTON BLAKE.
ARTHUR T. LYMAN.
FREDERICK L. AMES.
CHARLES MERRIAM.
ARTHUR ROTCH.

On the Part of the Commonwealth.

HIS EXCELLENCY, GOV. GEORGE D. ROBINSON.
HON. MARCUS MORTON, *Chief Justice of the Supreme Court.*
HON. JOHN W. DICKINSON, *Secretary of the Board of Education.*

EXECUTIVE COMMITTEE.

FRANCIS A. WALKER, } *Ex Officio.*
JOHN CUMMINGS, }

LEWIS WM. TAPPAN, Jun. HENRY B. ROGERS.
FRANCIS H. WILLIAMS. AUGUSTUS LOWELL.
ALEXANDER S. WHEELER.

FINANCE COMMITTEE.

WILLIAM ENDICOTT, Jun. DAVID R WHITNEY.
SAMUEL C. COBB. JOHN M. FORBES.

COMMITTEE ON THE SOCIETY OF ARTS.

HOWARD A. CARSON. EDWARD S. PHILBRICK.
EDWARD ATKINSON. HENRY L. PIERCE.
HIRAM F. MILLS.

AUDITING COMMITTEE.

FREDERICK W. LINCOLN. JAMES P. TOLMAN.
PERCIVAL LOWELL.

COMMITTEE ON NOMINATIONS.

AUGUSTUS LOWELL. JOHN CUMMINGS.
ALEXANDER H. RICE. SAMUEL C. COBB.
HOWARD STOCKTON.

TRUSTEES OF THE MUSEUM OF FINE ARTS.

HENRY B. ROGERS. ALEXANDER H. RICE.
M. DENMAN ROSS.

VISITING COMMITTEES.

The School of Mechanic Arts, and the Lowell School of Industrial Design.

EDWARD ATKINSON. JOHN D. RUNKLE.
M. DENMAN ROSS. STANTON BLAKE.
PERCIVAL LOWELL.

Department of Civil Engineering.

EDWARD S. PHILBRICK. HOWARD A. CARSON.
CHARLES F. CHOATE. HIRAM F. MILLS.

Departments of Mechanical Engineering and Applied Mechanics.

JAMES B. FRANCIS. CHARLES T. HUBBARD.
HIRAM F. MILLS.

Departments of Mining and Metallurgy.

THOMAS T. BOUVÉ. HOWARD STOCKTON.
CHARLES FAIRCHILD.

Department of Architecture.

ARTHUR ROTCH. ALEXANDER S. WHEELER.
ELIOT C. CLARKE. FREDERICK L. AMES.

Departments of Literature, History, and Political Economy.

ALEXANDER H. RICE. MARSHALL P. WILDER.
SAMUEL C. COBB. HENRY L. PIERCE.
ARTHUR T. LYMAN.

Department of Modern Languages.

CHARLES L. FLINT. STANTON BLAKE.
NATHANIEL THAYER.

Department of Mathematics.

HOWARD A. CARSON. CHARLES J. PAINE.
PERCIVAL LOWELL.

Departments of Chemistry, Physics, and Biology.

HENRY SALTONSTALL. ARTHUR T. LYMAN.
JAMES P. TOLMAN. FRANCIS H. WILLIAMS.

SCHOOL OF INDUSTRIAL SCIENCE.

SCHOOL OF INDUSTRIAL SCIENCE.

OFFICERS OF INSTRUCTION.

FRANCIS A. WALKER, PH.D., LL.D., *President.*

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

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

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

ROBERT H. RICHARDS, S.B.,
Professor of Mining Engineering and Metallurgy.

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

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

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

CHARLES R. CROSS, S.B.,
Thayer Professor of Physics, and Director of the Rogers Laboratory.

GAETANO LANZA, S.B., C.E.,
Professor of Theoretical and Applied Mechanics; in charge of the Department of Mechanical Engineering.

THEODORE M. CLARK, A.B.,
Professor of Architecture.

THOMAS M. DROWN, M.D.,
Professor of Analytical Chemistry.

EUGENE LETANG,
Associate Professor of Architecture.

JULES LUQUIENS, PH.D.,
Associate Professor of Modern Languages.

WILLIAM T. SEDGWICK, PH.D.,
Associate Professor of Biology.

SILAS W. HOLMAN, S.B.,
Associate Professor of Physics.

WEBSTER WELLS, S.B.,
Associate Professor of Mathematics.

LEWIS M. NORTON, PH.D.,
Associate Professor of Organic and Industrial Chemistry.

GEORGE F. SWAIN, S.B.,
Associate Professor of Civil Engineering.

WILLIAM O. CROSBY, S.B.,
Assistant Professor of Mineralogy and Lithology.

ALFRED E. BURTON, S.B.,
Assistant Professor of Topographical Engineering.

PETER SCHWAMB, S.B.,
Assistant Professor of Mechanism and Director of the Workshops.

CECIL H. PEABODY, S.B.,
Assistant Professor of Steam Engineering.

THOMAS E. POPE, A.M.,
Assistant Professor of Analytical Chemistry.

LINUS FAUNCE, S.B.,
Assistant Professor of Drawing.
HENRY K. BURRISON, S.B.,
Instructor in Mechanical Drawing.
ELLEN H. RICHARDS, A.M., S.B.,
Instructor in Sanitary Chemistry.
ARTHUR N. WHEELOCK, A.M.,
Instructor in English.
DWIGHT PORTER, PH.B.,
Instructor in Civil Engineering.
WILLIAM H. PICKERING, S.B.,
Instructor in Physics.
FREDERICK W. CLARK, S.B.,
Instructor in Mining and Metallurgy.
SAMUEL G. STEPHENS,
Instructor in Mechanical Engineering.
S. HOMER WOODBRIDGE, A.M.,
Instructor in Physics, and Lecturer on Ventilation.
GEN. HOBART MOORE,
Instructor in Military Tactics.
WILLIAM W. JACQUES, PH.D.,
Instructor in Telegraph Engineering.
HOWARD V. FROST, S.B., (*absent*),
Instructor in General Chemistry.
CLEMENT W. ANDREWS, A.M.,
Instructor in Organic Chemistry.
CHARLES L. ADAMS,
Instructor in Freehand Drawing.
JEROME SONDERICKER, S.B., C.E.,
Instructor in Applied Mechanics.
JOSEPH J. SKINNER, PH.D.,
Instructor in Mathematics.
CHARLES D. JAMESON, S.B.,
Instructor in Railroad Engineering.
DAVIS R. DEWEY, PH.D.,
Instructor in History and Political Science.
CHARLES A. FRENCH, S.B.,
Instructor in Mathematics.
GEORGE H. BARTON, S.B.,
Instructor in Determinative Mineralogy.
GEORGE R. UNDERWOOD, S.B.,
Instructor in Industrial Chemistry.
FREDERIC L. BARDWELL, B.S., S.B.,
Instructor in General Chemistry.
AUGUSTUS H. GILL, S.B.,
Instructor in General Chemistry.
ARTHUR J. PURINTON, S.B.,
Instructor in Mechanical Engineering.
HARRY W. TYLER, S.B.,
Instructor in Mathematics.
ALFRLD L. FITCH, S.B.,
Instructor in Mechanical Engineering.

GEORGE T. DIPPOLD, PH.D.,
Instructor in Modern Languages.
THOMAS O'GRADY, Jun.,
Instructor in Architecture.
WILLIAM L. FUFFER, S.B.,
Assistant in Physics.
CHARLES W. EATON,
Assistant in Drawing.
EDWARD G. GARDINER, PH.D.,
Assistant in Biology.
ALLYNE L. MERRILL, S.B.,
Assistant in Mechanical Engineering.
HENRY P. TALBOT, S.B.,
Assistant in Chemical Analysis.
HENRY MARTIN, S.B.,
Assistant in Chemical Analysis.
RICHARD W. LODGE,
Assistant in Mining and Metallurgy.
PETER BURNS,
Assistant in General Chemistry.
FREDERICK FOX, S.M.,
Assistant in Sanitary Chemistry.
DANA P. BARTLETT, S.B.,
Assistant in Mathematics.
HARRY E. H. CLIFFORD, S.B.,
Assistant in Physics.
EDWARD S. FOSS, S.B.,
Assistant in General Chemistry,
FRANK L. LOCKE, S.B.,
Assistant in Drawing.
EDWARD F. MILLER, S.B,
Assistant in Mechanical Engineering.
ARTHUR G. ROBBINS, S.B.,
Assistant in Civil Engineering.
L. KIMBALL RUSSELL, S.B.,
Assistant in General Chemistry.
GEORGE H. GUSTIN, S.B.,
Assistant in Chemical Analysis.

LECTURERS FOR THE CURRENT YEAR.

GEORGE W. BLODGETT, S.B., *on Applications of Electricity to Railway Working.*
HENRY M. HOWE, A.M., S.B., *on Metallurgy.*
C. HOWARD WALKER, *on Decoration.*
ROSS TURNER, *on Water-Color and Sketching.*
CHARLES W. HINMAN, S.B., *on the Manufacture of Illuminating Gas.*
H. O. HOFMAN, *on Metallurgy.*
WALTER S. ALLEN, S.B., *on the Manufacture of Fertilizers.*

FACULTY.

FRANCIS A. WALKER, *President.*
JOHN D. RUNKLE.
WILLIAM P. ATKINSON.
GEORGE A. OSBORNE.
ROBERT H. RICHARDS.
CHARLES P. OTIS.
ALPHEUS HYATT.
WILLIAM H. NILES.
CHARLES R. CROSS.
GAETANO LANZA.
THEODORE M. CLARK.
THOMAS M. DROWN.
EUGENE LETANG.
JULES LUQUIENS.
WILLIAM T. SEDGWICK.
SILAS W. HOLMAN.
WEBSTER WELLS.
LEWIS M. NORTON.
WILLIAM O. CROSBY.
GEORGE F. SWAIN.
ALFRED E. BURTON.
PETER SCHWAMB.
CECIL H. PEABODY.
THOMAS E. POPE.
LINUS FAUNCE.

JAMES P. MUNROE, *Secretary.*

COURSES OF INSTRUCTION.

The SCHOOL OF INDUSTRIAL SCIENCE of the Massachusetts Institute of Technology provides an extended series of scientific and literary studies, and of practical exercises. The courses of study include the Physical, Chemical, and Natural Sciences and their applications; Pure and Applied Mathematics; Drawing; the English, French, German, and other Modern Languages; History; Political Economy; and International and Business Law. These studies and exercises are so arranged as to afford a liberal and practical education in preparation for active pursuits, as well as a thorough training for most of the scientific professions. The positions and the character of the work for which the several courses fit their graduates are best indicated by an inspection of the record of the present occupations of graduates given on p. 134.

The following regular courses of study, each of four years duration, have been established; and, for proficiency in any one of them, the degree of Bachelor of Science, S.B., in the course pursued is conferred. Descriptions of the courses are given on the pages referred to.

Options. To enable a student to devote himself more closely to some one or more chosen branches of the professional or scientific course which he has undertaken, optional lines of study are introduced into the later years. Inspection of the course descriptions and schedules, pp. 20 to 38, will show the nature and effect of the options. In some cases the selection of later options is positively determined by the earlier ones, owing to the requirement of certain subjects as preparation for others; in others, a wide choice is offered throughout all the years, the difference in this respect arising largely from the nature of the topics involved. In all cases the necessary sequence of subjects may be determined by consulting the Schedule of Topics, pp. 74 to 89.

Five Years' Course. Students purposing to take the degree of the Institute, but for exceptional reasons finding it advantageous to take fewer studies at any one time than are prescribed in the schedules for the regular four years' courses, may, under the direction of the Faculty, pursue a course arranged with a view to a fifth year, without becoming classified as special students. In such a five years' course more extended study of professional or other topics will be possible.

Advanced courses of study may be pursued either with or without reference to the advanced degrees authorized by the corporation. See p. 41.

Free evening courses of scientific and literary instruction, open to both sexes, are given each year, being supported by the trustee of the Lowell Institute. Details may be found on p. 115.

Schedules and Descriptions of the Courses. The following pages contain schedules showing the distribution of studies throughout each of the several courses given in the School of Industrial Science. Each schedule is preceded by a brief description of the course.

The first year for all courses is the same (see next page), and contains subjects which are considered essential as preliminary training, and as a foundation for the more strictly professional studies of the later years of all courses. At the end of the first year, the regular student selects the course which he will pursue during the remaining three years; and his work becomes more specialized thereafter as it progresses.

An idea of the nature and amount of the work to be done in any of the regular courses may be obtained by considering, in connection with the schedule of that course, — as given on one of the following pages, — the statements in regard to the various branches of study (e.g., Chemistry, Physics, Mathematics, etc.), made in the paragraphs descriptive of the "Methods and Apparatus of Instruction," pp. 41 to 66; and by referring, at the same time, to the "Schedule of Topics," pp. 74 to 89.

Methods and Apparatus of Instruction. The statements on pp. 41 to 66 supply a general outline of the character and methods of instruction given, and of the equipment of the laboratories, museums, and libraries which form conspicuous features in the work of the Institute.

The Schedule of Topics gives information as to the nature, number, and period of occurrence of exercises in any particular topic, the name of the instructor, and the preparation required for admission to exercises in that subject. This is particularly of service to the regular student in selecting options, and to the special student in affording the means of ascertaining precisely what instruction is given in any topic which he may desire to pursue, when, at what length, and by whom it is treated, and exactly what preparation will be demanded of every applicant for the topic considered. By careful consultation of this schedule, the special course may be so planned that the earlier studies shall afford suitable preparation for those more advanced studies towards which the course is directed. See p. 74.

REGULAR COURSES.

SCHEDULES OF PRESCRIBED AND OPTIONAL STUDIES.

COMMON TO ALL REGULAR COURSES.

First Year.	
FIRST TERM.	SECOND TERM.
Algebra. Solid Geometry. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical Drawing. Military Drill.	Plane Trigonometry. General Chemistry. Chemical Laboratory. Political History since 1815. French. Mechanical and Freehand Drawing. Military Drill.

For descriptions of the methods, etc., used in the above instruction, see pp. 41 to 48, and p. 66.

I.—CIVIL ENGINEERING.

The course is designed to acquaint the student thoroughly with the principles underlying the sound practice of civil engineering. Also to so far illustrate and give practice in the application of these principles, that he may see their relation to actual work and become familiar with the operations and instruments of his profession. Of the graduates of this course up to 1885, the present occupation, as shown at the end of this catalogue, is, in percentage: railroad engineering, 25 per cent; general civil engineering practice, 16; water-works and public engineering works, 20; mining engineering, 7; supervision and agency of mills, 3; bridge construction, 3; various other employments, 26 per cent.

The earlier instruction is devoted mainly to training in mathematics, drawing, language, and history, and in chemistry; the last being valued, not merely for the chemical information, but largely as a needful introduction to methods of scientific observation, experiment, and study. In the second year, in addition to mathematics and language, the study of political economy, physical geography, and physics is begun, the latter being continued through the third year where it leads to work in the laboratory. A full course in surveying supplemented by work in the drawing-room, is also given. In the third year geology is introduced.

The rapid specialization now going on in the various departments of civil engineering render it desirable that students should be allowed some choice of direction in their more advanced studies. The course therefore offers, in the third year, a selection between more mathematical and more strictly technical subjects, while in the fourth year choice is given of a wide range of topics classed under the three general heads of a "General Course in Civil Engineering;" a course in "Roads and Railroads;" and one in "Geodesy, Geology, and Topography."

Descriptions of the methods and nature of instruction in the several professional topics will be found on pp. 53 to 56; and of the other topics, on pp. 42 to 52, and on p. 62.

I. — CIVIL ENGINEERING.

First Year.

Same for all Courses. See p. 19.

Second Year.

First Term.	Second Term.
Surveying: Compass and Transit.	Levelling: Profiles.
Plotting from Notes.	Differential Calculus.
Analytic Geometry.	Physics.
Physics.	Physical Geography.
Political Economy.	Literature.
German.	German.
Spherical Trigonometry.	*Options.*
Options.	1, 2 { Topographical Drawing.
1, 2. Adv. Geometrical Drawing.	3. Mineralogy.
3 { Topographical Drawing. Descriptive Astronomy.	

Third Year.

First Term.	Second Term.
Railroad Engineering.	Railroad Location.
Advanced Field Work.	Plane-Table Work.
Structural Drawing.	Adv. Topographical Drawing.
Integral Calculus.	Physics: Laboratory Work.
General Statics.	Historical Geology.
Physics: Lectures and Laboratory.	Literature.
Structural Geology.	German.
Literature.	*Options.*
German.	1 { Kinematics and Dynamics. Strength of Materials.
Options.	2 { Stereotomy. Railroad Engineering.
1, 2 { Foundations.	3. Determinants. Map Work.
3. Advanced Trigonometry.	Spherical and Prac. Astronomy.

Fourth Year.

First Term.	Second Term.
Bridges and Roofs.	Bridges and Roofs.
Bridge Design.	Principles of Construction.
Hydraulic Engineering.	Thesis Work.
Principles of Construction.	*Options.*
Strength of Materials.	1 { Hydraulic Engineering. Bridge or Hydraulic Design. Geodesy and Ast., or Machinery and Motors. Hygiene and Public Health, or Bridge Work.
Metallurgy of Iron.	
Options.	
1 { Sanitary Engineering. Hydraulic Field Work. R.R. Management, or Heat and Vent.	2 { Bridge Design. Railroads. Machinery and Motors.
2. R.R. Eng. and Management.	3 { Not definitely arranged; but to include Advanced Geodesy, Geology, and Topography, with Mining and other subjects.
3 { Not definitely arranged; but to include Geodesy, Least Squares, Mining, and Special Geological Research.	

II. — MECHANICAL ENGINEERING.

The course aims to equip the student with such training in pure and applied mathematics as shall qualify him to deal with the engineering problems of his profession from the most favorable standpoint. It attempts by instruction, both theoretical and practical, to acquaint him with engineering practice, and to give him a proper groundwork upon which to base a professional career. The more strictly professional work of the course may be classified as follows: —

1. Mathematics, physics, and applied mechanics, given outside the department; the last including the study of, and practice in testing the strength of materials.

2. Recitation-room work of the department proper, beginning with a study of the principles of mechanism, the construction of gear-teeth, etc., and continued by courses on machine tools and cotton machinery. Courses are given on the slide-valve and link, thermodynamics, theory of the steam-engine, and on steam-boilers. The fourth-year instruction includes such mechanical engineering subjects as dynamometers, governors, fly-wheels, springs, relative effect of reciprocating parts, balancing of engines, injectors, steam-pumps, cylinder condensation, hydraulics and hydraulic motors, etc. An option is given among courses on marine engineering, locomotive construction, and mill engineering.

3. Drawing-room work. The students in the second year make working-drawings from measurements, and the drawings necessary in connection with the course in mechanism and gear construction. In the third year they make detail and assembly drawings from machinery, and this is followed by mechanism designs, and boiler drawings. In the fourth year a course in machine design is given.

4. Shop-work, including carpentry, pattern-making, forging, chipping, filing, and machine-tool work.

5. Mechanical engineering laboratory work. This begins with drill in steam-engine tests in the second term of the third year, and is continued throughout the fourth year, including tests of boilers, pumps, power, etc., and a large amount of investigation.

II. — MECHANICAL ENGINEERING.

First Year.

Same for all Courses. See p. 19.

Second Year.

FIRST TERM.	SECOND TERM.
Principles of Mechanism. Construction of Gear Teeth. Drawing. Carpentry and Wood Turning (shopwork). Analytic Geometry. Descriptive Geometry. Physics. Political Economy. German.	Mechanism of Mill Machinery. Mechanism of Shop Machinery. Drawing. Pattern Work (shopwork). Differential Calculus. Physics. Literature. German.

Third Year.

FIRST TERM.	SECOND TERM.
Slide Valve. Link Motion. Thermodynamics. Steam Engineering. Drawing, Design, and Surveying. Forging (shopwork). Integral Calculus. General Statics. Physics: Lectures and Laboratory. German.	Steam Engineering. Drawing, Design, and Surveying. Mech. Engineering Laboratory. Forging, Chipping, and Filing (shopwork). Kinematics and Dynamics. Strength of Materials. Physical Laboratory. Literature. German.

Fourth Year.

FIRST TERM.	SECOND TERM.
Mechanical Engineering. Hydraulics. Machine Design. Mech. Engineering Laboratory. Engine Lathe Work (shopwork). Strength of Materials. Metallurgy. Heating and Ventilation. *Options.* 1. Marine Engineering. 2. Locomotive Construction. 3. Mill Engineering.	Hydraulic Engineering. Mech. Engineering Laboratory. Engine Lathe Work (shopwork). Strength and Stability of Structures. Theory of Elasticity. Constitutional History. Thesis Work. *Options.* 1. Marine Engineering. 2. Locomotive Construction. 3. Mill Engineering.

III. — MINING ENGINEERING.

This course is planned to prepare students for Mining, Geology, and Metallurgy, in accordance with the present demand for men. It is therefore laid out with three options. In the first, a considerable amount of time is devoted to surveying (see p. 53), mathematics, and drawing, — subjects of importance to the mine surveyor and engineer. The second emphasizes the geological subjects, and leads towards the surveying of geological deposits, with special reference to their economical value. The third is devoted to the metallurgical and chemical sides of the profession.

The instruction in mining includes a course of lectures on the general character of the various deposits of 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. Ore-dressing and metallurgy are taken up in a course of lectures, accompanied by a series of continuous practical exercises in the mining and metallurgical laboratories in the concentration and smelting of ores. (See p. 59.)

A large amount of time is devoted in this course to chemistry, especially in its application to the analysis of inorganic compounds. A description of the methods is given on pp. 44 to 48.

After the first term of the second year, the study of mathematics and applied mechanics (see pp. 42 and 51) is confined to those following the first option, students in the second option devoting themselves throughout the remainder of the course more particularly to physical, chemical, geological, and zoölogical work, while those in the third make a specialty of metallurgy and metallurgical chemistry.

During the second and third year, German, physics, mineralogy, and geology are prescribed ; and courses in physical geography, biology, history, etc., are laid down in the several options. (See pp. 43 to 64.)

III.—MINING ENGINEERING.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Chemical Analysis. Physics. German. Analytic Geometry. Surveying. Drawing.	Chemical Analysis. Physics. German. Mineralogy and Blowpipe Analysis. *Options.* 1. Surveying; Diff. Calculus. 2. Physical Geog.; Microscopical Technology; Chemistry. 3. Surveying; Physical Geog.; Chemistry.

Third Year.

First Term.	Second Term.
Chemical Analysis. Geology. German. Mining. Physics: Lectures. *Options.* 1. Chemistry; Int. Calculus and App. Mech. 2. Chemistry; Literature; Physical Laboratory; Zoöl. and Palæontology. 3. Literature; Special Methods; Physical Laboratory; Theoretical Chemistry.	Chemical Analysis and Assaying. German. Mining. Geology. Literature. *Options.* 1. Applied Mechanics. 2. Chemistry; Physical Laboratory; Zoöl. and Palæontology. 3. Chemistry; Physical Laboratory.

Fourth Year.

First Term.	Second Term.
Chemical Analysis. Mining Laboratory. Modern History. Ore Dressing and Metallurgy. Memoirs. *Options.* 1. Applied Mechanics. 2. Special Geological Work. 3. Special Metallurgical Work.	Chemical Analysis. Modern History. Metallurgy. Memoirs. *Options.* 1. Mining Laboratory; Motors. 2. Special Geological Work. 3. Mining Laboratory; Motors.

IV. — ARCHITECTURE.

Throughout this, as in the engineering courses, extends a full course in mathematics, pure and applied, to serve as a basis for professional work. (See pp. 42 and 51.)

The more strictly professional work begins in the second year, with the study of the five orders and their applications, and of architectural history. The student is made familiar with the materials and principles of construction, by lectures, problems, and visits to buildings. The subject of specifications and contracts is thoroughly gone over. Practice in architectural design is continued throughout the course. Instruction is given in sketching in black and white and water-color, and drawing both from the cast and from life. Regular students pursue, in addition to this work, courses in German, French, and English (see p. 43), and through the second and third years in physics (see p. 48).

All special students in Architecture are required to take in full, as a minimum, the following two years' course: —

SCHEDULE OF PARTIAL COURSE IN ARCHITECTURE.

FIRST YEAR.

FIRST TERM.	SECOND TERM.
The Orders and Elements of Arch.	Original Design.
Sketching in Water-Color.	Sketching in Water-Color.
Mechanical Drawing.	Common Constructions.
Materials.	Mechanical and Freehand Drawing.
Shades and Shadows.	Perspective.
Elements of Mechanics.	Ancient and Classic Arch. History.
Graphical Statics.	Strength of Materials.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Original Design.	Original Design.
Sketching in Water-Color.	Specifications and Contracts.
Mediæval and Goth. Arch. History.	Planning.
Specifications.	Iron Construction.
History of Ornament.	Schools, Theatres, Churches.
Problems in Construction.	Acoustics.
Ventilation and Heating.	Surveying.
Working-Drawings and Framing.	Problems in Construction.

The library and museum are described on p. 65.

IV.—ARCHITECTURE.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Materials.	Original Design.
Shades and Shadows.	Common Constructions.
Drawing. Tracing.	Ancient and Classic Architectural History.
The Orders and Elements of Architecture.	Tracing and Perspective.
Analytic Geometry.	Sketching.
Physics.	Differential Calculus.
Descriptive Geometry.	Physics.
Political Economy.	Modern History.
German.	German.

Third Year.

First Term.	Second Term.
Original Design.	Original Design.
Sketching in Water Color.	Sketching in Water Color.
Mediæval and Gothic Architectural History.	Lectures on Fine Arts.
Working-Drawings and Framing.	Iron Construction.
Integral Calculus.	Kinematics and Dynamics.
General Statics.	Strength of Materials.
Structural Geology.	Stereotomy.
Physics: Lectures and Laboratory Work.	Literature.
German.	German.
	Acoustics.

Fourth Year.

First Term.	Second Term.
Advanced Original Design.	Advanced Original Design.
History of Ornament.	Sketching in Water Color.
Sketching in Water Color.	Planning.
Problems in Construction.	Schools, Theatres, and Churches.
Specifications.	Problems in Construction.
Strength of Materials.	Specifications and Contracts.
Lectures on Fine Arts.	Constitutional History.
Ventilation and Heating.	Advanced French.
Advanced French.	Thesis Work.

V. — CHEMISTRY.

The course in Chemistry is primarily designed to prepare students for actual work in connection with manufactures based on chemical principles. It is also adapted to those who intend to become teachers of chemistry.

The class-room work consists of a full course of lectures on general chemistry, and lectures on theoretical, analytical, industrial, and organic chemistry. The non-chemical studies, such as mathematics, physics, mineralogy, English, history, political economy, and language, are selected with reference to their bearing on chemical work or educational value.

The student spends a large part of the four years in the laboratories, the work being arranged as follows: In the first year there is general laboratory practice, in which the student is taught the nature of chemical processes and the use of chemical apparatus, and is drilled in accurate habits of observation. Analytical chemistry — qualitative and quantitative — is begun in the second year, and continues throughout the course. Industrial, sanitary, and organic laboratory practice follow in the third and fourth years.

While there is a certain prescribed course of study and work in the separate departments of chemistry, which all regular students must pursue, there is allowed great latitude of choice of subjects in the third and fourth years.

Effort is made to develop self-reliance in the student, so that he may be fitted to make his way without assistance. To this end, he is obliged to make original investigations, involving research and reference to the appropriate literature in English, French, and German.

The details of instruction in this course, both for regular and special students, are given on p. 44, and the description of the Kidder laboratories on p. 47.

Of 61 living graduates in this course, there are now engaged, 12 per cent in dyeing and bleaching works, 5 per cent as chemists in iron works, 3 as railroad chemists, 7 as analytical chemists, 8 as metallurgists and assayers, 14 as chemical manufacturers, 25 as professors or instructors in chemistry, 3 in gas-works, and 3 per cent as students of chemistry.

V. — CHEMISTRY.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Chemical Analysis.	Chemical Analysis.
Theoretical Chemistry.	Mineralogy and Blowpipe Analysis.
Physics.	Physics.
German.	German.
Political Economy.	Literature.
Analytic Geometry.	*Options.*
	Differential Calculus.
	Physical Geography.
	Microscopical Technology.

Third Year.

First Term.	Second Term.
Chemical Analysis.	Chemical Analysis.
Special Methods.	Theoretical Chemistry.
Industrial Chemistry.	Industrial Chemistry.
Physics: Lectures and Laboratory.	Physical Laboratory.
German.	German.
Literature.	Literature.
Options.	*Options.*
Integral Calculus.	Physics.
Geology.	Geology.
Chemical Analysis.	Sanitary Chemistry.
General Physics (Electricity).	Industrial Chemistry.
Sanitary Chemistry.	

Fourth Year.

First Term.	Second Term.
Chemical Analysis.	Organic Chemistry.
Organic Chemistry.	Thesis Work.
Physics.	
Metallurgy.	
Abstracts.	
Options.	
Physics.	
Language.	
Sanitary Chemistry.	
Laboratory Options.	
Analytical Laboratory.	
Organic Laboratory.	
Metallurgical Laboratory.	
Industrial Laboratory.	

VI.—ELECTRICAL ENGINEERING.

This course has been established in order to meet the wants of young men desirous of entering upon the practice of any of the various applications of electricity in the arts. Its leading studies are physics, especially theoretical and applied electricity, mathematics, and mechanical engineering.

A broad training is obtained by the introduction of full mathematical courses, and studies in history, literature, political economy, and French and German, the latter being of importance in obtaining at first hand a prompt acquaintance with invention and discovery. Of the technical studies of the course, those in mechanical engineering run parallel with the electrical subjects, since in many branches of electrical engineering a sound knowledge of mechanics, motors, of measurements of power and its transmission, etc., is essential. Thus, through the second year the students follow mathematics, mechanism, shopwork, and drawing, to about the same extent as those of the mechanical engineering course. In the third year the pure and applied mathematics, mechanics, and mechanical engineering (lecture and laboratory work) are much the same in the two courses; and certain of these subjects are continued in the fourth year.

A full course in physics begins with the second year and continues, by lectures, recitations, and laboratory work, to the end of the third year. A portion of this is devoted to electricity; and at the middle of the second year, special readings and recitations on this topic are begun, by which the study of the theory of electricity is continued until the end of the third year. Work in the physical laboratory commences at the middle of the second year, and leads up to electrical measurements and testing. In the fourth year are given extended courses on the technical application of electricity to the telegraph, telephone, electric light, etc. Electrical study and research occupy the principal position in the fourth year. A series of advanced mathematical topics is also an important part of the work of this year. Further descriptions of the laboratories are given on pp. 48 to 51.

VI. — ELECTRICAL ENGINEERING.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Physics: Lectures.	Physics: Lectures.
Mechanics and Acoustics.	Physical Laboratory.
Analytic Geometry.	Acoustics and Electricity.
Descriptive Geometry.	Differential Calculus.
Mechanism.	Mechanism.
Carpentry and Wood-turning.	Drawing.
Political Economy.	Metal Turning.
German.	Literature.
	German.

Third Year.

First Term.	Second Term.
Physics: Lectures and Laboratory.	Physical Lab.: Heat, Electricity.
Electricity: Readings.	Electricity: Readings.
Integral Calculus.	Kinematics and Dynamics.
General Statics.	Strength of Materials.
Mechanical Engineering.	Mechanical Engineering.
Drawing.	Mech. Engineering Laboratory.
Literature.	Drawing.
German.	Literature.
	German.

Fourth Year.

First Term.	Second Term.
Technical Applications of Electricity to Telegraph, Telephone, Elec. Lighting, etc.: Lectures.	Technical Applications of Electricity.
Phys. Lab.: Electrical Testing & Construction of Instruments.	Advanced Physics, Memoirs, etc.
Testing of Telegraph Lines, Dynamo Machines, etc.	Physical Research.
Advanced Physics: Memoirs, etc.	Differential Equations.
Photometry.	Calculus of Variations.
Method of Least Squares.	Mech. Engineering Laboratory.
Mechanical Engineering.	Discussion of the Precision of Measurements.
Mech. Engineering Laboratory.	*Options.*
Applied Mechanics, Thermodynamics, Hydraulics, etc.	1. Quaternions.
	2. Physical Laboratory.
	3. Theory of Potential.

Note. — The student is advised to take Advanced German.

VII.A. — NATURAL HISTORY.

The study of Nature is the characteristic feature of this course. It is therefore adapted to students who are looking forward to the teaching of natural science as a profession and affords a substantial foundation for those who wish to become naturalists.

Chemistry, physics, and mathematics form an important part of the earlier scientific topics of the course. The modern languages, history, political economy, literature, and drawing are given the prominence due to them as essentials to broad training, or as necessary auxiliaries to the scientific studies. (See pp. 42 to 50.) Throughout the first two years, the course is almost identical with that in Chemistry; but with the third year the more characteristic studies are introduced.

Of these, the two principal subjects are geology, dealing with the history of the earth, rocks, minerals, fossils, etc. (lifeless things); and biology, treating of plants, the lower animals, and man (living things). To one of these, chosen as a major subject, the student will chiefly devote his attention, although much time must still be given to the other, minor, subject. But in the fourth year attention is concentrated upon the major subject, and the preparation of the thesis occupies most of the final term.

Abundant opportunities are secured for practical laboratory studies in the geological, biological, and mineralogical laboratories (see pp. 61 and 64), while unusual advantages for Natural History studies are offered by the library, museum, and laboratories of the Boston Society of Natural History (see p. 65).

The Institute collections pertaining to this department are also ample, and conveniently placed, the specimens and the systems of arrangement having been selected with special reference to teaching purposes.

For field-work, the vicinity of Boston affords rich opportunity in its long and accessible shore-line, varied geological features, and well-explored botanical fields.

VII.A. — NATURAL HISTORY.

First Year.

Same for all courses. See p. 19.

Second Year.

FIRST TERM.	SECOND TERM.
Physics. Chemical Analysis. Theoretical Chemistry. Analytic Geometry. Political Economy. German.	Chemical Analysis. Mineralogy and Blowpipe Analysis. Microscopical Technology. Physical Geography. Physics. Literature. German.

Third Year.

FIRST TERM.	SECOND TERM.
General Biology. Structural and Chemical Geology. Physics: Lectures and Laboratory. Literature. Zoölogy and Palæontology. German. *Options.* 1. Geology. 2. Physiology. 3. Zoölogy.	Historical Geology. Zoölogy and Palæontology. Literature. Physical Laboratory. German. *Options.* 1. Geology. 2. Cryptogamic Botany; Comparative Anatomy; Embryology. 3. Zoölogy.

A part of the summer vacation is to be devoted to field or seaside work.

Fourth Year.

FIRST TERM.	SECOND TERM.
Bibliography: Abstracts. Language. *Options.* 1. Geology. 2. Physiology and Histology; Higher Biology: Lectures. 3. Zoölogy.	History of the Natural Sciences. Climatology. The Teaching of Natural History. Thesis Work. *Options.* 1. Geology. 2. Physiology and Histology; Higher Biology: Lectures; Heredity: Lectures. 3. Zoölogy.

VII.B.—BIOLOGY, PREPARATORY TO MEDICAL STUDIES.

The establishment of a course of study in which Biology is a prominent feature is a natural result of the recent remarkable development of the biological sciences, and of the intimate relations now recognized as existing between biology and medicine in its more modern and scientific form. These relations, together with the important applications of physics and chemistry to physiology, indicate, as peculiarly adapted to one whose ultimate object is the study of medicine, a preparatory course whose characteristics shall be the combined studies of biology, physics, and chemistry.

With these are associated other important scientific topics, such as zoölogy, palæontology, geology, and studies of the modern languages, history, literature, political economy, etc. The aim is to make the student familiar with the anatomy and physiology of normal living things, thus supplying him with a knowledge which is admitted to be of inestimable value in the study of disease, and an education of the hand, the eye, and the brain, which comes only from prolonged acquaintance with, and constant use of, the microscope, the scalpel, and instruments of precision applied to the study of organic structure and function.

The organisms studied in the earlier years include such forms as yeast, amœba, moulds, bacteria, the fern, the seed-plant, hydra, the earthworm, lobster, dog-fish, frog, pigeon, and rabbit; while in the later years higher biology (introducing topics like natural selection, mimicry, the germ theory of disease and evolution) is carried on contemporaneously with comparative anatomy, embryology, experimental animal physiology, and histology. To this end a large biological laboratory is provided, a description of which, with an enumeration of some of the apparatus at command, will be found on p. 64.

VII.B.—BIOLOGY, PREPARATORY TO MEDICAL STUDIES.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Physics.	General Biology and Botany.
Chemical Analysis.	Chemical Analysis.
Analytic Geometry.	Physics.
Theoretical Chemistry.	Physical Geography.
Political Economy.	Literature.
German.	German.

Third Year.

First Term.	Second Term.
Sanitary Chemistry.	Comparative Anatomy and Embryology.
General Biology; continued.	Zoölogy and Palæontology.
Physics: Lectures and Laboratory.	Physical Laboratory.
Structural Geology.	Historical Geology.
Zoölogy and Palæontology.	Literature.
Literature.	German.
German.	*Options.*
Options.	1. Physics.
1. Physics.	2. Chemistry.
2. Chemistry.	3. Biology.
3. Biology.	

Fourth Year.

First Term.	Second Term.
Animal Physiology and Histology.	Physiology and Histology.
Ventilation and Heating.	Heredity: Lectures.
Bibliography: Abstracts.	Higher Biology: Lectures.
Higher Biology: Lectures.	Climatology.
Options.	Water Supply and Drainage.
1. Physics.	History of the Biological Sciences.
2. Chemistry.	Thesis Work.
3. Biology.	

VIII. — PHYSICS.

As distinguished from the professional or technical courses, e.g., those in Engineering, Architecture, etc., there are offered by the Institute courses of a purely scientific nature, of which this is one. It contains a series of studies adapted to those who wish to become teachers of physics, or who desire to begin upon a course in pure science with a view to its further continuance, or wholly as a matter of training. A strong line of mathematical topics and the continuous study of physics are its leading features. General, theoretical, and organic chemistry, and chemical analysis, occupy a position next in prominence to mathematics, but of hardly less importance. Options are so arranged that choice may be made between the pursuit of more advanced mathematical and chemical topics; also between shopwork instruction in the use of tools and work in the biological laboratory.

The historical, and other allied subjects, and the modern languages continue throughout the first three years; and the latter, which are of great importance, may be further prolonged if desired. Chemistry may be continued up to the middle of the last year, and mathematics, pure and applied, throughout the whole four years. Physics begins with the second year, and by lectures, readings, recitations, and laboratory exercises extends to the close of the course. A large amount of experimental work is performed, and an experimental investigation is undertaken during the fourth year in connection with the preparation of the thesis. At all times it is sought to encourage the spirit of original research, and to impart an understanding of the principles upon which scientific investigation, especially in quantitative measurement, should be conducted.

The advantages offered by the Rogers Laboratory of Physics, notably in the direction of electricity, acoustics, and heat, by the large equipment of apparatus, are somewhat unusual. The study of special topics is greatly facilitated by many valuable libraries to which, by right or courtesy, the students have admission.

VIII. — PHYSICS.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Physics: Lectures. Mechanics and Acoustics. Analytic Geometry. Chemical Analysis. Theoretical Chemistry. Descriptive Astronomy. Political Economy. German.	Physics: Lectures. Physical Laboratory. Acoustics and Electricity. Differential Calculus. Microscopical Technology. Literature. German. *Options.* 1. Chemistry. 2. General Theory of Equations and Determinants.

Third Year.

First Term.	Second Term.
Physics: Lectures and Laboratory. Optics or Electricity: Readings. Integral Calculus. General Statics. Physical Laboratory. Literature. German. *Options.* 1. { Chemistry. / Histology or Shopwork. 2. { Analytic Geometry of Three Dimensions. / Histology or Shopwork.	Physical Laboratory: Heat, Electricity. Optics, Electricity, or Heat: Readings. Kinematics and Dynamics. Strength of Materials. Theoretical Chemistry. Literature. German. *Options.* 1. Chemistry. 2. Advanced Analytic Geometry and Calculus.

Fourth Year.

First Term.	Second Term.
Physical Laboratory. General Physics. Advanced Physics: Memoirs, etc. History of Physical Science. Photography. Applied Mechanics: Thermodynamics. Method of Least Squares. *Options.* 1. Chemistry. 2. Defin. Integrals.	Physical Research. General Physics. Advanced Physics: Memoirs, etc. Differential Equations. Calculus of Variations. Discussion of the Precision of Measurements. *Options.* Physiological Measurements. Physical Laboratory. Quaternions. Theory of Potential.

IX.—THE GENERAL COURSE.

This course has been laid out to meet the wants of students who do not intend to enter any technical profession (such as those to which Courses I. to VI. have special reference), or to follow a career of scientific investigation (for which either Course VII., Natural History, or Course VIII., Physics, would serve as an appropriate preparation and introduction), but who purpose to engage in some branch of commercial or manufacturing business, or in some work of general administration. For such scholars the studies of Course IX. have been arranged with a view to securing an education primarily through scientific study and experiment, yet with a larger amount of philosophical study in history, language, and literature than is found compatible with the requirements of any of the other courses in the Institute. The space for studies of the general character indicated has, in forming Course IX., been cleared by the omission of much of those highly technical exercises which are essential to one or another of the first six courses, or of some of that special training and special knowledge which is required for a satisfactory attainment of the purposes of Courses VII. and VIII. The time thus released is occupied, in Course IX., by (1) the more extended study of French and German; (2) the introduction of other modern languages, especially Spanish and Italian; (3) the more extended study of the so-called English subjects required in the other regular courses; viz., history, especially the history of the United States, English literature, political, commercial, and industrial geography, and political economy; (4) the introduction of certain subjects for which no room can be found in the professional courses, but a knowledge of which is likely to be useful to the man of business, or which minister to general culture; e.g., finance, statistics, and commercial and international law.

From the nature of the course, wider lines of choice as to the direction of study and investigation are possible in the later years than in most other courses.

IX. — GENERAL COURSE.

First Year.

Same for all courses. See p. 19.

Second Year.

First Term.	Second Term.
Physics: Lectures.	Physics: Lectures.
Political Economy.	Literature.
German.	Constitutional History of England and the United States.
Advanced French.	German.
Analytical Geometry.	Advanced French.
1. } *Options.*	*Options.*
2. }	1. General Biology and Botany.
3. } Theoretical Chemistry.	2. Physical Geography.
4. }	3. Mineralogy and Blowpipe Analysis.
5. { Advanced Trigonometry. { Spherical Trigonometry.	4. Chemical Analysis.
	5. Differential Calculus.

Third Year.

First Term.	Second Term.
Physics: Lectures and Laboratory.	Physical Laboratory.
Literature.	Literature.
Industrial History.	International Law and American Illustrations.
German.	Commercial Geography.
Language.	History of Commerce.
Carpentry and Wood-turning.	German.
Options.	Language.
1. Biology.	Historical Geology.
2, 3. Geology; Zoölogy and Palæontology.	Metal Turning.
4. Ind. Chem.; Chem. Analysis.	*Options.*
5. Integral Calculus.	1. Biology; Embryology; Physiology.
	2, 3. Special Geological Work; Zoölogy and Palæontology.
	4. Ind. Chem.; Theoret. Chem.
	5. Gen. Theory of Equations; Determinants.

Fourth Year.

First Term.	Second Term.
Advanced German.	Advanced German. Literature.
Heating and Ventilation.	Finance. Administration.
English Literature. Tariffs.	Statistics and Graphic Methods.
Logic. Railroad Management.	Thesis Work.
Thesis Work.	*Options.*
Options.	1. { Physiology and Histology. { Climatology.
1. Physiology and Histology.	2. Geology; Climatology.
2. Geology.	3. { Zoölogy and Palæontology. { Climatology.
3. Zoölogy and Palæontology.	4. Chemical Laboratory.
4. Industrial, Analytical, or Sanitary Chemistry.	5. { Advanced Analytic Geom. { Differential Equations or Quaternions.
5. { Definite Integrals. { Analytic Geometry of 3 dimensions or Least Squares.	

SPECIAL COURSES.

In general, no schedule for special courses of study is laid down; but any special course selected by the student or applicant, and receiving the approval of the Faculty, may be pursued. Applicants should consult the Schedule of Topics, pp. 18 and 74. Special opportunity for the pursuit of laboratory and lecture courses is afforded to teachers, and to persons of mature years engaged in technical pursuits. All special students in Architecture are required to take in full, as a minimum, the course of two years' duration laid down on p. 26 and for admission to which the full entrance examinations are required. (See pp. 67 to 70.) Special students in Chemistry must pass the entrance examinations. (See pp. 67 to 70.)

REQUIREMENTS FOR GRADUATION.

The degree, Bachelor of Science, in the course pursued, is given for the satisfactory completion of any regular course of study.

To be entitled to a degree, 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 submitted to the Faculty for approval three days before the first degree examination, unless the thesis or design be dependent on laboratory work, in which case it must be presented two days after the close of the respective laboratories.

Students leaving the school before graduation shall be en-

titled to receive an honorable dismission, if their record for conduct, attention to studies, and scholarship, is satisfactory to the Faculty.

ADVANCED COURSES.

The degree, Master of Science, is awarded for proficiency in complete advanced courses of study of at least one year's duration.

The degrees, Doctor of Philosophy and Doctor of Science, are awarded for proficiency in complete advanced courses of study of at least two years' duration.

The particular course of study which candidates for these degrees wish to pursue must be submitted in writing to the Faculty, and must meet with approval. 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.

Advanced courses in chosen lines of study, and without reference to the degrees, may be pursued by graduates of the Institute without preliminary examination, or by Bachelors of other institutions, who shall satisfy the Faculty, by examination or otherwise, that they are qualified to take with advantage the course proposed.

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, subjects. In many branches, the instruction given differs widely from available text-books; and, in several such cases, notes on extended courses of lectures and laboratory work have been printed, either privately or by the Institute, and are furnished to the students at cost. A high value is set upon the educational effect of laboratory practice, drawing, and field-work.

Written Examinations. — Besides oral examinations 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. After the examinations, the standing of the student 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.

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 further instruction in the engineering and other courses. (See p. 74.)

The four topics following are taken by all regular students : —

1. Advanced Algebra.
2. Solid and Spherical Geometry.
3. Logarithms and Plane Trigonometry, with practical applications to the computation of triangles and the solution of such problems as occur in surveying.
4. Plane Analytical Geometry, including the equations and properties of the point, right line, and circle, and of the parabola, ellipse, and hyperbola.

Following these, a course in Spherical Trigonometry, including the solution of problems in latitude and longitude, is given to students of Civil Engineering. Students in all the Engineering courses receive instruction in the Differential and Integral Calculus.

In addition to the above, the following topics are given in some courses : —

1. Differential Equations, with applications to problems in Geometry.
2. The Theory of Probability and Method of Least Squares, including the adjustment of observations and the computation of probable errors.
3. Determinants.

As elective work, opportunities are afforded for the study of —

1. Advanced Trigonometry, including De Moivre's Theorem and its applications.

2. The General Theory of Equations, with the solution of higher equations by methods of approximation.

3. Analytical Geometry of Three Dimensions: the equations and properties of the point, right line, and plane, of the sphere, cylinder, and cone, and of the paraboloids, ellipsoids, and hyperboloids.

4. An advanced course in Analytical Geometry and the Calculus.

5. Definite Integrals, with the theory of the Gamma function.

6. Quaternions.

The Instruction in Descriptive Geometry. — The exercises in Descriptive Geometry are of two kinds. In the lecture-room the instruction is given by means of models and diagrams, and also by the use of text-books. In the drawing-room the student is drilled in the construction of such problems as shall illustrate the work of the class-room, and make him thoroughly familiar with this branch of mathematics.

The Instruction in Drawing. — Instruction is given to all regular students in the principles of Geometrical, Mechanical, and Freehand 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. Drawing is also continued in connection with the professional studies.

The Instruction in Modern Languages. — While the primary object of the instruction in French and German is reading, so that the student may avail himself of foreign works relating to his particular department, much importance is attached to the study of these languages as a means of general training. In either case, a thorough and systematic study of the structure of the language is deemed to be an

essential basis. This is, however, accomplished by means of practical work with the language itself, including written and oral exercises, rather than by an abstract study of the rules of grammar. French (see conditions of admission, p. 67) is continued through one year, and German through two years, for all regular students. In certain departments, there is an advanced course in each. Instruction in the elements of Italian and Spanish is also offered.

The Instruction in English. — In this department, all regular students receive a course of instruction in Rhetoric and Criticism, in the elements of Deductive and Inductive Logic, and in the History of English Literature. This is accompanied by practice in composition, and in the critical reading of English texts, so far as time allows. Additional instruction in these subjects is given in connection with the General Course. (See p. 38.)

The Instruction in History and Political Science. — All regular students receive instruction in the history of recent times, followed by a course in general European History, and a course in English and American Constitutional History. A course in Political Economy is given to all regular students. Students in the General Course receive more extended instruction in History and Political Science. (See p. 38.)

The Instruction in Chemistry. — All students who are candidates for a degree attend a course of lectures on Inorganic Chemistry, illustrated by experiments, and perform actual experimental work in the laboratory for general chemistry. The lectures are intended to prepare the student for his work in the laboratory, and to emphasize the facts which he there learns. In the laboratory, the student receives instruction in chemical manipulation, and performs a series of experiments designed to illustrate the properties of the more important elements, and the laws of chemical action. In connection with the lectures in Inorganic Chemistry, the elements of theoretical chemistry are taught; and the stu-

dent has practice in the solution of stochiometrical and other chemical problems. The study of the theory of the subject is continued by a more advanced course of lectures and recitations, in which are presented the prevailing theoretical views as to chemical action, the constitution and classification of chemical compounds, as well as certain portions of molecular physics which bear directly upon chemical theories, especially in the matter of thermo-chemistry.

The instruction in Analytical Chemistry extends through two or more years. Each student is given a desk in the laboratory, which is open to him at all times, and he receives personal instruction. Regular students have analytical work assigned them with particular reference to the course they are pursuing. This work is so arranged that they obtain experience in a great variety of methods and processes, and are thus prepared to undertake any chemical analysis. The more industrious students, and those who work extra time in the laboratory, have the privilege of supplementing their regular laboratory course with special work and instruction if they desire it. Special students may select any branch of analytical work for which they are qualified.

Particular attention is given to volumetric analysis. A special laboratory is fitted for this work, and the students are taught to graduate and calibrate the various instruments of measurement.

As an introduction to original work, each student is required to undertake a critical examination of some process of analysis, to determine its limits of accuracy under various conditions, and to make a written report thereon.

The special instruction in the laboratory is supplemented by lectures upon methods of analysis and manipulation; and the current chemical literature in English, French, and German is reviewed by the students, and subsequently discussed in the class-room under the direction of one of the professors.

The instruction in Sanitary Chemistry consists mainly of laboratory work, and a special laboratory has been equipped for the purpose. For all who choose to pursue the subject, a minimum amount of work is laid out, consisting of a study

of the methods in common use for the chemical examination of air and water, of milk and of butter. Subsequently opportunity is afforded for the critical study of other methods of analysis, for the examination of other articles of food, and for the investigation of a variety of sanitary problems in which chemical questions are involved.

Industrial Chemistry is taught by a course of lectures, and by work in the laboratory of industrial chemistry. A full description of the most important technical applications of chemistry is given in the lectures. A part of the lectures are given by persons actively employed in carrying out the processes which they describe. In the industrial laboratory, the students prepare chemical products from raw materials. They also undertake the preparation of pure chemicals. They are taught fractionation and distillation. Particular attention is paid to the preparation of dyes and mordants. A full course of instruction in bleaching and dyeing is given. It includes scouring, bleaching of cotton and wool, and the dyeing of yarn and cloth. The students are taught how to make comparative tests of dye-stuffs, and qualitative tests to determine the dyes present upon fibres. The students also become familiar with many of the most useful methods of commercial analysis. The laboratory instruction is supplemented by excursions to manufacturing establishments where the practical working of chemical industries can be examined.

The instruction in Organic Chemistry consists of lectures and laboratory work. The theories of organic chemistry are discussed, and the practical applications of these theories described. The work in the laboratory consists of ultimate analysis, preparation of organic products, and original research. Ample opportunities are afforded for the prosecution of investigations in organic chemistry.

The instruction in Chemistry is designed primarily for those who are candidates for the several degrees of the Institute, and for such special students as are looking to chemistry as a profession, and are following, in the main, the courses laid out for the regular students. Such special students are required to study French and German as a part of their

course, and are held to the same examinations in the subjects which they pursue as are the regular students. In addition, the Institute desires to make available all the facilities of the lecture-rooms and laboratories to teachers who wish to perfect themselves in chemistry, and to persons of maturer years who are engaged in technical pursuits, and who wish to acquire an accurate knowledge of the science. Such persons may be admitted without formal examinations, on satisfying the professors in the department that they are competent to pursue to advantage the subjects chosen.

The Kidder Laboratories of Chemistry afford accommodations for five hundred students. The chemical department occupies thirteen laboratories, two lecture-rooms, a reading-room, balance-room, offices, and supply-rooms: in all, twenty-two rooms. The laboratory for general chemistry has places for two hundred and eighty-eight students, and is very completely equipped for instruction in elementary chemistry. The analytical laboratory can accommodate one hundred and fifty students, and possesses every convenience for accurate and rapid analytical work. The organic laboratory has places for thirty students. Conveniences are afforded for conducting offensive and dangerous operations in the open air, or in a separate room. The sanitary laboratory contains places for sixteen students. It possesses a very complete outfit for the analysis of air and water, and for the investigation of sanitary problems. The laboratory for industrial chemistry accommodates sixteen students. It contains jacketed kettles, a centrifugal drier, drying-chambers, stills, presses, and numerous other pieces of apparatus needed to perform chemical operations upon a considerable scale. In connection with this laboratory is a room devoted to textile coloring, furnished with kettles, water-baths, drying-room, and various working-models of machines used in this branch of applied chemistry. Kidder Hall has a seating-capacity of one hundred and eighty, and is arranged with special reference to the delivery of experimental lectures. In addition, there is a small

lecture-room, seating thirty. The lecture-rooms contain valuable cabinets of specimens for purposes of illustration. The balance-room is supplied with twenty-two balances.

The reading-room of the department contains the chemical library, which now numbers over twenty-three hundred volumes, having been enriched during the past year by the gift of Professor Charles H. Wing of his chemical library, and by the bequest of the late Professor William Ripley Nichols of his scientific library, which includes one of the most complete collections of books and periodicals relating to sanitary chemistry in existence. The reading-room also contains files of all the important chemical periodicals.

The Instruction in Physics. — This begins with a series of lectures attended by all regular students, in which the whole subject of Physics is discussed. The various branches are treated both mathematically and experimentally. In all cases, the theoretical discussion of a question is followed by a full account of its practical applications.

The Institute possesses an extensive and rapidly increasing collection of physical apparatus, which has recently been materially increased by a gift from the late Dr. Robert E. Rogers, of his valuable cabinet of optical and electrical instruments.

In addition to the courses of general lecture-room and laboratory exercises in Physics, which are required of all regular students, various special courses of lectures, readings, and laboratory exercises in Optics, Acoustics, Heat, and Electricity, are provided for those making a specialty of Physics. Students pursuing these courses gain a familiarity with standard works on the various branches of Physics, in both their own and foreign languages. The subject of Photography, including its applications to micro-photography, spectrum photography, and the various photo-mechanical processes, will be discussed in a series of lectures accompanied by practical exercises in the photographic laboratory. Instruction is also given in Microscopy, and in the use of the lantern as an instrument of demonstration in the lecture-

room. A course of lectures and laboratory instruction in Calorimetric Measurements and allied subjects has been instituted, and the course in general Electrical Measurements is undergoing continual extension.

The Rogers Laboratory of Physics. — All regular students enter upon a general course of experimental work in this laboratory after the lecture course on Physics. The work is designed to strengthen the student's grasp of the laws and phenomena of that science, and to impart to him a knowledge of methods and instruments used in measurement, and of the mathematical discussion of experimental results. The laboratory work consists almost exclusively of quantitative measurement. The earlier and simpler work serves chiefly to train the student in the use of methods or instruments which are employed as accessories later. To this succeed experiments on the mechanics of solids, liquids, and gases, each illustrating a method by which some physical law or constant is determined. Work in optics follows; and heat and electrical measurements occupy the remaining and more difficult part of the course, more advanced instruction in both, however, being provided for.

Accurate work is required throughout; and in connection with the use of instruments of precision, especially in the more advanced measurements, the student's attention is particularly directed to the study of possible sources of error, and to the discusssion of the effects of these on the results obtained.

The particular line of work assigned to each person is adapted, to some extent, to his course in the school; and the instruments which he studies are often such as he will be called upon to use in later technical work. A brief course in photography is given to all regular students. In some courses, e.g., Physics, Electrical Engineering, and Chemistry, work of a more advanced scientific or technical nature is carried on. Original investigation is encouraged as far as possible, and the result has been a considerable number of published memoirs.

The library of the department contains the standard works upon various branches of Physics. It is especially full in those relating to electricity, and all new works of value on that subject are added as they appear. Most of the leading scientific and technical periodicals devoted to Physics are regularly received, and are accessible to students. A complete set of the Proceedings of the American Academy of Arts and Sciences, and of the Proceedings of the American Association for the Advancement of Science have been received as gifts from those societies.

The Instruction in Electrical Engineering. — As a foundation for subsequent work, thorough instruction is given in the theory of electricity. An extended course of lectures is devoted to the consideration of the various technical applications of electricity to land and submarine telegraphy, the telephone, electric lighting, and the electrical transmission of power. Instruction is given by lectures and laboratory exercises upon the processes of photometry, especially as applied to the measurement of electric lights. Advanced instruction in electrical measurements, including work with dynamo-electric machinery, together with a course on the electrical testing of telegraph lines, is provided. The subjects of construction, specifications, and contracts also receive attention.

In the later part of the course, each student prepares and reads before his class an essay on some electrical process, instrument, or system, or other professional topic. These are written after a study of recently published papers and memoirs, and often embody also the results of experimental work by the student. They are intended to familiarize the class with the topics presented, and to give experience in independent study, and in the preparation of original scientific papers. The work is also of particular advantage to those who intend to become teachers.

Besides the work done by the regular staff of instruction of the Institute, special teaching will be given by gentlemen who are professionally engaged in various departments of

Electrical Engineering, or especially conversant with certain branches of applied electricity. During the past year such instruction has been given by the following gentlemen: —

Mr. George W. Blodgett, Electrician of the Boston and Albany Railroad, on the Application of Electricity to Railway Signalling; Mr. J. Rayner Edmands, of the Harvard College Observatory, on the Establishment and Distribution of Time; Mr. C. J. H. Woodbury, of the Manufacturers' Mutual Fire Insurance Company, on Electric Lighting in its Relation to Fires and Fire Insurance; Mr. C. A. George, on Municipal Fire Alarm Systems. It is expected that these courses will be still further extended during the current year.

The Institute has received from the Union Electric Switch and Signal Company the valuable gift of a complete set of its electric railway signals, and is also indebted to the Brush Electric Company for the loan of a dynamo-electric machine, and a storage battery, together with electric lamps of several patterns. A Weston 60-light incandescent dynamo machine, a Gramme machine, and a compound dynamo for experimental purposes have recently been added to the apparatus available for instruction in this department. It has also received from the Edison Electric Light Company an illustrative set of incandescent lamps, switches, cut-outs, and other devices.

The Instruction in Theoretical and Applied Mechanics begins with the study of the Composition and Resolution of Forces, the general laws of Kinematics and Dynamics, mathematically discussed, the principles governing the determination of the stresses in the different members of trusses, centre of gravity, moment of inertia, and the ordinary principles of the strength of materials.

The more advanced part of this instruction embraces the completion of the study of Strength of Materials, including laboratory work, Theory of Elasticity, main principles of the Stability of Arches and Domes, and special study of Dynamics.

The methods of the differential and integral calculus are freely used whenever they are the most convenient.

The Laboratory of Applied Mechanics. — The object of this laboratory is to give to the students, as far as possible, the opportunity of becoming familiar, by actual test, with the strength and elastic properties of the materials used in construction. A plan of it will be found between pp. 56 and 57.

It is furnished with the following apparatus : —

1. An Olsen testing-machine of fifty thousand pounds capacity, capable of determining the tensile strength and elasticity of specimens not more than two feet long, and the compressive strength of short specimens.

2. A testing-machine of fifty thousand pounds capacity, capable of determining the transverse strength and stiffness of beams up to twenty-five feet in length, as well as of many of the framing-joints used in practice.

3. Machinery capable of determining the strength, twist, and deflection of shafting when subjected to such combinations of torsional and transverse loads as occur in practice, and while running.

4. Machinery for making time-tests of the transverse strength and deflection of full-size beams.

5. A machine for testing the tensile strength of mortars and cements.

6. The accessory apparatus needed for measuring stretch, deflection, and twist.

The classes are divided into small sections when making tests with machines.

All the experiments are so chosen as to make the student better acquainted with the resisting properties of materials, many of them forming part of some original research. Those on transverse strength and stiffness have also determined certain constants for use in construction, which had not previously been determined from tests on full-size pieces.

The Instruction in the Mechanic Arts. — 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. Mechanical laboratories have been 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, some manual skill in the use of tools, and a thorough knowledge of what can be accomplished with them. These laboratories are now located in the building on Garrison Street, and are equipped as follows: —

The carpenter, wood-turning, and pattern-making departments contain 40 carpenter's benches, 2 circular-saw benches, a swing-saw, 2 jig-saws, a buzz-planer, a boring-machine, 36 wood-lathes, a large pattern-maker's lathe, and 36 pattern-maker's benches. The foundry contains a cupola furnace for melting iron, 2 brass furnaces, and 32 moulder's benches. The forge-shop contains 32 forges, 7 blacksmith's vises, and 1 blacksmith's hand-drill. The machine-shop contains 23 engine-lathes, and 14 hand-lathes of recent approved patterns, 2 machine drills, 2 planers, a shaping-machine, a universal milling-machine, a grinding-lathe, and 32 vise-benches arranged for instruction in vise-work.

The Instruction in Civil Engineering is given by means of lectures and recitations, and by practice in the field and in the drawing-room. Visits are also made to works of interest and to manufacturing establishments of various kinds.

In surveying, the use of the various instruments is taught mainly by actual work in the field, covering the different operations involved in land, topographical, hydrographical, railroad, city, and mining surveying. The work in the drawing-room consists in representing upon paper the surveys made in the field, followed by topographical and map drawing; in topographical and other drawing, in connection with the field-work in railroad location; in the production of finished plans from direct measurement of actual engineering structures; and in making complete designs and working-drawings of bridges and other structures, plans for sewerage and water-supply, etc.

The course in Roads and Railroads includes the survey, location, construction, and equipment of railroads; and the

laying-out, building, and maintaining of town and county roads, and of city streets and pavements. In addition to the work in the class-room, an actual railroad survey and location, several miles in length, is made each year upon such ground as shall best illustrate the actual problems occurring in practice. Advanced courses (optional) are also given, embracing the subjects of railroad management and transportation, rolling-stock, motive-power, signals, etc.

The course in Hydraulic Engineering embraces the subjects of theoretical hydraulics with its practical applications, — hydrology, rivers and canals, water-supply, water-power, foundations, coast and harbor works, and irrigation. The practical application of the principles of hydraulics is illustrated by numerous examples; and in hydrometry the student is made practically familiar with the best methods, by actual practice in gauging rivers with instruments of various kinds, which have been provided for the use of the classes. The subjects of hydrology and irrigation are considered in detail, with reference to the conditions found in the United States. Special attention is given to the sources and supply of water, to its flow in natural and artificial channels, and to the methods of collecting, storing, filtering, raising, and distributing water for domestic purposes, with practical details for carrying out such works. A particular study is also made of the control and improvement of rivers, of the construction of locks, dams, and canals, and of the utilization and distribution of water as a motive-power, excursions being made to the cities of Lowell, Lawrence, and Holyoke, for practical illustrations of this branch of engineering. Under coast and harbor works are considered the design and construction of harbors, docks, sea-walls, breakwaters, and jetties, the maintenance of channels, and the protection of coasts. The course in Sanitary Engineering embraces the study in detail of the house, with its apparatus, the disposal of sewage by surface or sub-surface irrigation for isolated buildings, the collection and removal of sewage in the larger towns, sanitary drainage for cities, and drainage and irrigation for agricultural purposes. Frequent opportunities are given to the

student for the inspection of actual examples of sanitary engineering, and a study is made of the questions of the day in relation to public health.

The course in Principles of Construction embraces a study of the methods of determining the stresses in bridges and roofs, and of investigating the stability and strength of piers, abutments, arches, retaining-walls, and similar structures. The course in Bridges and Roofs consists in a detailed study of the different structures of this class, with reference to economy of material, methods of proportioning parts, and the details of design. Parallel with it goes the work in the drawing-room, in which the student is required to make complete designs and working-drawings, with blue prints, for several structures of this kind. The materials used in engineering are studied in the courses on the Strength of Materials and the Metallurgy of Iron; and, in addition, further study is devoted to this subject in connection with the other courses, each material being taken up in conection with the structures in which it is most extensively applied. A laboratory for cement testing, fitted with all the necessary apparatus, is thus made extensive use of by the students in Sanitary and Hydraulic Engineering. The study of Specifications and Contracts is taken up in connection with each of the special courses, and a variety of actual specifications are studied in detail, each in its proper place. The course in Geodesy and Practical Astronomy includes the study of descriptive, spherical, and practical astronomy, and of the mathematical and physical principles of geodesy, with practice in some of the simpler geodetic field operations.

By the kindness of many active members of the profession, and especially through the courtesy of Mr. W. H. Barnes, General Manager of the Boston and Albany Railroad, and of Mr. James T. Furber, General Manager of the Boston and Maine Railroad, the classes are able to inspect a great variety of engineering works, and to carry on field operations in specially favorable localities. The help thus received has been of great value.

In addition to the regular lectures of the school, many

prominent engineers in the active practice of their profession have consented to deliver occasional lectures on subjects with which they are specially familiar.

The Instruction in Mechanical Engineering is given by means of lectures and recitations, and by practice in the drawing-rooms and in the mechanical engineering laboratory. Frequent visits, also, are made to machine-shops and manufacturing establishments, to witness machinery in operation, and manufacturing processes in addition to those which can be seen at the Institute itself.

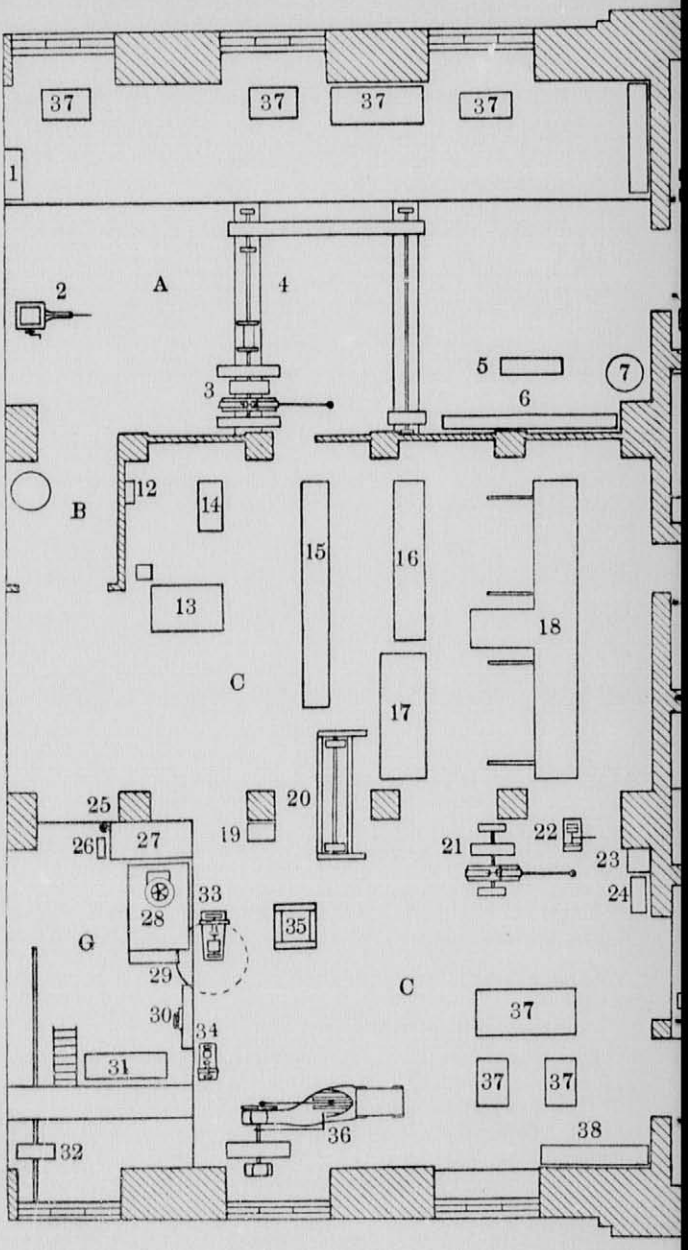
The laboratory work, in its earlier portions, is devoted to some of the more simple experiments, such as will impart to the students a familiarity with the manner of running the engines, taking indicator cards, and using the other apparatus in the laboratory. The later laboratory work takes very largely the form of original research ; and it is intended that the students of this laboratory shall, under suitable direction, undertake the experimental investigation of a number of important engineering problems.

A large amount of drawing is done by the students throughout their course in connection with their regular work, drawing for mere practice ceasing at the end of the first year. A style is adopted that is believed to be a good one, and is adhered to throughout ; and early in their course the students are taught to use the "Blue process."

Besides the teaching done by the regular corps of instructors, lectures upon special subjects are given by gentlemen actively engaged in the profession. During the last school-year lectures were given by the late Mr. J. C. Hoadley, on Steam-Engine Practice ; Mr. H. A. Hill, on Stationary Engines ; Mr. A. F. Hall, on Indexing Drawings, etc. ; Mr. Charles T. Main of the Pacific Mills, on Mill Construction ; Mr. James N. Lauder of the Old Colony Railroad, on the Locomotive ; and Mr. Edw. Atkinson, on Mill Construction.

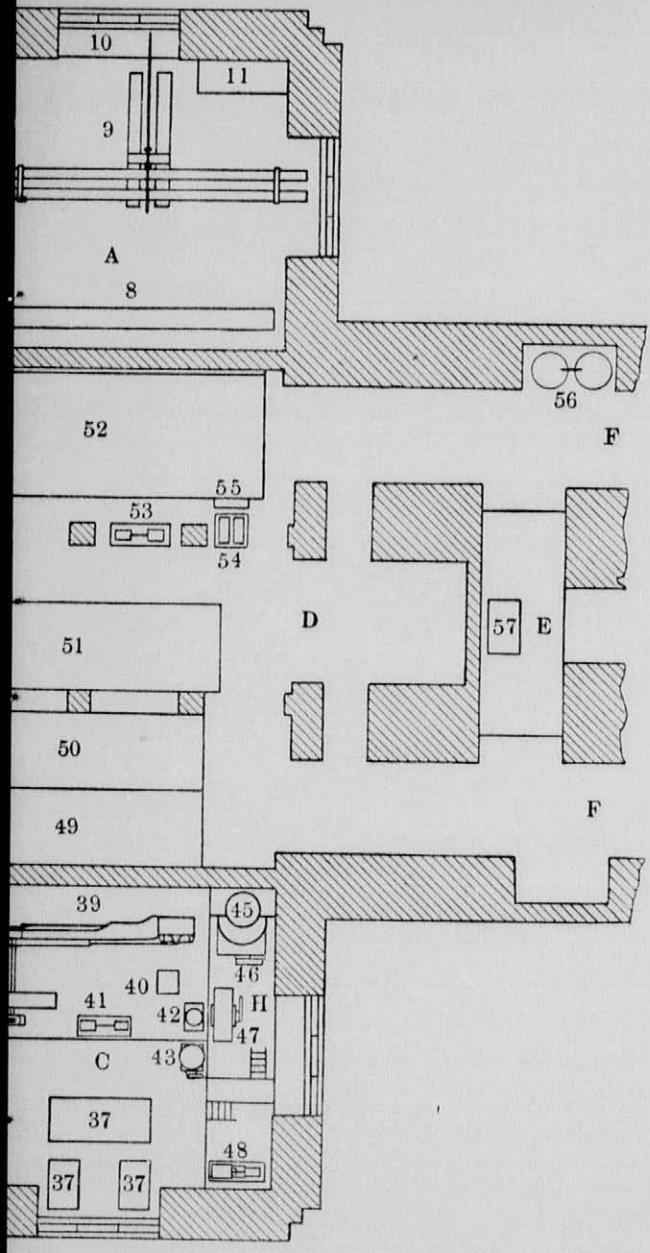
The mechanical engineering students of the fourth year's class were afforded the privilege of attending the sessions of

LABORATORIES OF APPLIED MECHAN



A. Applied Mechanics Laboratory.
B. Entrance Hall and Circular Stairway.
C. Mechanical Engineering Laboratory.
D. Boiler Room.
E. Elevated Platform.
F. Coal Bins.
G. Large Pit.
H. Small Pit.

1. Workbench.
2. Olsen Testing-Machine. (50,000 lbs.)
3. Friction Brake. (30 H.P.)
4. Machine for Testing Shafting.
5. Cement-Testing Machine.
6. Specimen Case.
7. Forge.
8. Machine for Time Tests of Beams.
9. Transverse Testing-Machine. (50,000 lbs.)
10. Workbench.
11. Dark Room.
12. Yarn-Testing Machine.
13. Cotton Card.
14. Drawing Frame.
15. Speeder.
16. Fly Frame.
17. Ring-Spinning Frame.
18. Mule.
19. Standard Gauge and
20. Belt-Testing Machi
21. Friction Brake. (2
22. Webber Dynamome
23. Workbench.
24. Lathe.
25. Mercury Column.
26. Knowles's Pump.
27. Tank for Turbine.
28. Swain Turbine.
29. Cistern.
30. Tank on Scales.



31. Large Surface-Condenser.
32. Main Shaft to New Building.
33. Large Centrifugal Pump.
34. Small Centrifugal Pump.
35. Belt-Testing Machine.
36. Porter-Allen Engine. (80 H.P.)
37. Desk.
38. Instrument Case.
39. Harris-Corliss Engine. (16 H.P.)
40. Small Condenser.
41. Blake Pump.
42. Barrus Calorimeter.
43. Tank on Scales.

45. Small Tank at Foot of Standpipe.
46. Large Tank at Foot of Standpipe on Scales.
47. Tank on Scales.
48. Deane Vacuum Pump.
49. Low-Pressure Boiler No. 1.
50. Low-Pressure Boiler No. 2.
51. High-Pressure Boiler No. 3.
52. High-Pressure Boiler No. 4.
53. Blake Pump.
54. Worthington Pump.
55. Mack Injector.
56. Tanks for Use during Boiler Tests.
57. Tank on Scales for Use during Boiler Tests.

the American Society of Mechanical Engineers at its meeting of November, 1885, at the Institute of Technology.

The Laboratory of Mechanical Engineering. — The objects to be accomplished by this laboratory are the following: —

1. To give to the students practice in such experimental work as they are liable to be called upon to perform in the practice of their profession, as boiler and engine tests, pump tests, calorimetric work, measurement of power, etc.

2. To give to the students practice in carrying on original investigations on mechanical engineering subjects, with such care and accuracy as to render the results of real value to the engineering community.

3. By publishing, from time to time, the results of such investigations, to add gradually to the common stock of knowledge.

The laboratory contains as a portion of its equipment, —

1. An eighty-horse-power Porter-Allen engine, by which power is also furnished to the new building and to the mining department.

2. A sixteen-horse-power Harris-Corliss engine, used almost entirely for experimental purposes: this is furnished, in addition to its own automatic cut-off governor, with a throttle governor, so arranged that either can be used, the former being in addition so constructed that the speed of the engine can be varied at will.

The exhaust of each engine is connected with a surface condenser, and thence with a tank on scales, so that the water passing through the engines can be weighed.

3. Two surface condensers, one of which is arranged in sections, so that the condensing water can be made to traverse the length of the condenser once, twice, or three times, at the option of the experimenter.

4. Machinery for determining the tension required in a belt to enable it to carry a given power, at a given speed, with no more than a given amount of slip.

5. Two brakes so constructed that a given amount of

work can be put at will on either engine, and in such a manner that this work can be accurately measured.

6. A steam-pump so arranged as to enable the students to make pump tests, indicating both the steam and the water cylinder, weighing the exhaust steam, and also the water pumped.

7. A six-inch Swain turbine-wheel so arranged that it can be run under a head of fifteen feet, and that experiments can be made on the power exerted, the efficiency, etc., under different gates.

8. Two calorimeters.

9. A dynamometer.

10. Cotton-machinery as follows; viz., a card, a drawing-frame, a speeder, a fly-frame, a ring-frame, and a mule.

11. Apparatus for testing injectors.

12. A mercurial pressure column.

13. A mercurial vacuum column.

14. Apparatus for determining the quantity of steam issuing from a given orifice under a given difference of pressure.

15. A good supply of indicators, gauges, thermometers, anemometers, and other accessory apparatus.

16. Four horizontal tubular boilers. Another boiler, a forty-horse-power Brown engine, a number of looms, and other apparatus in the mechanical laboratories on Garrison Street, are available for the purpose of experiment.

As examples of the work done in the laboratory, the following experiments are enumerated: — tests of the evaporative power of boilers; tests of the effects of different cut-off, compression, back-pressure, speed, etc., of engines under constant or variable loads; calorimetric tests; dynamometric measurements; investigations of the tension required in a belt to carry a given power, at a given speed, with no more than a given amount of slip; experiments on the efficiency of condensers under different conditions; on the efficiency of a turbine, etc.

A plan of the laboratory will be found between pp. 56 and 57.

The Mining and Metallurgical Laboratories. — The aim of these laboratories is to furnish students the means for studying, experimentally, various processes of ore-dressing and smelting, and at the same time to enable them to gain an idea of what is required of a miner or a metallurgist. To this end, the apparatus has been chosen with a view of illustrating, as far as possible, the principles of the more important machines and furnaces which are used in Mining and Metallurgy.

The metallurgy of lead, copper, gold, and silver has been chosen as the best suited for laboratory illustration: production of iron and steel in quantity is prohibited by the size of the plant, and by the large amount of ores and fluxes necessary to put this into operation.

The experimental work of the laboratory is carried on by the students under the immediate charge 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, wherever practicable, the amount of power, water, chemicals, fuel, and labor expended, and thus learns approximately the effectiveness and economy of the method adopted. He learns, also, the value of chemistry as a check upon metallurgical work. Each student is assisted in working his ore by his classmates, each of whom has an opportunity in turn to manage the machines and furnaces.

The Institute does not claim that this laboratory is in any sense of the word a substitute for the works. What is claimed is, that it prepares students to go into works, and to profit by them. The spirit of investigation which is developed is of great advantage to the student.

The mining laboratory consists of three parts, — milling-room, furnace-room, and assay-room, — with ample storage-vaults, supply-room, and toilet-room attached.

The milling-room is supplied with four suites of milling-apparatus : —

I. A three-stamp battery, a set of amalgamating-plates, a mercury-saver, a Frue-vanner for concentrating tailings, a settling-tank, and a centrifugal-pump.

II. A Blake challenge crusher, crushing-rolls with automatic sizing screens, a Richards-Coggin separator, a spitzkasten, two Harz-Mountain jigs, an Evans table or rotary-buddle, a settling-tank, and a centrifugal-pump.

III. A set of four amalgamating-pans, 30, 18, 12, and 8 inches in diameter respectively, also a 36-inch settler, and a little automatic kieve for separating mercury from pulp.

IV. A set of three 40-gallon leaching-vessels, a set of four 8-gallon leaching-vessels, and a small dynamo for deposition.

This laboratory contains also the following auxiliary apparatus : a steam-engine, a Bogardus mill, a Root blower, a Sturtevant dust-fan, drying-tables, and four Morrell agate mortars.

The furnace-room contains a water-jacket blast-furnace, a copper-refining furnace, a reverberatory lead-smelting or agglomerating furnace, two roasting-furnaces, furnaces for cupellation, furnaces for fusion, a blacksmith's forge, a melting-kettle, retorts, etc. The assay-room contains ten crucible furnaces, 12 x 12, all of which are jacketed with iron shells to insure good draught, stability, and durability ; also two muffles 4 x 7, one muffle 3 x 6, four muffles 7 x 12, one muffle 8 x 15. These furnaces are all provided with ample flue capacity and abundant draught. This room contains also six pulp-balances, six flux-balances, five button-balances, and desks for fifty students.

The Institute is from time to time receiving ores of gold, silver, lead, copper, nickel, antimony, etc., from various localities. These ores are worked, and reports sent to those who contribute them ; and it is expected, 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.

To bring the mining students into closer acquaintance with their profession, excursions are organized for visiting mines, mills, smelting-works, and geological fields. These excursions take place as often as once in two years; and, since the year 1870, excursions have been made to Colorado, Lake Superior, and Virginia, twice to Vermont, Pennsylvania, and Lake Champlain, and three times to New Brunswick and Nova Scotia. Lesser excursions of a day or two at a time are made while the school is in session.

The valuable scientific library of the late Prof. Henry D. Rogers, of the University of Glasgow, presented to the Institute by Mrs. Rogers, is accessible to the students in geology and mining.

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 forms which characterize different periods

The handling and drawing of specimens by the student are essential features of the method of instruction. The lectures of the instructor are devoted largely to explanatory demonstrations of the specimens which the students have studied and drawn.

The Museum of the Boston Society of Natural History is used in this course, and also a laboratory collection of recent and fossil animals belonging to the society, and selected with special reference to the needs of students.

The Instruction in Mineralogy. — Crystallography is taught with the aid of models, diagrams, and a series of crystals. In Descriptive Mineralogy, specimens are freely used, an example of each of all the more important species being placed before each student; while a collection of typical specimens is always open to students. The collection in this

department is supplemented by that in the museum of the Boston Society of Natural History, as explained in the next section. In Determinative Mineralogy, students are taught to identify minerals by their crystallization and physical properties, as well as by their blowpipe or chemical characters. The instruction in Blowpipe Analysis is given in a separate laboratory, and is supplemented by sufficient practice to insure familiarity with the methods.

In the spring, several excursions are made to interesting mineral localities.

The Instruction in Geology and Physical Geography. — The instruction in these branches has been so arranged that the topics to be taught may be presented in the order of their logical succession ; namely, —

I. *Physical Geography, including Dynamical Geology.* — It is the aim of the lessons on these topics, to lead the student to a scientific knowledge of the principal features of the earth's surface, their characteristics, classification, geographical relations, and the changes which they have experienced within the historic period. Frosts, glaciers, rains, streams, tides, volcanoes, earthquakes, plants, animals, etc., are considered as geological agencies, and also in their bearing upon navigation, the construction and maintenance of roads, and various works of improvement.

II. *Structural Geology, including a systematic course in Lithology.* — Oral instruction and laboratory work are combined in this course, the aim being to place in the hands of each student a specimen of each type to be considered. The principal structural features characterizing large masses of rocks, embracing stratification, joint structure, faults, folds, slaty-cleavage, veins, dikes, etc., are taught as practically as circumstances will allow. This instruction is supplemented by frequent excursions to localities of geological interest in the vicinity of Boston. The instruction in Chemical Geology and the history of crystalline formations comprises the formation, alteration, and decay of rocks, the origin of vein-stones and ore deposits, of rock-salt and mineral waters, and

of coal and petroleum; also a general sketch of the chemical forces which co-operated with physical agencies in the formation of the earth. The collections in this department are extensive, and specially adapted to the laboratory method of instruction; and a complete series of typical rocks is accessible to students at all times.

III. *Historical Geology.* — In this branch, the outlines of the physical history of the earth are taught, and special attention is given to American geological history. The geological positions of ores and other economic products, and the modes of their occurrence, are taught in connection with the geological formations in which they are found. The instruction is made as practical 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 vacations, excursions of a few weeks are often made to regions where the fossiliferous formations are well developed.

The instruction in Climatology and Industrial Geography includes the influences of geographical positions, physical features, climates, etc., upon the nature and distribution of animals and plants upon the resources of countries, and upon the character and prosperity of nations.

In addition to the efficient collections in the Rogers Building, the students in this department have access at all times to the extensive and valuable mineralogical and geological collections of the Boston Society of Natural History. These are very conveniently placed, and have been arranged with special reference to the needs of students, each division of mineralogy and geology being separately and fully illustrated in the order in which it is taken up in the Institute course.

The Instruction in Biology begins in the second year with a course of lectures, recitations, and laboratory exercises in General Biology. Attention is given to fundamental facts of life and living matter, protoplasm, cells, tissues, and organs; and these are illustrated upon representative forms of animal and vegetal life, such as the fern, earthworm, yeast-plant, amœba, moulds, bacteria, etc. Afterwards higher

forms, like the lobster, clam, seed-plant, frog, and rabbit, are carefully dissected and studied. Stress is laid not less on physiological than anatomical facts and theories, and painless studies of the living specimen are regarded as of prime importance. This general introductory course extends into the third year, and is followed by a more special course in comparative anatomy and embryology (chiefly of vertebrates,) accompanied likewise by practical laboratory studies, with dissections, the histology of the embryo chick, etc.

In the fourth year animal physiology and histology are taken up, and pursued till graduation. They are taught experimentally in the laboratory, and by lectures and recitations. Physiological chemistry also receives attention. Lectures are given during this year upon higher biology, including topics like natural selection, mimicry, evolution, the germ theory of disease, heredity, and the history of the biological sciences. A biological-journal club, to which the more advanced students are admitted, has been found helpful as a means of keeping abreast of current progress, and in giving practice in bibliography.

Students of biology have also privileges of great value in connection with the Boston Society of Natural History of which the museum, the library, and the teaching-collections are freely accessible.

The Biological Laboratory is a large room on the first floor of the Rogers Building. It is well lighted, and furnished with tables for microscopical work, for dissection, and for the simpler operations of physiological chemistry. Every student is supplied with a Zeiss or Hartnack microscope, a work-table, and a locker. The laboratory instruments include Thoma and Schanze microtomes, a long-roll kymograph, Du Bois-Reymond induction machines, and a rotating drum for smoked paper, a moist chamber, pendulum myograph, etc., besides many minor pieces. A frog-tank and aquaria are also provided. The biological library is in the laboratory, and includes all the ordinary text-books, and works of reference. It has been much enlarged during the past year, both by gifts and by purchase.

The Instruction in Architecture. — The professional work begins with the study of the five orders and the elements of architecture. Students of the third year attend a series of lectures on mediæval and Gothic architectural history; and those of the fourth year, a series of lectures on the history of ornament, prefaced by lectures on theory of decoration, color, form, proportion, conventionalism, etc.

In the second term are given to the students of the several years, lectures on the history of ancient and classic architecture, on the architectural history of the Renaissance period, on the theory of design, style, and composition, and on fine arts.

The students are constantly practised in original design. Lectures and exercises are also given in shades and shadows and perspective, in tracing, sketching, and drawing on the blackboard. The more advanced students sketch, measure, and make drawings of buildings already erected.

The Boston Society of Architects has established two prizes of the value of fifty dollars each, given in books, for students who, at the end of the year, exhibit the best work.

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. To these collections, large additions have been made, mostly by gifts. Models and illustrations of architectural detail and materials are arranged in the rooms of the department. The 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, together 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 is 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 library of this department contains technical works and periodicals, both American and foreign. The publications of the

Royal Institute of British Architects, and of the Société Centrale des Architectes in Paris, are presented by the authorities of those institutions.

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. All students who take two or more first-year studies are required to attend three times a week an exercise in tactics, unless specially excused by the Faculty. A written and a drill examination are held at the end of the year. For the drill-exercises, they are required to provide themselves with uniforms which are made from measures and by contract, in order to secure uniformity of material and manufacture as well as cheapness. The whole cost to each student does not exceed fifteen dollars. 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 (within thirty days after the opening of the term) an examination satisfactory to the department, in both theoretical and practical tactics and drill.

The large drill-hall includes a gymnasium, used by all classes in the Institute.

Libraries. — The Institute possesses an increasing general library; and each department has, in its own reading-room, its separate working-library of reference. A valuable addition to these has recently been received by a gift from Mrs. William B. Rogers of several hundred books and pamphlets from the library of the late President Rogers. These departmental libraries, which are of the greatest value to students, are intended to contain a careful selection of the best text-books, special treatises, monographs, etc., and the more valuable periodical publications, in the subjects germane to the work of the department. They are accessible to all students; and a certain valuable experience in the use of

them is acquired before the completion of the regular courses, either incidentally to the preparation of theses, or in connection with lectures or recitations.

The Boston Society of Natural History grants to the students of the Institute the full use of its valuable library. The unusual facilities of the Boston Public Library, of 479,300 volumes, are at the disposal of all students of the Institute. The collections of this library are of exceptional value, and contain the best scientific, literary, and technical publications of various countries, whether standard or special treatises, periodicals, or works of more purely literary or historical value; and new books are promptly bought on proper application to the authorities of the library.

Many libraries of scientific societies, of individuals, and of private corporations, rich in complete sets of the scientific periodicals of all countries, and of the publications of leading scientific societies throughout the world, are, through the courtesy of the owners, open to advanced students of the Institute.

REQUIREMENTS FOR ADMISSION.

Time of Examination for Admission. — A first examination for admission to the first year class will be held in the Rogers Building, 187 Boylston Street, beginning at 9 A.M., on the first Thursday after May 29, and continuing two days. A second examination for admission, and for applicants conditioned at the first examinations, will begin at 9 A.M., on the first Tuesday after Sept. 17, and will continue two days (see Calendar, p. 90). Attendance on both days of one examination or the other is required.

Entrance examinations were held in June, 1886, in New-York City, Philadelphia, Chicago, Cincinnati, St. Louis, Washington, San Francisco, St. Paul, Nashville, Atlanta, and Montreal. Arrangements will probably be made for examining applicants in June, 1887, in the same cities. For detailed information, address the secretary.

Applicants for advanced standing must pass the entrance

examinations, as before given, and present themselves for further examination at 9 A.M. on the Thursday following the second entrance examination (see Calendar, p. 90).

Applications for admission to the regular and special courses at other times than the above will be received only when illness or some other equally good cause has prevented attendance on the days prescribed. A fee of five dollars will be charged for all such examinations held at other times than those above specified. Women who are properly qualified are admitted to any of the courses of the school.

TO THE REGULAR COURSES.

First Year. — To be admitted as a regular student in the first-year class, the applicant must have attained the age of seventeen years, and must pass a satisfactory examination in Arithmetic, Algebra, Plane Geometry, French, English Grammar and Composition, History and Literature, and Geography.

The requirements in the various subjects are as follows: —

1. *Arithmetic.* — Prime and composite numbers; greatest common divisor and least common multiple; ratio and proportion; common and decimal fractions; percentage; simple and compound interest; compound numbers; metric system of weights and measures; square root. A satisfactory treatment of these subjects may be found in either Seaver and Walton's, Wentworth and Hill's, or Greenleaf's Complete Arithmetic.

2. *Algebra.* — Fundamental operations; use of parentheses; factoring; highest common factor; lowest common multiple; fractions, simple and complex; simple equations, with one or more unknown quantities; involution of monomials and polynomials; evolution of monomials and polynomials and the cube root of numbers; the theory of exponents with applications; radicals, including rationalization, imaginary quantities, properties of quadratic surds, square root of a binomial surd, and solution of equations containing radi-

cals ; quadratic equations ; equations in the quadratic form ; simultaneous quadratic equations ; theory of quadratic equations ; ratio and proportion ; arithmetical progression ; geometrical progression ; binomial theorem, with proof for a positive integral exponent. A satisfactory treatment of the topics in Algebra may be found in either of the following text-books : Wells' Academic, Wentworth's Elementary, or Todhunter's Algebra for Beginners.

3. *Plane Geometry.* — As much as is contained in the first five books of Wells', Chauvenet's, or Wentworth's Geometry. Much more importance will be attached to the applicant's ability to demonstrate new propositions, than to reproduce the demonstrations of those propositions which he has learned in his text-book.

NOTE. *Solid Geometry.* — Candidates will be allowed an examination in Solid Geometry, and if successful, will be excused from studying the subject after admission.

4. *French.* — Elements of grammar, and some practice in translation. Part I. of Otto's Grammar, with fifty or sixty pages of easy reading, represents, in general, the required amount. Practical exercises, both oral and written, are essential.

NOTE. *German.* — Candidates not prepared in French will be permitted to substitute an equivalent in German. Otis's "Elementary German" represents the required amount.

5. *English.* — The elements of English grammar as they are to be found in Professor Whitney's "Essentials of English Grammar," or an equivalent ; the principal rules respecting correctness of style as they are to be found in Campbell's "Philosophy of Rhetoric," Book II., or Whately's "Elements of Rhetoric," Book III., or in any reputable modern school Rhetoric.

6. *History and Literature.* — So much knowledge of recent history as may be obtained from Mackenzie's "Nineteenth Century," or an equivalent. Such a knowledge of the periods into which the history of English literature is divided, and of

the chief writers therein, as may be obtained from Brooke's "Primer of English Literature," together with evidence that the candidate has really read, and is more or less familiar with, some of the classical English writers in prose and verse.

7. *Geography.* — The text-books intended for use in grammar schools usually represent the amount of preparation required. Practice in freehand map-drawing from memory is strongly recommended.

Candidates for admission will be permitted, at their option, to divide their entrance examinations between two successive years. The first divided examination will be held only in June, and will include Arithmetic, Geography, English Grammar and Rhetoric, the subjects in Algebra on p. 68 as far as Quadratic Equations, and Plane Geometry. The second divided examination will be held in June or September of the following year, and will include the Metric System, History and Literature, French (or German), and the remaining requirements in Algebra.

To be admitted to the first divided examination, the candidate must be sixteen years of age, and must have notified the Secretary of the Faculty, at least two weeks before the date fixed for the examination, of his intention to apply. This notice must be accompanied by a certificate from his teacher, stating that he is qualified in the required subjects. No credit will be allowed for the first divided examination, unless the candidate shall pass on at least four of the five prescribed subjects. He will not be allowed to take any of the subjects of the second at the first examination.

In general, the training given in the best high schools and academies will afford suitable preparation. To the student, the importance of thorough preparation is great; since the character and amount of instruction given in the school from the outset leave little opportunity for one imperfectly fitted to make up deficiencies, and render it impossible for him to derive the full benefit from his course, or perhaps even to maintain his standing.

Students will find their progress in Physics and Chemistry promoted by making themselves thoroughly familiar with so much of Physics as is contained in Balfour Stewart's Primer.

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 the course in Natural History or in Biology, preparatory to Medical Studies, will find it advantageous to acquire also the elements of Greek.

Second, Third, and Fourth Years. — To be admitted as a regular student in either of these classes, the applicant for this advanced standing must have attained the proper age (eighteen, nineteen, and twenty years respectively), must in general pass satisfactorily the examination for admission to the first-year class, and examinations on all of the subjects given in the earlier years of the course which he desires to enter. See pp. 67 to 70, and pp. 20 to 39. Applicants for advanced standing in the course preparatory to Medical Studies will not for the present be received.

Graduates of Colleges who are prepared to enter upon most of the studies of the third year will be afforded opportunity to make up any studies of the earlier years in which they are deficient: they will, in general, be credited with all subjects in earlier or later years in which they can show, by examination or otherwise, a standing satisfactory to the Faculty, and be received provisionally as regular students. The attention of such applicants is particularly called to the schedules of courses on pp. 20 to 39, and to the schedule of topics on pp. 74 to 89. Students contemplating a professional course after graduation from College, will find their work facilitated by arranging their college electives to cover the earlier subjects of the chosen course. In order to enter any of the engineering courses in the third year, it will be essential for the applicant to be familiar with the differential calculus. Further information may be obtained from the Secretary.

TO SPECIAL COURSES.

To be admitted as a student in any one or more selected subjects in any of the regular courses, except that in Architecture (see p. 40), i.e., to partial or special courses, the applicant must have attained the age of at least seventeen years, and must pass satisfactorily such examinations as shall prove him to be qualified to pursue to advantage the subjects chosen.

By means of the schedule of topics and requirements as given in the following sixteen pages, the applicant may ascertain what the individual subjects of study are, how and by whom they are given, by what regular courses and when they are taken, the subjects required in preparation for each, and the time occupied by it. In general, no student will be allowed to take any one of these topics until he has passed a suitable examination in all the others required as preparation for that applied for.

Special students in Architecture and Chemistry must pass the regular entrance examination to the first-year class (p. 68). Special students in Architecture are required to take as a minimum the full two years' partial course given at p. 26, but may, with the consent of the Faculty, substitute equivalent studies, or take such additional ones as they may desire.

SCHEDULE OF TOPICS.

The following fourteen pages form a schedule which includes the larger part of all the distinct topics or subjects of study taught in the School of Industrial Science. The various branches of study are classified under headings, such as "Mathematics," "Chemistry," "Physics," "Non-professional Studies," etc. In the first column of the table is given the numeral by which any given topic is designated for convenience of reference; in the second column, the name of the subject; in the third, the manner in which this is taught, whether by lectures, by recitations, or by work in the laboratory, drawing-room, or field, or by several of these in conjunction; in the fourth, the name of the professor or instructor

taking charge of the exercise; in the fifth, the courses involving this subject; in the sixth and seventh, the term (1st or 2d) and number of the year (1st, 2d, 3d, or 4th) in which the subject occurs; in the eighth and ninth, the number of weeks and of hours per week given to the subject; and, in the tenth, the number of the preparatory subject or subjects required of any one who desires to be admitted to the topic under consideration, such requirements including, not merely the subjects referred to by number, but all subjects required as preparation for these. Thus, for instance, the requirements for 32 (Applied Mechanics) are 31 and 126; that for 31 is 30; that for 30 is 28; that for 28 is 29A; those for 29A are 26 and 27; those for 26 and 27 are 1, 2, and 3 (the admission requirements in arithmetic, algebra, and plane geometry); that for 126 is 29A, which has already been followed through. So that, to take up the topic 32 in Applied Mechanics, the applicant must be prepared to pass, or must have passed, in 26, 27, 28, 29A, 30, 31, 126, and in 1, 2, and 3. The sufficient reason for this is, that, in topic 32, use is made of all of the subjects referred to; and, to carry on the work, the student must have had suitable training in all of them, and must give satisfactory evidence by examination or otherwise that such is the case.

By a careful consideration of the schedule, in connection with the pages on the "Methods and Apparatus of Instruction" (41 to 67), the applicant for a special course may select for the earlier part of that course such topics as will enable him to pursue later those more advanced subjects which he may particularly desire. He may also ascertain what preparatory training is desirable before entering the School.

The topics included in the schedule are, of course, subject to change at any time through action of the Faculty.

Subjects numbered from 1 to 7 are the entrance requirements, full statements of which are given on pp. 68 and 69.

1. Arithmetic.
2. Algebra.
3. Plane Geometry.
4. French.
5. English.
6. History and Literature.
7. Geography.

MATHEMATICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
26	Algebra	Rec.	Wells, Skinner, French, Bartlett.	All reg. students . .	1	1	9	4	(1) (2) (3)
27	Solid Geometry	Rec.	Wells, Skinner, French, Bartlett.	All reg. students . .	1	1	6	4	(26)
28	Plane Analytic Geometry . .	Lect., Rec.	Runkle, Skinner, Tyler.	All reg. students . .	2	1	15	3	(29 A)
29A	Logarithms and Plane Trigonometry	Rec.	Wells, Skinner, French, Tyler, Bartlett.	All reg. students .	1	2	15	4	(26) (27)
29B	Spherical Trigonometry . .	Rec.	Skinner.	I., IX.	2	1	5	3	(29 A)
30	Differential Calculus . . .	Lect., Rec.	Runkle, Osborne, Tyler.	All courses except VII.	2	2	15	3	(28)
31	Integral Calculus.	Lect., Rec.	Runkle, Osborne.	All courses except VII.	3	1	5 10	4 2	(30)
32	Applied Mechanics (Statics and Stresses in Frames) .	Lect., Rec.	Sondericker.	I., II., III., IV., VI., VIII. . .	3	1	10	2	(31) (126)
33	Applied Mechanics (Strength of Materials, Kinematics, and Dynamics)	Lect., Rec.	Sondericker.	I., II., III., IV., VI., VIII. . .	3	2	15	3	(32)
34	Applied Mechanics (Strength of Materials, Hydraulics, and Dynamics)	Lect., Rec., Lab.	Lanza, Sondericker.	I., II., III., IV., VI., VIII. . .	4	1	15	3	(33)

MATHEMATICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
35	Applied Mechanics (Strength of Materials, Hydraulics, and Dynamics)	Lect., Rec., Lab.	Lanza, Sondericker.	II., VIII.	4	2	15	3	(34)
36A	General Theory of Equations,	Lect., Rec.	Wells.	I., VIII., IX. . . .	2, 3	2	15	2	(26)
36B	Determinants	Lect., Rec.	Wells.	I., VI., VIII., IX. .	2,3,4	2	15	1	(26)
37	Advanced Trigonometry . .	Lect., Rec.	Osborne.	I., IX.	2, 3	1	8	2	(29A)
38	Analytic Geometry of Three Dimensions	Lect., Rec.	Runkle.	VIII., IX.	3, 4	1	15	2	(30)
39	Advanced Analytic Geometry and Calculus . . .	Lect., Rec.	Runkle.	I., VIII., IX. . . .	3, 4	2	15	3	(30) (36B)
40	Definite Integrals	Lect., Rec.	Wells.	VIII., IX.	?	1	15	2	(31) (36A) (37)
41	Differential Equations . . .	Lect., Rec.	Osborne.	I., VI., VIII., IX. .	4	2	15	3	(31)
42	Theory of Probability and Method of Least Squares,	Lect., Rec.	Wells.	I., VI., VIII., IX. .	4	1	15	2	(31)
43	Quaternions	Lect., Rec.	Osborne.	I., VI., VIII. . . .	4	2	15	3	(31)

DRAWING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
51	Geometrical and Mechanical Drawing	Lect., Draw.	Faunce, Burrison.	All reg. students	1	1 2	15 15	6 7	
52	Descriptive Geometry	Lect., Rec., Draw.	Faunce.	II., IV., VI.	2	1	15	5	(1) (27) (51) (53)
53	Freehand Drawing	Draw.	Adams.	All reg. students	1	2	15	2	

NON-PROFESSIONAL STUDIES.

76	Rhetoric and English Composition	Lect., Rec.	Wheelock.	All reg. students	1	1	15	2	(5) (6)
77	Political History since 1815	Lect., Rec.	Dewey.	All reg. students	1	2	15	2	(76)
78A	Political Economy	Lect., Rec.	Dewey.	All reg. students	2	1	15	2	(77)
78B	Literature	Lect., Rec.	Wheelock.	All reg. students	2	2	15	2	(76)
79	Industrial History	Lect., Rec.	Dewey.	IX.	3	1	15	2	
80A	English Literature	Rec., Writ., Read.	Atkinson.	All courses except II. and IV.	3	1	15	2	
80B	English Literature	Rec., Writ., Read.	Atkinson.	II., IV.	4	2	15	2	

NON-PROFESSIONAL STUDIES.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
81	Constitutional History of England and the United States	Lect., Rec.	The President, Atkinson.	IX.	2	2	15	3	(78 A)
82	English History and Literature (special studies)	Read.	Atkinson.	IX.	4	1, 2	30	2	(80 A)
83	Modern History	Lect.	Atkinson.	III.	4	1, 2	30	2	
84	Political Economy [1]	Lect., Rec.	The President.	All reg. students	3	2	15	2	
85	International Law	Lect., Rec.	Wheelock.	IX.	3	2	15	2	(78 A)
86	Finance	Lect., Rec.	The President.	IX.	4	2	15	2	(85)
94	Commercial Geography and History of Commerce	Lect., Rec.	Niles, Dewey.	IX.	3	2	15	2	(79)
95	Logic	Lect., Rec.	Wheelock.	IX.	4	1	15	1	
96	Tariffs	Lect., Rec.	Dewey.	IX.	4	1	15	2	(94)
97	Business Law	Lect.	—	All reg. students	4	2	15	1	

[1] After May, 1887, this course will be discontinued. See 78 A.

NON-PROFESSIONAL STUDIES.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
98	Administration	Lect., Rec.	Dewey.	IX.	4	2	15	1	(96)
99	Statistics and Graph. Methods	Lect., Rec.	Dewey	IX.	4	2	15	1	(96)
87	French (grammar and translation)	Lect., Rec.	Luquiens, Dippold.	All reg. students	1	1, 2	30	3	(4)
88	Advanced French	Lect., Rec.	Luquiens.	IV., V., IX.	–	1, 2	30	3	(87)
90	German (elementary)	Lect., Rec.	Otis, Dippold.	All reg. students	2	1, 2	30	3	
91	German (grammar and translation)	Lect., Rec.	Otis.	All reg. students	3	1, 2	30	3	(90)
92	German (advanced)	Lect., Rec.	Otis.	IX.	4	1, 2	30	3	(91)
93	Language	Lect., Rec.	Otis or Luquiens.	IV., V., VII., IX.	3, 4	1, 2	30	2	(87) (90)

CHEMISTRY.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
101	General Chemistry	Lect., Lab.	Pope, Bardwell.	All reg. students.	1	1, 2	30	7	(1) (2) (3) (4) (5) (6) (7)
102	Chemical Analysis	Lect., Lab.	Drown, Pope.	III., V., VII., VIII., IX . . .	2	1, 2	30	–	(87) (101)
103A	Theoretical Chemistry . . .	Lect., Rec.	Pope.	III., V., VII., VIII., IX.. . .	2	1	15	2	(101)
103B	Theoretical Chemistry . .	Lect., Rec.	Andrews.	V., VIII., IX.. . .	3	2	15	1	(103 A)
104	Chemical Analysis	Lab.	Drown, Pope.	III., V.	3	1, 2	30	–	(90) (102)
105	Chemical Analysis	Lab.	Drown, Pope.	VII.B., VIII. . . .	3	1	30	–	(102)
106	Special Methods	Rec.	Drown.	III., V.	3	1	15	2	(90) (102)
107	Industrial Chemistry . . .	Lect.	Norton.	V., IX.	3	1, 2	30	2	(90) (102) (51)
108	Chemical Analysis	Lab.	Drown, Pope.	III., V., VIII.. . .	4	1	15	–	(104)
109	Chemical Analysis	Lab.	Drown, Pope.	III., V.	4	2	15	–	(108)
110	Organic Chemistry	Lect.	Norton.	V., IX.	4	1, 2	30	2	(103B) (90) (104)
111	Organic Chemistry	Lab.	Norton, Andrews.	V.	4	1, 2	30	12	(110)
112	Industrial Chemistry . . .	Lab.	Norton, Underwood.	V., IX.	4	1	15	12	(104) (107)

CHEMISTRY.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
113	Sanitary Chemistry	Lab.	Drown, Mrs. Richards.	V., VII.B.	3	–	15	6	104) (106)
114	Industrial Chemistry . . .	Lab.	Norton, Underwood.	V.	3	2	15	6	(105) (107)
115	Sanitary Chemistry	Lab.	Drown, Mrs. Richards.	V.	4	1	15	4	(104) (106)

PHYSICS.

126	Physics	Lect.	Cross.	All reg. students . .	2	1, 2	30	3	(29 A)
127	Descriptive Astronomy . .	Read.	Pickering.	I., VIII.	4	1	15	1	(29 B)
128	Mechanics, Acoustics, and Electricity (in connection with 126)	Rec.	Clifford.	VI., VIII.	2	1, 2	30	2	(29 A)
129	Physical Laboratory . . .	Lab.	Holman, Pickering, Woodbridge.	VI., VIII.	2	2	15	2	(126)[1] (128)
132A	Physics: Heat	Lect.	Holman.	All reg. students . .	3	1	8	2	(126)
132B	Physical Laboratory . . .	Lab.	Holman, Pickering, Woodbridge.	All courses	3	1, 2	22	2	(132 A)
133	Physical Laboratory . . .	Lab.	Cross, Holman, Pickering.	V., VIII.	3	–	–	–	(126)

[1] The student must also be qualified to enter VI., as a regular, 2d year, 1st term.

PHYSICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
134	Physical Laboratory . . .	Lab.	Holman.	VI.	3	1, 2	7 15	2 3	(129)
135	Electricity	Read.	Cross, Clifford.	V., VI.	3	1, 2	30	3	(126)
136	General Physics (optics or acoustics)	Read.	Cross, Pickering.	VIII.	3	1, 2	30	3	(132B) (87) (28)
137	Advanced Physics (memoirs) .	Read.	Cross, Holman.	VI., VIII.	4	–	–	–	(132B) (87)
139A	Physical Laboratory . . .	Lab.	Holman.	V.	4	1	15	2	(132B)
139B	Physical Laboratory . . .	Lab.	Cross, Holman, Pickering.	VI., VIII.	4	1	15	–	(132B)
140	History of Physical Science .	Read.	Cross.	VIII.	4	–	–	–	(87) (90) (132B)
141	General Physics	Read.	Cross, Holman, Pickering.	VIII.	4	1, 2	–	–	(87) (31) (132B) (90)
142	Precision of Measurements .	Lect.	Holman.	VI., VIII.	4	2	–	–	(42) (139)
143	Physical Laborat'y(acoustics),	Lab.	Cross, Woodbridge.	VII. B.	–	–	–	–	(130))132)
144	Electrical Engineering . . .	Lect.	Cross.	VI.	4	1, 2	15 15	4 5	(134) (135)
145	Theory of Potential	Rec.	Clifford.	VI., VIII.	4	2	15	3	(31) (135)
146	Heating and Ventilation . .	Lect.	Woodbridge.	I., II., IV., VII., IX .	4	1	15	–	

CIVIL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
151A	Surveying	Lect., Rec., Field, Draw.	Burton, Porter.	I., III.	2	1, 2	30	8 6	(29) (51)
151B	Surveying	Lect., Rec., Field, Draw.	Burton.	II., IV.	3	2	30	2	(29) (51)
152	Topographical Drawing . .	Draw.	Burton.	I.	2 3	2	15	5 3	(51)
153	Plane-Table and Map Work .	Field, Draw.	Burton.	I.	3	2	15	8	(151A) (152)
154	Structure Drawing	Draw.	Burton.	I.	3	1	15	4	(151A)
155	Advanced Geometrical Drawing	Draw.	Porter.	I.	2	1	15	4	(51)
156	Stereotomy	Lect., Draw.	Porter.	I.	3	2	15	2	(154) (155)
157	Geodesy and Astronomy . .	Lect., Rec., Field.	Burton.	I.	4	2	15	3	(127) (151A)

CIVIL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
158	Spherical and Practical Astronomy	Lect., Rec., Field.	Osborne, Burton.	I.	4	1	15	3	(29B)
159	Higher Geodesy	Lect., Rec., Field.	Burton.	I.	4	2	15	3	(42) (127) (158)
160A	Roads and Railroads . . .	Lect., Rec., Draw.	Jameson.	I.	3	1, 2	30	3	(151A) (152A)
160B	Railroad Engineering . . .	Lect., Rec, Draw.	Jameson.	I.	4	1	15	5	(160A)
160C	Railroads: Transportation, Rolling-Stock, Management, etc.	Lect., Rec., Draw.	Jameson.	I.	4	2	15	4	(160B)
161	Railroad Field-Work . . .	Field.	Jameson.	I.	3	1, 2	14	–	(160A)
162	Railroad Management . . .	Lect.	Jameson.	I., IX.	4	1	15	2	—
163	Foundations	Lect.	Swain.	I.	3	1	15	1	(151A)
164	Sanitary Engineering . . .	Lect., Rec., Draw.	Porter.	I.	4	1	15	3	(151A) (152A)

CIVIL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
165	Theoretical Hydraulics . .	Lect., Rec.	Swain.	I.	4	1	15	3	(33)
166	Hydraulic Engineering. . .	Lect., Rec.	Swain.	I.	4	2	15	4	(165)
167	Hydraulic Measurements . .	Field, Draw.	Swain.	I.	4	1	6	5	(165)
168	Principles of Construction .	Lect., Rec.	Swain.	I.	4	1 2	15 15	2 3	(33)
169	Bridges and Similar Structures	Lect., Rec.	Swain.	I.	4	1 2	15 15	2 3	(33) (168)
170	Bridge Designing	Draw.	Swain.	I.	4	1, 2	30	6	(169)

MECHANICAL ENGINEERING.

176	Mechanism (must take also 28 and 52)	Lect., Rec., Draw.	Schwamb, Stephens, Purinton.	II., VI.	2	1	15	4 2	(29A) (51)
177	Mechanism (must take also 30)	Lect., Rec., Draw.	Schwamb, Stephens.	II., VI.	2	2	15	9 6	(176)
178	Mechanical Engineering (must take also 31, 32, and 132)	Lect., Rec., Draw.	Peabody, Stephens.	II., VI.	3	1	15	9 6	(30) (177)

MECHANICAL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
179	Mechanical Engineering (must also take 33 and 132)	Lect., Rec., Draw., Lab.	Peabody, Schwamb, Stephens, Purinton.	II., VI.	3	2	15	11 7	(178)
180A	Mechanical Engineering (must take also 34) . .	Lect., Rec.	Lanza, Peabody.	II.	4	1, 2	30	5	(179)
180B	Mechanical Engineering (must take also 34) . .	Lect., Rec	Lanza, Peabody, Fitch.	VI.	4	1	15	3	(179)
181	Designing (must take also 34),	Draw.	Schwamb.	II.	4	1	15	8	(179)
182	Mechanical Engineering . .	Lab.	Lanza, Peabody.	II., VI.	4	1, 2	30	4	(179)
183	Carpentry and Wood-Turning	Shop.	Merrick.	II., VI., IX. . . .	2	1	15	4	
184	Pattern Work	Shop.	Merrick.	II.	2	2	7	4	(183)
185	Forging, Chipping and Filing,	Shop.	Lambirth.	II.	3	1, 2	23	6	
186	Machine Tool Work . . .	Shop.	Stephenson.	II.	4	1, 2	30	6	

MINING ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
201	Mineralogy (including Blow-pipe Analysis and Crystallography)	Lect., Lab.	Crosby, Barton.	III., V., VII., IX. .	2	2	15	6	(3) (101)
202	Mining Engineering	Lect.	Richards, Clark.	III.	3	1, 2	30	3	(126) (151) (201)
203	Assaying by Fire	Lab.	Clark.	III., V.	3	2	5	6	(102)
204	Metallurgy	Lect.	Richards.	I, II.	4	1	15	1	(101)
205	Metallurgy	Lect.	Richards, Howe, Hofman.	III., V., IX. . . .	4	1	15	3	(102) (201)
206	Mining and Metallurgy . .	Lab.	Richards, Clark.	III., V.	4	1	15	8	(104) (203)
207	Mining and Metallurgy . .	Lab.	Richards, Clark.	III.	4	2	15	12	(206)
208	Ore Dressing	Lect.	Richards.	III.	4	1	6	3	(126)
209	Metallurgy	Lect.	Richards, Clark.	III.	4	2	15	3	(205)

ARCHITECTURE.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
226	Architectural History . . .	Lect.	O'Grady.	IV.	2	1, 2	30	1	Students in Architecture must follow the regular course (p. 26), or the partial two-year course (p. 26). The regular examinations for admission (see p. 68) are required for either course.
227	Orders	Lect., Draw.	O'Grady.	IV.	2	1	12	4	
228	Materials of Architecture .	Lect.	Clark.	IV.	2	1	15	2	
229	Practical Construction . .	Lect.	Clark.	IV.	2	2	15	1	
230	Shades, Shadows, and Perspective	Lect., Draw.	Clark, O'Grady.	IV.	2	2	7	2	
231	Working Drawings	Lect., Draw.	Clark.	IV.	3	1	15	1	
232	Iron Construction	Lect.	Clark.	IV.	3	2	15	1	
233	Fine Art	Lect.	O'Grady, Walker.	IV.	3, 4	1	15	1	
234	Sketching	Draw.	Turner.	IV.	3, 4	1, 2	30	2	
235	Specifications and Contracts,	Lect.	Clark.	IV.	4	1, 2	30	1	
236	Problems in Construction .	Lect., Draw.	Clark.	IV.	4	1, 2	30	1	
238	Schools, Theatres, Churches, Hospitals, etc.	Lect.	Clark.	IV.	4	2	15	1	

ARCHITECTURE.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
239	Planning	Lect.	Clark.	IV.	4	2	15	1	
240	Designing	Draw.	Létang.	IV.	–	1, 2	30	–	
241	Elementary Mechanics . . .	Lect.	O'Grady.	IV. (Partial) . . .	1	1, 2	30	3	
242	History of Ornament . . .	Lect.	O'Grady.	IV.	4	1	15	2	

NATURAL SCIENCES.

251	Physical Geography	Lect.	Niles.	I., III., V., VII., IX.,	2	2	15	3	(7)
252	General Biology and Botany .	Lect., Rec., Lab.	Sedgwick.	VII., IX.	2	2	15	4	
253	Microscopical Technology .	Lect., Rec., Lab.	Sedgwick.	III., V., VII., IX. .	2	2	15	3	(101)
254	Zoölogy and Palæontology .	Lect., Lab.	Hyatt.	III., VII., IX. . .	3	1, 2	30	2	
256	Geology (Elements of Lithology and Structural Geology)	Lect., Lab.	Crosby.	I., IV., IX.	3	1	15	2	(101)

NATURAL SCIENCES.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
257	Geology (Lithological, Structural, and Chemical) . .	Lect., Lab.	Crosby.	III., V., VII. . . .	3	1	15	3	(201)
258	Historical Geology	Lect., Rec.	Niles.	I., III., V., VII., IX.,	3	2	15	3	(256) or (257)
259	General Biology	Lect., Rec., Lab.	Sedgwick.	VII., IX.	3	1	15	6	
261	Animal Physiology and Histology	Lect., Rec., Lab.	Sedgwick.	VII., IX.	4	1, 2	30	–	(262)
262	Comparative Anatomy and Embryology	Lab.	Gardiner.	VII., IX.	3	2	15	6	(252) (259)
264	Climatology	Lect., Rec.	Niles.	VII., IX.	4	2	–	–	
265	Hygiene and Public Health .	Lect.	Sedgwick.	I.	4	2	15	1	(101)

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 after Jan. 28. On legal holidays, and on the Friday and Saturday following Thanksgiving Day, the exercises of the school are suspended.

CALENDAR FOR 1886-87.

School year began	Monday, Sept. 27, 1886.
Second term will begin	Tuesday, Feb. 1, 1887.
Degrees conferred	Tuesday, May 31, 1887.
First Entrance Examinations	Thursday, June 2, 1887, and Friday, June 3, 1887.
Second Entrance Examinations	Tuesday, Sept. 20, 1887, and Wednesday, Sept. 21, 1887.
Examinations for Advanced Standing,	Thursday, Sept. 22, 1887.
School year of 1887–88 will begin	Monday, Sept. 26, 1887.

CALENDAR FOR 1887–88.

School year will begin	Monday, Sept. 26, 1887.
Second term will begin	Tuesday, Jan. 31, 1888.
Degrees conferred	Tuesday, May 29, 1888.
First Entrance Examinations	Thursday, May 31, 1888, and Friday, June 1, 1888.
Second Entrance Examinations	Tuesday, Sept. 18, 1888, and Wednesday, Sept. 19, 1888.
Examinations for Advanced Standing,	Thursday, Sept. 20, 1888.
School year of 1888–89 will begin	Monday, Sept. 24, 1888.

Status of Students in regard to scholarship and ability to continue their courses is largely determined by means of examinations, but regularity of attendance and faithfulness to daily duties are considered essential.

Examinations. — A semi-annual examination is held in January, which will cover all the studies of the preceding term; and an annual examination in May, which in the first,

second, and third years will cover the studies of the entire year, except subjects finished during the first half year; and in the fourth year will cover all the professional work of the year, and any professional work of previous years upon which it may be deemed best to hold examination.

Examinations for students conditioned in subjects of the first, second, and third years will be held on the Thursday and following days after the September entrance examinations, and at the time of the semi-annual and annual examinations. But any candidate for graduation, conditioned at the semi-annual examination of the fourth year, will be re-examined at such time previous to March 1 as may be convenient for the professor in whose subject he has been conditioned.

Intermediate examinations, the results of which are not made a matter of permanent record, may be held at any time in place of a regular exercise.

Students conditioned in any subject, and failing to make up the condition at the time appointed for the examination, will not be allowed another examination, but will be required either to repeat the subject, or to drop it, as well as all subjects dependent thereon, unless further time be allowed by special vote of the Faculty. A regular student failing entirely to make up any condition, will cease to be regular, and his name will be therefore transferred to the list of special students.

Any special student attaining a proper standing in all subjects required of a regular student up to any given period of the course, may apply to have his name transferred to the list of regular students.

Attendance Paper. — At the opening of each term of every year, the student should fill out, and present to the Secretary, an attendance paper, blank forms for which will be supplied. The attendance paper is the direct means by which the student must place before the Faculty his wishes in regard to his course or selection of studies. The paper must be presented at the earliest possible moment to give opportunity for the immediate determination of qualifications and status.

Petitions. — Special matters in regard to courses of study etc., may be brought before the Faculty for action by suitable petitions presented through the Secretary.

Bond or Deposit. — Every student is required, on entering the school, to file with the Bursar a bond in the sum of two hundred dollars, signed by two responsible sureties, one of whom must be a citizen of the United States, as security for the payment of all bills of the Massachusetts Institute of Technology. If, for any reason, such a bond cannot be obtained, a deposit of fifty dollars, as security, will be accepted. No officer of instruction or student of the Institute will be received as a surety.

Fees. — The tuition-fee for regular students is $200 per year, and must be paid in advance, as follows: $125 on or before Oct. 10, and $75 on or before Feb. 10. For one-half, or any less fraction, of the school year, the fee is $125. Payment is also required of the cost of apparatus injured or destroyed 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.

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 in the City of Boston. Mr. Sherwin was also an active and influential member of the Corporation of the Institute. The pupil, to receive the privilege of this scholarship, is to be a graduate of the English High School of Boston, and is to be selected by the Faculty of the Institute in concurrence with the Head Master of the High School for the time being.

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.

Two scholarships (of $125 each) founded by the Massachusetts Charitable Mechanics' Association are awarded to sons of present or past members of the Association.

A scholarship, founded by the contributions of certain residents of the town of Milton, is given to such pupil of the high school as the master of that school and the school committee of Milton may select.

Joy Scholarships. Miss Nabby Joy originally gave the money for these scholarships, which are created pursuant to a decree of the Supreme Judicial Court of Massachusetts, for the benefit of one or more women studying natural science in the Institute. At present one scholarship only is available. A second will be established when the fund has increased sufficiently to warrant such expenditure.

Graduate Scholarships. — Five scholarships for graduates of the Institute have been established, and will be awarded to such applicants as are recommended by the Faculty.

Residence and Expenses. — As the exercises of the school begin at nine o'clock in the morning, and end before 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 books, drawing-instruments, paper, etc., exclusive of chemical breakage, is from twenty-five to thirty-five dollars a year.

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 4.15 P.M., except during the interval from 1 P.M to 2.15 P.M. 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 offence, rendering the offender liable to immediate expulsion.

REGISTER OF STUDENTS.

GRADUATE STUDENTS.

CANDIDATES FOR ADVANCED DEGREES.

NAME.	HOME.	RESIDENCE.
Newell, Fred. H., S.B., Mass. Institute of Technology.	*Bradford, Penn.*	Brookline.
Noyes, Arthur A., S.B. Mass. Institute of Technology.	*Newburyport.*	Newburyport.
Atkinson, Charles H., A.B., Harvard University.	*Brookline.*	Brookline.
Bemis, John W., A.B., Harvard University.	*Cambridge.*	Cambridge.
Braithwaite, J. T. Norwood, M.A., Baldwin University.	*Cleveland, O.*	12 Somerset St.
Converse, Charles H., A.B., Harvard University.	*Newton.*	Newton.
Cushing, William C., M.A., University of New Brunswick.	*St. John, N.B.*	298 Col'mb's Ave.
Doak, John E., Ph.B., University of the Pacific.	*Stockton, Cal.*	85 Dartmouth St.
Edwards, Addie E., A.B., University of Vermont.	*Winooski, Vt.*	Bradford.
Emerson, Harrison D., A.B., Belmont College.	*Cincinnati, O.*	323 Col'mb's Ave.
Folwell, Amory P., A.B., Brown University.	*Brooklyn, N.Y.*	106 Appleton St.
Gardner, Charles H., B.S., Columbian University.	*Boston.*	16 Mt. Vernon St.
Harding, Selwyn L., A.B., Harvard University.	*Cambridge.*	Cambridge.
Patterson, George W., Jun., A.B., Yale College.	*Westfield, N.Y.*	61 Clarendon St.
Peterson, Charles A., A.B., Harvard University.	*Boston.*	180 Cambridge St.
Roberts, Odin B., A.B., Harvard University.	*Boston.*	81 Mt. Vernon St.
Sabine, Annie W., M.A., Ohio State University.	*Columbus, O.*	Cambridge.
Smith, Clarence W., A.B., Harvard University.	*Cambridge.*	Cambridge.
Smith, Noah B., B.P., Brown University.	*Washington, D.C.*	106 Appleton St.
Taylor, Frederic S., A.B., Harvard University.	*Boston.*	231 Marlboro' St.
Weld, Frederic C., A.B., Harvard University.	*Jamaica Plain.*	Forest Hill St.

REGULAR STUDENTS.

FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Armington, George A.,	II.	*Weymouth.*	Weymouth.
Atkinson, Charles H., A.B.,	II.	*Brookline.*	Brookline.
Bartlett, Sidney R.,	VII.B.	*Boston.*	13 Arlington St.
Barton, Charles A.,	II.	*Waltham.*	Waltham.
Blake, William B.,	I.	*Newburyport.*	Newburyport.
Brace, Walter C.,	III.	*Leavenworth, Kan.*	113 Berkeley St.
Brainerd, Henry B.,	IX.	*Montreal, P.Q.*	150 Chandler St.
Brainerd, Thomas D.,	IX.	*Montreal, P.Q.*	150 Chandler St.
Bryant, Henry F.,	I.	*Bryantville.*	Bryantville.
Burgess, Frank G.,	I.	*Boston.*	175 Warren Ave.
Cameron, Julian A.,	II.	*Westford.*	228 W. Canton St.
Carney, Frank D.,	III.	*Thomaston, Me.*	2 Sunderland St.
Cole, Winthrop,	II.	*Newton.*	Newton.
Conant, Henry J.,	II.	*Watertown.*	Watertown.
Cooley, Helen,	V.	*Little Britain, N.Y.*	505 Col'mb's Ave.
Curtis, Ralph E.,	II.	*Newburyport.*	Newburyport.
Cushing, William C., M.A.,	I.	*St John, N.B.*	298 Col'mb's Ave.
Fish, Walter C.,	VI.	*Taunton.*	Taunton.
Fox, John M.,	VI.	*Portland, Me.*	190 W. Br'kl'e St.
Gay, Joseph B.,	IV.	*Boston.*	5 Myrtle St.
Gleason, Walter H.,	V.	*Boston.*	123 St. Bot'ph St.
Hadaway, William S., Jun.,	VIII.	*Plymouth.*	Plymouth.
Hildreth, William O.,	II.	*Gardiner, Me.*	65 Dorchester St.
Hobart, James C.,	II.	*Cincinnati, O.*	312 Col'mb's Ave.
Hussey, Oren S.,	II.	*Nashua, N.H.*	223 W. Canton St.
Jones, Edward A.,	II.	*Pittsfield.*	19 Upton St.
Kendall, Charles B.,	V.	*Manchester, N.H.*	29 Union Park.
Livermore, William D.,	V.	*Charlestown.*	45 Soley St.
Mossman, Philip A.,	III.	*Beverly.*	Beverly.
Mulliken, Samuel P.,	V.	*Newburyport.*	Newburyport.
Norris, George L.,	III.	*Melrose.*	Melrose.
Patterson, G. W. Jun., A.B.,	VI.	*Westfield, N.Y.*	61 Clarendon St.
Pearson, Edwin R.,	VI.	*Portsmouth, N.H.*	14 Temple St.
Peters, Quintard,	IX.	*Atlanta, Ga.*	314 Col'mb's Ave.
Richardson, Herbert A.,	V.	*Boston,*	1818 Wash'ton St.
Schwarz, Franz H.,	II.	*Boston.*	157 Charles St.
Sears, Henry D.,	VI.	*Dubuque, Ia.*	5 Moseley Ave.
Sears, Willard T.,	II.	*Hyde Park.*	Hyde Park.
Shepard, Frank E.,	II.	*Dorchester.*	15 Ashland St.
Smith, Charles P.,	II.	*Cambridge.*	Cambridge.
Smith, Harry E.,	V.	*Marshalltown, Io.*	1 Yarmouth St.

NAME.	HOME.	COURSE.	RESIDENCE.
Souther, Henry, Jun.,	III.	*So. Boston.*	546 Broadway.
Spaulding, Hollon C.,	II.	*E. Boston.*	9 Princeton St.
Sprague, Timothy W.,	III.	*Fitchburg.*	308 Col'mb's Ave.
Stanwood, James H.,	I.	*Portland, Me.*	298 Col'mb's Ave.
Stoddard, Henry F.,	II.	*Plymouth.*	Plymouth.
Taintor, Giles,	VI.	*Keene, N.H.*	15 St. James Ave.
Thomas, Edward G.,	II.	*Hingham Centre.*	223 W. Canton St.
Thompson, Walter S.,	I.	*Boston.*	33 Rockland St.
Tucker, H. Judson,	VI.	*Providence, R.I.*	39 Warren Ave.
Twombly, Alex. H.,	II.	*Boston.*	39 High St.
Vose, Ralph,	VI.	*Hyde Park.*	Hyde Park.
Whitmore, Walter G.,	VI.	*Plymouth.*	15 Dwight St.
Whitney, Granger,	III.	*Beverly.*	Beverly.
Whitney, William A.,	I.	*Boston.*	75 Kendall St.
Wilcox, Herbert A.,	III.	*Somerville.*	Somerville.
Williams, Sidney,	I.	*Boston.*	15 Arlington St.
		THIRD YEAR.	
Bates, Henry D.,	IV.	*Racine, Wis.*	236 W. Canton St.
Belser, James L.,	II.	*Marlboro'.*	Marlboro'.
Bigelow, Henry F.,	IV.	*Clinton.*	34 Mt. Vernon St.
Binney, Harold O.,	VI.	*Newport, R.I.*	297 Beacon St.
Bird, Herbert S.,	V.	*City Mills.*	City Mills.
Blanchard, Winslow,	II.	*Dorchester.*	Park St.
Blodgett, John,	II.	*Pawtucket, R.I.*	Jamaica Plain.
Blood, William H., Jun.,	VI.	*Auburndale.*	Auburndale.
Bradlee, Arthur T.,	II.	*Boston.*	113 Beacon St.
Buttolph, Benjamin G.,	II.	*Buffalo, N.Y.*	166 W. Canton St.
Capen, Frank I.,	III.	*Stoughton.*	Stoughton.
Center, David A.,	VI.	*Gloucester.*	Gloucester.
Cheney, Frank P.,	VI.	*Lowell.*	Lowell.
Child, Stephen,	I.	*West Newton.*	West Newton.
Claflin, George E.,	VI.	*Providence, R.I.*	12 Highland Ave.
Cobb, Sylvanus H.,	VI.	*Hyde Park.*	Hyde Park.
Colby, Russell H.,	V.	*Leominster.*	50 Monument Sq.
Cole, Fred B.,	II.	*Kingston.*	Kingston.
Collins, Bertrand R. T.,	II.	*Great Falls, N.H.*	87 Appleton St.
Collins, Edward, Jun.,	VI.	*Milton.*	Milton.
Conner, Arthur J.,	V.	*Boston.*	437 Col'mb's Ave.
Cromwell, Charles H.,	II.	*Baltimore, Md.*	
Devens, Richard,	II.	*Boston.*	19 St. James Ave.
Dutton, Edgar F.,	VI.	*Boston.*	534 Warren St.
Eastman, Henry F.,	II.	*Lowell.*	142 Chandler St.
Ellsworth, Alfred B.,	I.	*Buffalo, N.Y.*	4 Ashburton Pl.

NAME.	COURSE.	HOME.	RESIDENCE.
Eppes, Richard, Jun.,	II.	*City Point, Va.*	233 W. Canton St.
Fay, Ralph M.,	IX.	*Xenia, O.*	Hotel Berkshire.
Ferguson, Louis A.,	VI.	*So. Boston.*	121 K. St.
Flint, Bertram P.,	II.	*Roxbury.*	27 Linwood St.
Folwell, Amory P., A.B.,	I.	*Brooklyn, N.Y.*	106 Appleton St.
Foque, Theodore A.,	II.	*Malden.*	Malden.
Fukuzawa, Stejirau,	I.	*Tokio, Japan.*	148 Warren Ave.
Fuller, J. Edward, Jun.,	IV.	*Worcester.*	311 Col'mb's Ave.
Gerrish, William H.,	II.	*Lowell.*	Lowell.
Greene, Irving G.,	I.	*Boston.*	564 Col'mb's Ave.
Gross, Harold G.,	VII.B.	*Eureka, Cal.*	604 Tremont St.
Gulliver, Frederic P.,	III.	*Norwich, Conn.*	
Hamblet, George W.,	II.	*Lawrence.*	Lawrence.
Harding, Selwyn L., A.B.,	II.	*Cambridge.*	Cambridge.
Harris, William L.,	VII.B.	*No. Wilmington.*	314 Col'mb's Ave.
Harvey, George L.,	II.	*Chicago, Ill.*	74 Chandler St.
Hastings, Charles F.,	III.	*West Newton.*	West Newton.
Heath, George L.,	V.	*Everett.*	Everett.
Herrick, Edward W.,	II.	*Northampton.*	311 Col'mb's Ave.
Holman, George U. G.,	VI.	*E. Boston.*	20 Chelsea St.
Holton, Edward C.,	V.	*Winchester.*	Winchester.
Horn, Henry J., Jun.,	I.	*St. Paul, Minn.*	161 W. Br'kl'e St.
James, Frank M.,	II.	*Haverhill.*	Haverhill.
Jones, Arthur W.,	VI.	*Germantown, Penn.*	Norfolk House.
Jordan, Edwin O.,	VII.A.	*Auburndale.*	Auburndale.
Keough, William T.,	II.	*E. Boston.*	25 Maverick St.
Lee, George S.,	I.	*Revere.*	Revere.
Linzee, John W., Jun.,	I.	*Brookline.*	Brookline.
Loveland, James W.,	V.	*E. Boston.*	25 Princeton St.
Mann, Arthur S.,	II.	*W. Medway.*	W. Medway.
McLauthlin, George V.,	V.	*E. Bridgewater.*	E. Bridgewater.
Merrell, Charles G.,	V.	*Cincinnati, O.*	21 Pinckney St.
Moore, Frank A.,	IV.	*Worcester.*	311 Col'mb's Ave.
Moore, Harry C.,	II.	*Brookline.*	Brookline.
Newell, Joseph P.,	I.	*Mt. Tabor, Ore.*	207 Col'mb's Ave.
Nichols, Fred R.,	VI.	*Keene, N.H.*	358 Col'mb's Ave.
Nickerson, Addison D.,	I.	*Harwichport.*	106 Appleton St.
Peterson, Charles A., A.B.,	VI.	*Boston.*	180 Cambridge St.
Pierce, Herbert F.,	I.	*So. Braintree.*	So. Braintree.
Ranlett, Foster P.,	I.	*Newtonville.*	Newtonville.
Ray, John,	II.	*Boston.*	113 Berkeley St.
Robb, Russell,	VI.	*Detroit, Mich.*	148 Warren Ave.
Roberts, Odin B., A.B.,	II.	*Boston.*	81 Mt. Vernon St.
Safford, Frederick H.,	VI.	*Lawrence.*	Lawrence.
Sawyer, Alfred H.,	II.	*Concord.*	Concord.

NAME.	COURSE.	HOME.	RESIDENCE.
Sayer, Frederick L.,	II.	*New Bedford*	31 Yarmouth St.
Shaw, Walter K.,	II.	*Lexington.*	Lexington.
Sjöström, Ivar L.,	I.	*Lawrence.*	Lawrence.
Smith, Edward M.,	II.	*No. Hampton, N.H.*	N. Hampt'n, N.H.
Snow, William G.,	II.	*Watertown.*	Watertown.
Stetson, Frank O.,	V.	*Newton.*	Newton.
Stone, Charles A.,	VI.	*Newton.*	Newton.
Sully, John M.,	III.	*Cambridge.*	Cambridge.
Towne, Walter I.,	VI.	*Topsfield.*	
Underhill, William W.,	II.	*Winchester.*	Winchester.
Vorce, Clarence B.,	I.	*Farmington, Conn.*	26 Holyoke St.
Warren, A. Sydney,	III.	*Newport, R.I.*	29 West Cedar St.
Webster, Edwin S.,	VI.	*Boston,*	232 Newbury St.
Williams, Arthur S.,	VI.	*Boston.*	15 Arlington St.
Woodward, Amos E.,	III.	*E. Somerville.*	E. Somerville.
Young, John E.,	I.	*Danielsonville, Ct.*	86 Chandler St.
		SECOND YEAR.	
Ayer, Arthur W.,	II.	*East Somerville.*	East Somerville.
Bailey, Hayden G.,	II.	*Boston.*	208 Dartm'th St.
Bartlett, Spaulding,	V.	*Webster.*	3 Oxford Terrace.
Basford, George M.,	II.	*Boston.*	Parker Hill Ave.
Beach, Edward J.,	V.	*Dubuque, Io.*	1204 Wash'ton St.
Beals, Charles E.,	II.	*Stoughton.*	Stoughton.
Bixby, Willard G.,	II.	*Salem.*	Salem.
Bliss, Zenas W.,	II.	*Providence, R.I.*	41 Fairfield St.
Borden, Charles N.,	II.	*Fall River.*	369 Col'mb's Ave.
Boutwell, Frederic S.,	IX.	*Andover.*	Andover.
Bradley, Frederick W.,	VI.	*Lowell.*	420 Col'mb's Ave.
Brainerd, Frederick H.,	III.	*So. Englewood, Ill.*	768 Dudley St.
Bulkley, J. Norman,	VI.	*New York, N.Y.*	204 W. Sp'gfi'd St.
Crabtree, Fred,	V.	*Lawrence.*	Lawrence.
Craigin, Henry A.,	II.	*Boston.*	41 Fairfield St.
Crossman, Fred A.,	II.	*Providence, R.I.*	20 Milford St.
Cutter, Roland N.,	I.	*Winchester.*	Winchester.
Dame, Frank L.,	VI.	*Boston.*	19 Temple Pl.
Davenport, William S.,	V.	*Roxbury.*	190 Dudley St.
Davis, Arthur L.,	II.	*San Francisco, Cal.*	85 Dartmouth St.
Deetz, Charles H.,	I.	*Sellersville, Penn.*	196 W. Cant'n St.
Dodge, Charles B.,	IX.	*Skowhegan, Me.*	12 Bowdoin St.
Dow, William H.,	I.	*Portland, Me.*	42 Concord Sq.
Duane, William M.,	I.	*West Newton.*	West Newton.
Dunbar, Kinsley,	VI.	*Canton.*	Canton.
Durfee, Nathan,	II.	*Fall River.*	369 Col'mb's Ave.

NAME.	COURSE.	HOME.	RESIDENCE.
Dwelley, Edwin F.,	I.	*W. Hanover.*	W. Hanover.
Dyar, Harrison G.,	V.	*Rhinebeck, N.Y.*	170 W. Ches'r Pk.
Edgett, Horace P.,	VIII.	*Beverly.*	Beverly.
Edwards, Arthur V.,	IV.	*Milton.*	Milton.
Fairbairn, John T.,	II.	*Hyde Park.*	Hyde Park.
Fiske, J. Parker B.,	VI.	*Auburndale.*	Auburndale.
French, Edward V.,	II.	*Lynn.*	Lynn.
French, Hollis,	VI.	*Boston.*	200 Com'w'th Av.
Gannett, Earl W.,	VI.	*Omaha, Neb.*	127 St. Bot'lph St.
Gardiner, Irving L'H.,	II.	*Milford, Penn.*	6 Allston St.
Goodrich, David P.,	IV.	*So. Boston.*	801 Broadway.
Grose, Charles W.,	I.	*No. Abington.*	No. Abington.
Guppy, Benjamin W.,	I.	*Jamaica Plain.*	8 Myrtle St.
Ham, Fred,	VI.	*Somerville.*	Somerville.
Harrington, Edward M.,	V.	*Reading.*	Reading.
Hart, Francis,	VI.	*New Bedford.*	Forest Hill St.
Hazard, Schuyler,	I.	*Georgetown, S.C.*	Braintree.
Hobart, Henry M.,	VI.	*Boston.*	60 W. Rutland Sq.
Hobbs, Franklin W.,	II.	*Brookline.*	Brookline.
Hooker, Richard,	IV.	*Roxbury.*	19 Forest Ave.
Hopkins, Fred L.,	V.	*Lawrence.*	Lawrence.
Hunt, Harry H.,	VI.	*Melrose.*	Melrose.
Hutchins, Edward S.,	II.	*Providence, R.I.*	5 St. James Ave.
Johnson, William S.,	I.	*Saxonville.*	Saxonville.
Kilham, Walter H.,	IV.	*Beverly.*	Beverly.
Kunhardt, Lewis H.,	II.	*Melrose Highlands.*	Melrose Highl'ds.
Laws, Frank A.,	VI.	*Brockton.*	Brockton.
Lewis, William W.,	II.	*Hyde Park.*	Hyde Park.
Mauran, J. Lawrence,	VI.	*Providence, R.I.*	19 W. Cedar St.
May, John E., Jun.,	I.	*Philadelphia, Penn.*	19 St. James Ave.
Merrick, Sumner B.,	II.	*Arlington Heights.*	Arlington H'g'ts.
Merrill, William H., Jun.,	VI.	*New York, N.Y.*	304 Col'mb's Ave.
Mildram, Samuel H.,	I.	*Neponset.*	Wood St.
Newell, Samuel M.,	I.	*W. Newbury.*	336 Shawmut Av.
Norris, Almon E.,	II.	*Lexington.*	Lexington.
Norris, Clarence G.,	I.	*Hyde Park.*	Hyde Park.
Pendleton, Lyman B.,	I.	*Stonington, Conn.*	34 Bucking'm St.
Pietsch, Theodore W.,	IV.	*Chicago, Ill.*	40 Clifford St.
Pike, Clayton W.,	VI.	*Fryeburg, Me.*	165 Boylston St.
Plumer, William G.,	IV.	*Peabody.*	Peabody.
Power, Charles W.,	VI.	*Pittsfield.*	19 Upton St.
Ranno, Fred W.,	I.	*Manchester, N.H.*	69 M'ntg'm'ry St.
Ray, Victor,	III.	*Cincinnati, O.*	113 Berkeley St.
Richardson, George L.,	I.	*San Rafael, Cal.*	85 Dartmouth St.
Rollins, Montgomery,	IX.	*Concord, N.H.*	239 W. Canton St.

NAME.	COURSE.	HOME.	RESIDENCE.
Rounds, George W.,	VI.	*Malden.*	Malden.
Russel, Richard L.,	I.	*Pottsville, Penn.*	198 Beacon St.
Russell, George F.,	IX.	*Lawrence.*	143 Boylston St.
Sanborn, Frank E.,	II.	*Roxbury.*	103 Moreland St.
Shepard, Edward V.,	I.	*Salem.*	Salem.
Silsbee, Walter E.,	I.	*Lynn.*	4 Allston St.
Simpson, Charles L.,	I.	*Kansas City, Kan.*	517 Col'mb's Ave.
Smith, Harry D.,	II.	*Boston.*	16 Bond St.
Smith, William L.,	VI.	*Boston.*	360 Marlboro' St.
Smythe, Frank A.,	I.	*Somerville.*	Somerville.
Thurber, William B.,	II.	*Plymouth.*	Plymouth.
Truesdell, Arthur E.,	VI.	*W. Stockbridge.*	Newton.
Van Nostrand, Frank B.,	VI.	*Charlestown.*	10 Auburn St.
Wadsworth, Oliver F., Jun.,	IV.	*Boston.*	139 Boylston St.
Wales, George C.,	IV.	*Boston.*	202 C'm'w'lth Av.
Walker, Charles R.,	V.	*Cambridgeport.*	Cambridgeport.
Warner, Charles H.,	VI.	*Fall River.*	275 Newbury St.
Whipple, George C.,	I.	*Chelsea.*	Chelsea.
Whiting, Jasper,	III.	*Charlestown.*	100 Main St.
Whitmore, George A.,	VI.	*Boston.*	Hotel Helvetia.
Whitney, Frank P.,	VI.	*Boston.*	592 Adams St.
Williams, Robert C.,	III.	*Marquette, Mich.*	127 Pembroke St.
Williams, Theodore G.,	VI.	*Boston.*	28 H'ghl'd Pk. Av.
Williston, Arthur L.,	II.	*Cambridge.*	Cambridge.
Wilson, Benjamin F., Jun.,	III.	*Norfolk, Va.*	26 Berwick Pk.
Windett, Victor,	II.	*Chicago, Ill.*	296 Col'mb's Ave.
Wuichet, Walter G.,	II.	*Dayton, O.*	62 Berkeley St.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Adams, Arthur H.	*Watertown.*	Watertown.
Aldrich, Willard C.	*Somerville.*	Somerville.
Armington, Everett F.	*Weymouth.*	Weymouth.
Ashton, Albert C.	*Somerville.*	Somerville.
Atwood, Frank W.	*E. Boston.*	81 Lexington St.
Babb, Cyrus C.	*Boston.*	12 Somerset St.
Babbitt, Samuel W.	*Fairhaven.*	Cambridgeport.
Baker, Joseph B.	*So. Boston.*	819 Broadway.
Batchelder, John L., Jun.	*Jamaica Plain.*	Pond St.
Beals, Edward M.	*Boston.*	125 Newbury St.
Bellows, Arthur B.	*Walpole, N.H.*	272 Newbury St.
Bird, Elisha B.	*Dorchester.*	122 Cottage St.
Blood, John B.	*Newburyport.*	Newburyport.
Blume, J. Cristóbal.	*Lima, Peru.*	48 Chester Sq.
Borden, J. Edgar.	*Fall River.*	Auburndale.

NAME.	HOME.	RESIDENCE.
Bowker, Willard L.	*Walpole.*	Walpole.
Bradley, Alexander S.	*Hyde Park, Ill.*	768 Dudley St.
Bragg, Edward F.	*Taunton.*	Taunton.
Brand, Horace L. P.	*Chicago, Ill.*	12 Yarmouth St.
Brown, Albert F.	*Roxbury.*	106 Ziegler St.
Brown, Edward D.	*Reading.*	Reading.
Brown, Harry W.	*Marblehead.*	Marblehead.
Brown, Ralph G.	*Boston.*	486 Col'mb's Ave.
Buffum, Harrison S.	*Providence, R.I.*	91 Waltham St.
Bunker, Adrianna V.	*Auburndale.*	Auburndale.
Butters, Robert G. W.	*Haverhill.*	291 Col'mb's Ave.
Calkins, Gary N.	*Chicago, Ill.*	113 Berkeley St.
Campbell, Duncan.	*Pawtucket, R.I.*	102 Revere St.
Carlisle, Morten.	*Cincinnati, O.*	295 Col'mb's Ave.
Carlton, Chester V.	*Milford, N.H.*	Winchester.
Carney, James A.	*Lowell.*	Lowell.
Chapman, George D.	*Fitchburg.*	66 Chester Sq.
Choate, Francis B.	*Salem.*	Salem.
Churchill, Charles O.	*Abington.*	Abington.
Clapp, Homer C.	*So. Boston.*	729 E. Fourth St.
Clark, Edward A.	*Jamaica Plain.*	Greenough Ave.
Clark, James, Jun.	*Louisville, Ky.*	325 Col'mb's Ave.
Clement, Harry W.	*Rutland, Vt.*	316 Shawmut Av.
Codman, Thomas N.	*So. Lincoln.*	So. Lincoln.
Collins, William H.	*Phœnix, R.I.*	118 Chandler St.
Cook, Walter F.	*Dorchester.*	Boston St.
Crane, John G.	*Taunton.*	Taunton.
Creden, William L.	*So. Boston.*	940 Broadway.
Curtis, Harry W.	*Marlboro'.*	Marlboro'.
Curtis, William G.	*Abington.*	Abington.
Daniell, Otis.	*Franklin, N.H.*	474 Col'mb's Ave.
Daniell, W. Fisher, Jun.	*Franklin, N.H.*	474 Col'mb's Ave.
de Bullet, John C. E.	*Carroll P.O., Md.*	Hotel Brunswick.
Delano, Alexander J.	*Boston.*	231 Dudley St.
De Wolf, John O.	*Greenfield.*	14 Winthrop St.
Dodd, George W.	*Boston.*	12 Newbury St.
Dodge, Fred. H.	*Toledo, O.*	80 W. Newton St.
Dore, Walter J.	*Chicago, Ill.*	150 Chandler St.
Dunbar, Frank W.	*Canton.*	Canton.
du Pont, Pierre S.	*Philadelphia, Penn.*	436 Col'mb's Ave.
Eaton, Gordon.	*Holliston.*	Holliston.
Eldridge, George F.	*Hyde Park.*	Hyde Park.
Ellis, Walter.	*Newton.*	Newton.
Emerson, Guy C.	*Orland, Me.*	413 Shawmut Ave.
Fenn, William H.	*Jersey City, N.J.*	426 Col'mb's Ave.

NAME.	HOME.	RESIDENCE.
Finch, William I.	*Scranton, Penn.*	369 Col'mb's Ave.
Fischer, Frederick T.	*Highland Park, Ill.*	517 Col'mb's Ave.
Fitts, Charles F.	*Haverhill.*	Haverhill.
Flint, William P.	*Brookline.*	Walnut St.
Flood, S. Douglas	*Hyde Park, Ill.*	19 St. James Ave.
Foster, Cassius M.	*Toledo, O.*	80 W. Newton St.
Fuller, George W.	*W. Medway.*	W. Medway.
Garfield, Edmund D.	*Fitchburg.*	Cambridge.
Gilmore, George L.	*Charlestown.*	212 B'nk'r Hill St.
Glidden, John W.	*De Kalb, Ill.*	753 Tremont St.
Goodhue, Francis, Jun.	*Brattleboro', Vt.*	32 W. Cedar St.
Goodwin, Harry M.	*Boston.*	3 Townsend St.
Greene, William R.	*Riverpoint, R.I.*	Brookline.
Greenlaw, Frank M.	*Roxbury.*	5 Willoughby Pl.
Haddock, Herbert W.	*Michigan City, Ind.*	Auburndale.
Hale, George E.	*Chicago, Ill.*	3 Wheatland Ave.
Hall, Frederic B.	*Charlestown.*	70 Winthrop St.
Hall, John R., 2d.	*Longwood.*	Longwood.
Hall, Roderick D.	*Boston.*	376 Col'mb's Ave.
Hamilton, Edgar L.	*Fond du Lac, Wis.*	361 Col'mb's Ave.
Harnden, Frederick E.	*Boston.*	34 Rutland Sq.
Haskins, William.	*Medford.*	Medford.
Hawes, George L.	*Newton Centre.*	Newton Centre.
Hayden, Charles.	*Boston.*	166 Newbury St.
Hayden, Sophia G.	*Jamaica Plain.*	335 Lamartine St.
Heywood, John P.	*Chicago, Ill.*	78 Temple St.
Hills, Leonard M.	*Amherst.*	148 W. Canton St.
Hilton, George A.	*Cambridge.*	Cambridge.
Holmes, Edward S.	*Plymouth.*	Plymouth.
Holmes, Eugene A.	*Medford.*	Medford.
Holmes, Lemuel B.	*Kingston.*	Kingston.
Horton, S. Ellsworth.	*Windsor Locks, Ct.*	46 Savin St.
Hubbard, Gilbert.	*West Newton.*	West Newton.
Hussey, Francis F.	*West Newton.*	West Newton.
Hyde, John S.	*Bath, Me.*	105 Pembroke St.
Hyde, Karl H.	*Neponset.*	Neponset.
Jaques, S. Foster.	*Newburyport.*	Newburyport.
Johnson, William H.	*Haverhill.*	291 Col'mb's Ave.
Kern, Harry W.	*Chicago, Ill.*	369 Col'mb's Ave.
Kimball, Richard H.	*Concord, N.H.*	
Kingsbury, Fred. E.	*Keene, N.H.*	Mount Auburn.
Knight, Franklin.	*Lynn.*	Lynn.
Koch, Charles.	*Cincinnati, O.*	37 Greenwich Pk.
Latta, Louis M.	*Boston.*	180 Com'w'h Ave.
Lenfest, Bertram A.	*Reading.*	Reading.

NAME.	HOME.	RESIDENCE.
Le Sueur, Ernest A.	*Ottawa, Can.*	Newton High.
Loring, Atherton.	*So. Boston.*	789 Broadway.
Loynes, George B.	*Lee.*	Newton Centre.
Lyman, Moses, Jun.	*Waverly, N.Y.*	2 Columbus Sq.
Macgregor, Wallace.	*E. Braintree.*	E. Braintree.
Machado, Ernest M. A.	*Salem.*	Salem.
Maker, Edward R.	*Melrose.*	Melrose.
Mann, Bertram H.	*Weymouth.*	Weymouth.
Martin, Waldo A.	*Milton.*	Milton.
Martin, Wisner B.	*San Francisco, Cal.*	Cambridge.
McBean, George B.	*New York, N.Y.*	314 Col'mb's Ave.
McDonald, Frank A.	*Ellsworth, Me.*	148 W. Newt'n St.
Mead, James A.	*Grand Rapids, Mich.*	86 Mt. Vernon St.
Merrick, George E.	*Holyoke.*	98 Chandler St.
Mesier, Henry.	*Wappinger's Falls, N.Y.*	115 Berkeley St.
Metcalf, Frederick.	*Providence, R.I.*	69 Appleton St.
Mitchell, Everett S.	*Boston.*	15 Hayward Pl.
Moody, Burdett.	*Deadwood, Dak.*	17 Upton St.
Moody, Frederick C.	*Boston.*	116 Appleton St.
Moore, S. Wallace.	*Newton.*	Newton.
Morse, Cabot J.	*Boston.*	16 Fairfield St.
Moss, S. Arthur.	*New Berlin, N.Y.*	2 Columbus Sq.
Mossman, William.	*Mattapan.*	Mattapan.
Murdock, William L.	*Woburn.*	Woburn.
Nason, Charles R.	*Hartford, Conn.*	Dorchester.
Nelson, George L.	*Geneva, N.Y.*	157 Boylston St.
Newell, Allan H.	*Stockton, Cal.*	82 W. Newton St.
Nims, Norman G.	*Keene, N.H.*	Somerville.
Northey, Edward A.	*Salem.*	Salem.
Noyes, Harry L.	*Boone, Io.*	Parker Hill Ave.
Noyes, Joseph K.	*Binghamton, N.Y.*	2 Columbus Sq.
Orrok, George A.	*Dorchester.*	38 Olney St.
Osborne, George C.	*Tate, Ga.*	Newtonville.
Packard, George A.	*Wakefield.*	Wakefield.
Peyton, William R.	*Duluth, Minn.*	154 Warren Ave.
Poland, William B.	*Boston.*	116 W. Newt'n St.
Preston, Evans.	*Boston.*	Hotel Berkeley.
Raymond, Edward B.	*Somerville.*	Somerville.
Read, Carleton A.	*Bolton.*	Bolton.
Reed, William B.	*Westfield.*	304 Col'mb's Ave.
Reed, William K.	*Columbus, O.*	98 Appleton St.
Reynolds, John F.	*Marblehead.*	Marblehead.
Rice, Calvin W.	*Winchester,*	Winchester.
Ripley, Charles E.	*Rutland, Vt.*	79 Waltham St.
Ripley, William Z.	*Newton.*	Newton.

NAME.	HOME.	RESIDENCE.
Roberts, Harold B.	*Boston.*	81 Mt. Vernon St.
Robinson, Edward.	*Hudson.*	Hudson.
Robinson, Graham.	*E. Taunton.*	E. Taunton.
Rogers, Allen H.	*So. Boston.*	707 E. Broadway.
Rogers, Minnie.	*Jamaica Plain.*	53 Bowe St.
Roots, Willard H.	*Little Rock, Ark.*	75 Chandler St.
Royce, Frederick P.	*Boston.*	256 Newbury St.
Schieffelin, Schuyler.	*New York, N.Y.*	1 St. James Ave.
Schroeter, Hugo E.	*Roxbury.*	7 Sudbury Pl.
Sherman, Charles W.	*Kingston.*	Kingston.
Simpson, Edmund T.	*Lowell.*	Lowell.
Slater, Howard C.	*Providence, R.I.*	85 Dartmouth St.
Smith, Frederic W.	*Salem.*	Salem.
Sonnemann, George A.	*Boston.*	228 Tremont St.
Southworth, Martin O.	*Stoughton.*	Stoughton.
Spaulding, Henry P.	*Newton.*	Newton.
Spring, Andrew H.	*Somerville.*	Somerville.
Stearns, Arthur B.	*Framingham.*	Framingham.
Stearns, Edward B.	*Dorchester.*	58 Magnolia St.
Sturges, Benton.	*Lake Geneva, Wis.*	150 Chandler St.
Sturtevant, Thomas J.	*Geneva, N.Y.*	So. Framingham.
Swanton, Frederick W.	*Bath, Me.*	1 Columbus Sq.
Tallant, George P.	*San Francisco, Cal.*	1 St. James Ave.
Taylor, Gordon H.	*E. Cambridge.*	E. Cambridge.
Thomas, Francis C. P.	*Oswego, N.Y.*	129 Dartmouth St.
Thompson, Herbert A.	*Amherst.*	116 W. Newt'n St.
Towne, John H.	*Stamford, Conn.*	64 Mt. Vernon St.
Tripp, Thaxter N.	*Lynn.*	Lynn.
Tuckerman, Samuel F.	*Roxbury.*	10 Lambert St.
Voorhees, Gardner T.	*Cambridgeport.*	Cambridgeport.
Waite, Henry M.	*Toledo, O.*	80 W. Newton St.
Walker, Elton D.	*Taunton.*	Taunton.
Walker, Robert T.	*Greenfield.*	14 Winthrop St.
Warren, Lyman O.	*Brighton.*	Brighton.
Wason, Leonard C.	*Brookline.*	Brookline.
Watson, C. Morris.	*Jamaica Plain.*	26 Greenough Av.
Weld, George F.	*Falmouth.*	Morton St.
Wells, William F.	*New Haven, Conn.*	213 W. Sp'g'd. St.
Wertheimer, Leon.	*Allegheny, Penn.*	127 Pembroke St.
White, Franklin W.	*Boston.*	Hotel Berwick.
Whitten, Ernest P.	*Roxbury.*	59 School St.
Wilcox, William M.	*Madison, Conn.*	3 Wheatland Ave.
Willes, Will D.	*Bath, Me.*	60 W. Rutland Sq.
Wood, Edward H.	*Beverly.*	Beverly.
Wood, Harry.	*Natick.*	Natick.

NAME.	HOME.	RESIDENCE.
Wood, William B.	*Arlington.*	Arlington.
Woodman, Andrew W.	*Chelsea.*	Chelsea.
Woodward, George M.	*Seekonk.*	102 Revere St.

SPECIAL STUDENTS.

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

App. Mech.,	Applied Mechanics.	Eng.,	English.	Mech. and Acoust.,	Mechanics and Acoustics.
Arch.,	Architecture.	Fr.,	French.	Met.,	Metallurgy.
Chem.,	Chemistry.	Gen. Biol.,	General Biology.	Mil.,	Military Drill.
Civ. Eng.,	Civil Engineering.	Geol.,	Geology.	Min.,	Mining.
Draw.,	Mech. Drawing.	Germ.,	German.	Phys.,	Physics.
Desc. Geom.,	Descriptive Geometry.	Heat. and Vent.,	Heating and Ventilation.	Shop.,	Shopwork.
Elec. Eng.,	Electrical Engineering.	Math.,	Mathematics.	Surv.,	Surveying.
		Mech.,	Mechanism.	Zoöl.,	Zoölogy.
		Mech. Eng.,	Mechanical Engineering.		

NAMES.	HOME.	RESIDENCE.
Aldrich, Will S.,	*Freeport, Me.*	50 Union Park.
Arch.		
Attwill, William H.,	*Lynn.*	Lynn.
Desc. Geom., Mech. and Acoust., Mech., Phys.		
Baldwin, Annie F.,	*Boston.*	61 Clarendon St.
Phys., Chem., Draw., Geol., Gen. Biol., Zoöl.		
Baldwin, James C. T.,	*Jamaica Plain.*	Pond St.
Math., Germ., Mech., Eng., Phys.		
Bardwell, Arthur F.,	*Springfield.*	2 Oxford Terrace.
Math., Fr., Eng., Surv., Phys.		
Bates, Charles H.,	*Boston.*	41 Mt. Vernon St.
Math., Desc. Geom., Eng., Germ., Mech., Phys., Shop.		
Bates, Sturgis G.,	*Greenup, Ky.*	16 Ashburton Pl.
Eng., Germ., Shop.		
Beaman, William M.,	*Rutland, Vt.*	20 Worcester Sq.
Math., Chem., Germ., Phys., Surv.		
Beasom, Charles B.,	*Nashua, N.H.*	30 Appleton St.
Math., Chem., Draw.		
Bemis, John W., A.B.,	*Cambridge.*	Cambridge.
Arch.		
Bigelow, Samuel L.,	*Boston,*	4 Chestnut St.
Chem.		
Bliss, Will S.,	*Carson, Nev.*	26 Holyoke St.
App. Mech., Phys., Civ. Eng., Met.		
Blume, Federico, y Corbacho,	*Lima, Peru.*	16 E. Br'kline St.
Chem.		
Boss, Austin D.,	*Willimantic, Conn.*	4 Moreland St.
Math., Chem., Draw., Eng., Shop., Mil.		

NAMES.	HOME.	RESIDENCE.
Bosworth, William W.,	*Roxbury.*	Hotel Warren.
Arch., Germ.		
Bowditch, Nathaniel I.,	*Framingham.*	29 C'm'nw'lth Av.
Desc. Geom., Germ., Mech. and Acoust., Fr., Eng.		
Braithwaite, J. T. Norwood, M.A.,	*Cleveland, O.*	12 Somerset St.
Chem., Geol.		
Brewer, Nathaniel, 3d.,	*Swampscott.*	Swampscott.
Chem., Fr., Germ., Shop.		
Bridges, Luther W.,	*So. Framingham.*	So. Framingham.
Math., Germ., App. Mech., Mech. Eng., Phys., Shop.		
Brintnall, Daniel W.,	*Charlestown.*	76 High St.
Math., Chem., Draw., Eng., Elem. Fr., Mil.		
Brown, Charles L.,	*Stoughton.*	Stoughton.
Chem., Math., App. Mech., Geol., Min., Phys.		
Brown, E. Lyman,	*Boston.*	80 Mt. Vernon St.
Math., Desc. Geom., Eng., Germ., Mech., Phys., Shop.		
Burley, Harry B.,	*No. Epping, N.H.*	147 Worcester St.
Math., Chem., Draw., Eng., Elem. Fr., Mil.		
Calkins, F. Earle,	*Chicago, Ill.*	113 Berkeley St.
Fr., Germ., Arch.		
Carleton, Elbridge S.,	*Rochdale.*	2 Ashburton Pl.
App. Mech., Arch., Phys., Heat. and Vent.		
Cartwright, Jas. W., jun.,	*Boston.*	503 Col'mb's Ave.
Chem., Fr., Germ., Eng.		
Case, John W.,	*Detroit, Mich.*	29 Berwick Park.
Arch., Fr., Geol., App. Mech.		
Chandler, Joseph E.,	*Plymouth.*	
Arch., Fr.		
Chapman, Mary,	*Boston.*	52 Bowdoin St.
Chem., Phys.		
Chase, Arthur E.,	*Leominster.*	325 Col'mb's Ave.
Chem., Draw., Eng., Germ.		
Chase, Arthur T.,	*Haverhill.*	Haverhill.
Math., Phys.		
Cilley, Frank H.,	*Dorchester.*	601 Dudley St.
Math., Surv., Eng., Germ., Phys.		
Clark, Harry W.,	*No. Andover.*	148 Warren Ave.
Chem., Met.		
Cobb, Morton E.,	*Newton.*	Newton.
App. Mech., Met., Shop., Heat. and Vent., Mech. Eng.		
Coffin, Winthrop,	*Auburndale.*	Auburndale.
Chem.		
Congar, Ernest C.,	*Manchester, Io.*	19 Harwich St.
Chem., Phys., Shop., Germ., Zöol., Eng.		
Conant, Elbridge R.,	*Acton.*	Acton.
Math., Eng., Germ., Phys., Surv.		
Converse, Charles H., A.B.,	*Newton.*	Newton.
Arch.		
Coulson, Joseph, Jun.,	*Lawrence.*	Lawrence.
Civ. Eng., Germ., Phys., Math., App. Mech.		

NAMES.	HOME.	RESIDENCE.
Crane, Edward A., Arch.	*Taunton.*	Taunton.
Curtiss, George F., App. Mech., Germ., Elec. Eng., Math., Mech. Eng.	*New Britain, Conn.*	131 W. Newt'n St.
Dawson, Charles W., Arch.	*Lowell.*	Lowell.
Dearborn, William L., Civ. Eng., Math., App. Mech., Geol., Germ., Phys.	*Dorchester.*	Harrison Sq.
Dempsey, George C., Chem., Germ.	*Lowell.*	Lowell.
Dittrich, Heinrich C., Arch., Eng., Germ.	*Kansas City, Mo.*	63 Camden St.
Doak, John E., Ph.B., Germ., Mech., Phys., Shop., Eng.	*Stockton, Cal.*	85 Dartmouth St.
Donnell, Francis M., Math., App. Mech., Germ., Mech. Eng., Phys., Shop.	*Houlton, Me.*	28 Hancock St.
Draper, George O., App. Mech., Heat. and Vent., Met., Shop., Eng.	*Hopedale.*	200 Dartm'th St.
du Pont, Maurice, Math., App. Mech., Eng., Germ., Mech. Eng., Phys.	*Wilmington, Del.*	312 Col'mb's Ave.
Edgerton, Charles R., Arch., Fr., Germ.	*Little Rock, Ark.*	75 Chandler St.
Edwards, Addie E., A.B., Chem.	*Winooski, Vt.*	Bradford.
Eisendrath, Simon B., Arch., Fr.	*Chicago, Ill.*	102 Dartmouth St.
Elder, Herman S., Math., Desc. Geom., Mech., Phys.	*Lewiston, Penn.*	362 Col'mb's Ave.
Ellis, Fred E., Math., Germ., App. Mech., Mech. Eng., Phys., Shop.	*Melrose.*	Melrose.
Emerson, Harrison D., A.B., Math., Civ. Eng.	*Cincinnati, O.*	323 Col'mb's Ave.
Estabrook, Willard W., Math., Desc. Geom., Mech., Phys., Shop.	*Boston.*	42 Rutland Sq.
Farwell, Lyman, Arch., Math., App. Mech., Geol.	*St. Paul, Minn.*	42 Worcester St.
Forristall, Arthur M., Chem., Fr., Eng., Germ.	*Boston.*	172 W. Newt'n St.
French, Alfred W., Math., Draw., Eng., Germ., Phys., Surv.	*Hartford, Conn.*	West Roxbury.
Frink, William P., Math., Elect. Eng., Shop.	*Greenland, N.H.*	115 Chandler St.
Frizell, Arthur B., Math., Desc. Geom., Mech. and Acoust., Mech., Phys., Eng., Shop., App. Mech., Germ.	*Dorchester.*	75 Linden St.
Gage, Walter C., Math., Mech., Phys., Eng., Geol., Shop.	*Warren.*	Somerville.
Gahagan, Walter H., Math., Phys., App. Mech., Civ. Eng.	*Troy, O.*	207 Col'mb's Ave.
Gaines, Ambrose P., Math., Chem., Germ., Phys., Eng., Surv., Geol.	*Nashville, Tenn.*	3 Columbus Sq.

NAME.	HOME.	RESIDENCE.
Gale, Edwards J.,	*Exeter, N.H.*	Newton.
Arch., Fr.		
Gammans, James A.,	*Belfast, Me.*	Newton Centre.
Chem., Math., Surv., Geol.		
Gardner, Charles H., B.S.,	*Boston.*	16 Mt. Vernon St.
Chem., Met., Min., Lab.		
Gilbert, James P.,	*Jamaica Plain.*	Chestnut Ave.
Math., Chem., Germ., Phys.		
Gilbreth, Mary E.,	*Boston.*	156 W. Ches. Pk.
Chem.		
Gilman, G. Abbott,	*Newton.*	Newton.
Math., Chem., Draw., Eng., Elem. Fr., Mil.		
Gleason, Hall,	*W. Medford.*	W. Medford.
Math., Phys., Shop.		
Goss, Edward O.,	*Waterbury, Conn.*	309 Col'mb's Ave.
App. Mech., Mech. Eng., Met., Shop., Heat. and Vent.		
Gowing, Frank P.,	*Boston.*	4 Marlboro' St.
Math., Draw., Eng., Fr., Mil.		
Granger, Alfred H.,	*Zanesville, O.*	43 W. Newton St.
Arch.		
Greeley, James T.,	*Nashua, N.H.*	290 Col'mb's Ave.
Chem., Phys., Eng., Germ., Geol.		
Guild, Edith T.,	*Boston.*	108 Marlboro' St.
Chem.		
Guild, Irving T.,	*Lynn.*	Lynn.
Arch., Fr.		
Hague, William,	*Tidioute, Penn.*	Wollaston Hei'ts.
Math., Chem., Draw., Elem. Fr., Mil.		
Hall, Joseph J.,	*Atlanta, Ga.*	Lexington.
Arch.		
Hallenberg, Adolph,	*Louisville, Ky.*	420 Col'mb's Ave.
Arch.		
Harding, George C.,	*Pittsfield.*	41 Appleton St.
Arch.		
Hathaway, Savory C., Jun.,	*New Bedford.*	16 Circuit St.
Math., Eng., Germ., Chem., Mech. Eng., Phys., App. Mech., Elect. Eng.		
Hawkins, Paul R.,	*Springfield.*	312 Col'mb's Ave.
Math., Eng., Germ., Phys., Surv.		
Hodgkins, Howard G.,	*Boston.*	77 Montg'ery St.
Arch., Math., App. Mech., Eng., Geol., Germ.		
Hollis, Fred. S.,	*Newton Highlands.*	Newton Highl'ds.
Phys., Chem., Eng., Germ., Fr.		
Holmes, Charles L.,	*Waterbury, Conn.*	309 Col'mb's Ave.
Math., App. Mech., Mech. Eng., Phys., Shop.		
Howard, Henry,	*Longwood.*	Longwood.
Fr., Chem., Germ.		
Huntoon, Edm. J. B.,	*Canton.*	Canton.
Math., Desc. Geom., Eng., Germ., Mech. and Acoust., Phys., Mech., Shop.		
Hutcheson, Mary,	*Boston.*	Hotel Copley.
Chem.		

NAME.	HOME.	RESIDENCE.
Hyams, Isabel F., Chem.	*Boston.*	1 Sharon St.
Jarecki, Alexander, Math., App. Mech., Mech. Eng., Phys.	*Erie, Penn.*	
Johnson, Lewis E., Math., Chem., Mech., Phys., Germ., Shop.	*Waterloo, Io.*	290 Col'mb's Ave.
Joyce, Joseph L., Arch., Geol.	*Boston.*	84 Terrace St.
Kaufman, George C., Arch., Fr.	*Syracuse, N.Y.*	196 W. Canton St.
Kean, Alexander L., Eng., Zoöl., Germ., Biol.	*Elizabeth, N.J.*	1 Oxford Terrace.
Kearns, Daniel D., Arch.	*Roxbury.*	77 Quincy St.
Kendricken, Paul J., Math., Desc. Geom., Eng., Germ., Phys., Shop.	*Boston.*	376 Dudley St.
Kimball, Harry W., App. Mech., Mech. Eng., Met., Shop., Heat. and Vent.	*Bath, Me.*	147 W. Newt'n St.
Kimball, Thomas R., Arch.	*Omaha, Neb.*	
Kinsman, Arthur D., Math., Chem., Eng., Germ., Mech. and Acoust., Phys.	*Ipswich.*	Beverly.
Ladd, Frank M., Phys., Surv., Eng., Germ., Shop.	*Uncasville, Conn.*	26 Holyoke St.
Lane, Benjamin C., Chem., Germ., Met., Phys.	*Boston.*	623 Tremont St.
La Rose, Anthime W., Arch., Desc. Geom., Phys.	*Albany, N.Y.*	68 Chandler St.
La Rose, Charles R., Arch., Germ.	*Albany, N.Y.*	68 Chandler St.
Lauder, George B., Math., Desc. Geom., Eng., Germ., Mech. and Acoust., Mech., Phys., Fr.	*Concord, N.H.*	408 Col'mb's Ave.
Lee, John C., Chem.	*Roxbury.*	145 Cedar St.
Loewenthal, Joseph B., Chem., Germ., Met., Eng., Heat. and Vent.	*Chicago, Ill.*	1 Yarmouth St.
Loring, Harrison, Jun., Math., Desc. Geom., Eng.,, Germ., Mech., Phys., Shop.	*So. Boston.*	789 Broadway.
Marcy, George D., Fr., Eng., Phys., Shop.	*Portsmouth, N.H.*	
Marsh, Edmund P., Math., Desc. Geom., Eng., Germ., Mech., Phys., Shop., Chem.	*Newton.*	Newton.
Marshall, William A., Germ., Eng., Mil.	*Belfast, Me.*	46 Union Park.
Martin, Frank H., Arch.	*Providence, R.I.*	
McConnell, George B., Math., Phys., Surv., Geol., Germ.	*Roxbury.*	153 Blue Hill Ave.
Meade, Frank B., Arch.	*Cleveland, O.*	25 Berwick Park.

NAME.	HOME.	RESIDENCE.
Means, Ellison C.,	*Ashland, Ky.*	215 W. Canton St.
Chem., Geol., Germ., Met., Min.		
Meyers, Edwin J.,	*Evansville, Ind.*	357 Col'mb's Ave.
Arch.		
Moody, Walter S.,	*Chelsea.*	Chelsea.
Math., Mech. Eng., App. Mech., Elect. Eng.		
Morrison, Gilbert W.,	*Exeter, N.H.*	355 Dudley St.
App. Mech., Mech. Eng., Met., Heat. and Vent.		
Morse, Mary L. W.,	*Poland, O.*	Jamaica Plain.
Chem., Germ.		
Mott, William E.,	*Burlington, N.J.*	161 W. Br'kl'e St.
Math., App. Mech., Civ. Eng., Eng., Geol., Germ., Phys.		
Muhlenberg, Frederick H.,	*Boston.*	117 Chandler St.
Math., App. Mech., Mech. Eng., Phys., Eng., Shop.		
Nash, Frank C.,	*Cherryfield, Me.*	336 Shawmut Av.
Math., Desc. Geom., Eng., Germ., Mech., Phys., Shop., Chem.		
Nash, Henry A., Jun.,	*No. Weymouth.*	No. Weymouth.
Math., Draw., Eng., Fr., Mil.		
Newell, Lorenzo B.,	*Newton Centre.*	Newton Centre.
Math., Germ., App. Mech., Mech. Eng., Phys., Eng., Shop.		
Newton, Edward T.,	*Holyoke.*	371 Col'mb's Ave.
Arch., Chem., Fr.		
Newton, James S.,	*Holyoke.*	371 Col'mb's Ave.
Eng., Germ., Geol., Shop.		
Nichols, Frank C.,	*New London, Conn.*	6 Berwick Park.
Math., Fr., App. Mech., Germ., Mech. Eng., Phys., Shop.		
Nickels, Arthur R.,	*Cherryfield, Me.*	63 Chandler St.
App. Mech., Chem., Met., Min. Lab., Eng.		
Nutter, Oscar E.,	*Great Falls, N.H.*	355 Dudley St.
Fr., App. Mech., Mech. Eng., Met., Shop., Heat. and Vent.		
O'Brien, John F.,	*Boston.*	Chardon St.
Arch.		
Packard, Frank L.,	*Columbus, O.*	29 Berwick Pk.
Arch., Elem. Fr.		
Parker, Herman,	*Boston.*	228 Com'nw'h Av.
Arch.		
Parker, Wilson B.,	*Morristown, N.J.*	310 Col'mb's Ave.
Arch., Germ., Geol.		
Perkins, Dwight H.,	*Chicago, Ill.*	127 Pembroke St.
Arch., Fr.		
Perley, Clarence W.,	*Lynn.*	Lynn.
App. Mech., Germ., Shop., Geol.		
Pickering, Oscar W.,	*Malden.*	Malden.
Chem., Germ.		
Pierce, Frank L.,	*Springfield.*	
Math., Desc. Geom., Eng., Germ., Mech., Phys., Shop.		
Pitman, Charles B.,	*Somerville.*	Somerville.
Arch.		
Pool, George B.,	*Forest Hills.*	3604 Wash'ton St.
Math., Fr., App. Mech., Eng., Germ., Mech. Eng., Phys.		

NAME.	HOME.	RESIDENCE.
Pope, Henry H.,	*Mattapan.*	1050 Adams St.
Math., Chem., Eng., Fr., Mil.		
Potter, Frederick W.,	*Grand Rapids, Mich.*	20 Beacon St.
Math., Chem., Draw., Eng., Elem. Fr., Mil.		
Proctor, William, Jun.,	*Arlington.*	Arlington.
Arch., Phys., Math., App. Mech., Geol.		
Rankin, John H.,	*Lock Haven, Penn.*	16 Bulfinch St.
Arch., Fr.		
Ray, Clary E.,	*Washington, D.C.*	
Arch.		
Redd, Benoist S.,	*Natchez, Miss.*	Brookline.
Math., Chem., App. Mech., Germ., Mech. Eng., Phys., Shop.		
Remick, Mabelle K.,	*Everett.*	Everett.
Chem.		
Rickoff, W. Monroe,	*New York, N.Y.*	2 Oxford Terrace.
Chem., Germ., Mech., Phys.		
Rockfellow, Annie G.,	*Mount Morris, N.Y.*	67 Chandler St.
Arch.		
Roper, George W.,	*Norfolk, Va.*	19 Union Park.
Math., App. Mech., Civ. Eng., Geol. Germ.		
Sabine, Annie W., M.A.,	*Columbus, O.*	Cambridge.
Chem., Mech. and Acoust., Phys,, App. Mech., Math.		
Scales, George C.,	*Newton.*	Newton.
Math., App. Mech., Civ. Eng., Geol., Phys., Eng., Germ.		
Schultz, Louis G.,	*Phillipsburg, N.J.*	190 W. Br'k'e St.
Math., App. Mech., Chem., Phys.		
Sears, Francis P.,	*Boston.*	85 Mt. Vernon St.
Math., Eng., Germ., Mil.		
Seavey, Herbert T.,	*Canton.*	Canton.
Math., Chem., Fr., Mil.		
Sever, George F.,	*Cambridge.*	Cambridge.
Chem., Eng., Mech. Eng., Math., Phys., App. Mech.		
Shattuck, George C.,	*Nashua, N.H.*	Nashua, N.H.
Arch., Phys., Math., App. Mech., Geol.		
Sheldon, Samuel B.,	*Manchester.*	Manchester.
Math., Desc. Geom., Eng., Germ., Mech. and Acoust., Mech., Phys., Shop.		
Sherman, Adelaide.,	*Roxbury.*	53 Norfolk St.
Math., Chem., Eng., Draw., Geol., Germ., Phys.		
Silverberg, David,	*Washington, D.C.*	24 Greenwich Pk.
Math., App. Mech., Eng., Germ., Phys.		
Smith, Clarence W., A.B.,	*Cambridge.*	Cambridge.
Phys., Chem.		
Smith, Joseph C.,	*Providence, R.I.*	25 Yarmouth St.
Chem., Geol., Germ.		
Smith, J. Waldo,	*Lincoln.*	Jamaica Plain.
Fr.		
Smith, Murray,	*Boston.*	12 Atherton St.
Arch., Desc. Geom., Fr., Geol.		
Smith, Noah B., B.P.,	*Washington, D.C.*	106 Appleton St.
Geol., Chem., Met., Min., Min. Lab.		

NAME.	HOME.	RESIDENCE.
Snow, Robert K., Arch.	*Boston.*	27 Newbury St.
Spring, Marcus T., Math., Chem., Eng., Germ., Phys., Surv.	*Danvers.*	Danvers.
Stone, George G., Math., Chem., Germ., Phys., Surv.	*Evanston, Ill.*	108 Boylston St.
Stone, George W., Arch., Elem. Fr.	*Madisonville, O.*	West Medford.
Swasey, Sumner E., Chem., Geol., Germ.	*Boston.*	
Sweetland, Ralph., Math., App. Mech., Mech. Eng., Phys., Shop.	*Natick.*	Natick.
Tamkin, Herman W., Arch.	*Syracuse, N.Y.*	14 St. Charles St.
Taylor, Everett K., Arch.	*So. Orange, N.J.*	310 Col'mb's Ave.
Taylor, Frederick S., A.B., Arch., Desc. Geom., Germ.	*Boston.*	231 Marlboro' St.
Taylor, George W., Draw., Eng., Fr., Mil.	*Morristown, N.J.*	115 Berkeley St.
Tenney, Walter H., Jun., Math., Germ., Fr.	*Dorchester.*	Trull St.
Thomas, William R., Math., Met., App. Mech., Mech. Eng., Shop., Heat. and Vent.	*Boston.*	16 Circuit St.
Thompson, Frederick, App. Mech., Civ. Eng., Met., Fr., Phys.	*Washington, D.C.*	290 Col'mb's Ave.
Tilson, Willard C., Math., Chem., Draw., Fr., Mil.	*Malden.*	Malden.
Totman, Harry F., Civ. Eng., Heat. and Vent.	*Fairfield, Me.*	26 Holyoke St.
Tracy, Paul H., Arch.	*Boston.*	620 Tremont St.
Tucker, Greenleaf R., Math., Phys., Chem.	*Boston.*	City Hospital.
Tuttle, Herbert C., Chem., Draw., Fr., Germ.	*Concord.*	Concord.
Von Wrede, Guido, Mech., Phys., Shop.	*Antwerp, Belgium.*	18 W. Dedham St.
Weil, Charles L., Math., App. Mech., Germ., Shop., Mech. Eng., Phys.	*No. Andover.*	148 Warren Ave.
Weld, Fred. C., A.B., Chem.	*Jamaica Plain.*	Forest Hill St.
Wheeler, Sam, Math., Phys., App. Mech., Eng., Civ. Eng., Geol.	*Concord.*	Concord.
White, Joseph B., Math., Desc. Geom., Eng., Mech., Phys., Shop.	*No. Hanson.*	No. Hanson.
Whitney, Joseph T., Math., Chem., Elect. Eng., Phys.	*Leominster.*	Chelsea.
Whitney, Willis R., Math., Chem., Draw., Eng., Elem. Fr., Mil.	*Jamestown, N.Y.*	524 Tremont St.

NAME.	HOME.	RESIDENCE.
Wilber, Nathan B.,	*Bridgewater.*	Bridgewater.
Math., Chem., Eng., Draw., Elem. Fr.		
Willim, William B.,	*Stillwater, Minn.*	69 Montgom'y St.
Math., Chem., Draw., Germ., Shop.		
Wilson, Arthur R.,	*Oakland, Cal.*	38 Upton St.
Math., Chem., Draw., Eng., Elem. Fr., Mil.		
Wood, J. Delano,	*New Bedford.*	4 Mt. Vernon St.
Math., Fr., Eng., Germ., Phys.		
Woodward, Harvey G.,	*Wheeling, W. Va.*	34 Union Park.
Chem., Geol., Min., Zoöl.		
Wright, Julian V.,	*Cincinnati, O.*	312 Col'mb's Ave.
Math., Desc. Geom., Mech., Phys., Shop., Eng.		

SUMMARY: SCHOOL OF INDUSTRIAL SCIENCE.

GRADUATE STUDENTS	21
REGULAR STUDENTS, 4th year	57
" " 3d "	87
" " 2d "	98
" " 1st "	198
SPECIAL STUDENTS	194
	655
Deduct names counted twice	19
Total	636

FREE COURSES OF INSTRUCTION.

The Trustee of the Lowell Institute has established, under the supervision of the Institute of Technology, courses of instruction, generally given in the evening, and open to

On page 114, the number of Special Students should be 195, and the total 637.

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 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.

FREE COURSES OF INSTRUCTION.

The Trustee of the Lowell Institute has established, under the supervision of the Institute of Technology, courses of instruction, generally given in the evening, and 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, biology, English, French, German, history, navigation, and nautical astronomy, architecture, and engineering.

The subjects, and the extent of the several courses, will be made known, by suitable advertisement in the public journals, 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 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 1886–87 are on the following subjects: —

I. *Physiology of Nutrition.* — Twelve lectures and laboratory exercises by Associate Professor Sedgwick, on Mondays and Fridays at 7.30 P.M., beginning Nov. 5.

II. *Conic Sections.* — Twelve lectures by Associate Professor Wells, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 8.

III. *The Steam Engine Indicator and its Uses.* — Twelve lectures by Assistant Professor Peabody, on Tuesdays and Thursdays at 7.30 P.M., beginning Dec. 2.

IV. *Elementary Electrical Measurements.* — Ten laboratory exercises by Associate Professor Holman, on Fridays at 7 P.M., beginning Dec. 3.

V. *Descriptive Geometry.* — Twelve lectures by Assistant Professor Faunce, on Mondays and Wednesdays at 7.30 P.M., beginning Dec. 13.

VI. *Chemistry of the Iron and Steel Manufacture.* — Twelve lectures by Professor Drown, on Mondays and Wednesdays at 7.30 P.M., beginning Jan. 3.

VII. *Map Reading and Map Making.* — Twelve lectures by Assistant Professor Burton, on Mondays and Fridays at 7.30 P.M., beginning Jan. 7.

VIII. *Volumetric Analysis.* — Twelve lectures by Assistant Professor Pope, on Tuesdays and Thursdays at 7.30 P.M., beginning Feb. 3.

SCHOOL OF MECHANIC ARTS.

SCHOOL OF MECHANIC ARTS.

A subordinate School of Mechanic Arts has been established by the Corporation of the Institute, in which special prominence is given to handwork in connection with high-school studies, affording an opportunity to such students as have completed the ordinary grammar-school course to continue the elementary scientific and literary studies, together with mechanical and freehand drawing, while receiving instruction in the use of the typical hand and machine tools for working iron and wood.

The general plan of the school is similar to that of the Imperial Technical School of Moscow, the Royal Mechanic Art School of Komotau in Bohemia, the École Municipale d'Apprentis of Paris, or that of the Ambachtsschoole of the principal cities of Holland, but has been specially adapted to the somewhat different conditions existing in our own country. The object is not to fit the pupil for a particular trade, but to develop the bodily and mental powers in harmony with each other, and with reference to the actual wants of life. The handwork is done without regard to pecuniary profit, but is designed to give the student good judgment, self-reliance, and executive power, pieces practically useful being introduced when it can be done without detriment to the systematic arrangement of the courses. Its exact and systematic method affords the direct advantage 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 school occupies a building on Garrison Street, a short distance from the Rogers Building. The facilities for instruction are ample and increasing; and the mechanical

laboratories, in which the instruction in the mechanic arts is given, have a thorough equipment (see p. 52).

The instruction in the mechanic arts given to each regular student, at present embraces, —

1. Carpentry and Joinery; 2. Wood-turning; 3. Pattern-making; 4. Foundry-work; 5. Iron-forging; 6. Vise-work; 7. Machine-Tool work.

The regular course also includes two years of study. Special students may be received, upon the approval of the Faculty, for shorter times, or for particular parts of the course.

The present regular course is as follows: —

REGULAR COURSE.

FIRST YEAR.

FIRST TERM.	SECOND TERM.
Shopwork, — Carpentry.	Shopwork, — Wood-turning, Pattern-making, Foundry-work.
Algebra.	Algebra.
Geometry.	Geometry and Metric System.
English Composition.	English Composition.
Mechanical and Freehand Drawing.	Mechanical and Freehand Drawing.

SECOND YEAR.

FIRST TERM.	SECOND TERM.
Shopwork, — Forging.	Shopwork, — Vise-work, Machine-Tool Work.
Algebra.	Geometry.
Elementary Physics.	Physics.
English Composition.	English Composition.
Mechanical and Freehand Drawing.	Mechanical and Freehand Drawing.
French.	French.

As there are many who desire a year of study and work additional to the regular course, to become better fitted either for the superintendence of labor or for the instruction of others, it is expected, that, when the new arrangements are completed, the increased facilities will render such a course possible.

REQUIREMENTS FOR ADMISSION.

Applicants for the regular course must be at least fifteen years of age, and must pass a satisfactory examination, at the

time and place of the examinations for the School of Industrial Science, in Arithmetic, Geography, History of the United States, and English Composition. For shopwork only, or for mechanical drawing, no examination is required.

The requirements in the various subjects are as follows: —

1. *Arithmetic.* — Prime and composite numbers, greatest common divisor, and least common multiple, ratio and proportion, common and decimal fractions, percentage, simple and compound interest, square root, and compound numbers; as treated in the text-books of either Seaver and Walton, Wentworth and Hill, or Greenleaf.

2. *English.* — Parts of speech, inflection, and parsing, as found in the text-books of either Swinton, Whitney, or Greene; also fair penmanship and orthography.

3. *History.* — As much of the history of the United States as may be obtained from the text-books of either Anderson, Higginson, or Barnes.

4. *Geography.* — As much as may be obtained from the grammar-school text-books of either Guyot or Swinton.

An equivalent preparation in the works of other authors than those named should prepare the student for examination

In general, the training given in the grammar schools will afford a suitable preparation.

REGULATIONS OF THE SCHOOL.

School-year. — 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, p. 90).

Attendance. — Students are expected to be prompt in their attendance on all the exercises of their course, and no excuse will be granted except by special vote of the Officers of Instruction. The daily exercises of the school begin at 9 A.M., and end at 4 P.M., with an intermission from 1 P.M. until 2 P.M., except on Saturdays, when the exercises close at noon.

Fees. — The tuition fee is one hundred and fifty dollars a year, payable one hundred dollars at the beginning of the year, and fifty dollars at the commencement of the second

term (February). Special students taking fewer studies than those of the regular course may be charged less.

No extra charge is made for materials, nor for the proper use of tools, except in case of special students who pursue more than one branch of shopwork at a time. All unnecessary damage to tools or furniture must be paid for. Each student provides his own drawing instruments. The cost of books and stationery will not exceed fifteen dollars a year. Each student is entitled to his drawings and pieces in shopwork; but the School reserves the right to retain one drawing of each set, and one piece from each course in shopwork.

Bond. — The regulations concerning the bond are the same as in the School of Industrial Science (see p. 92).

Examinations. — Examinations are held at the close of each term, and a report of the progress of each student is made to his parent or guardian. Intermediate examinations, the results of which are not made a matter of permanent record, are held twice during each term.

Any candidate for graduation conditioned at the semi-annual examination of the second year, will be re-examined at some time previous to March 1.

Each regular student will be entitled to a certificate of proficiency on the satisfactory completion of the course.

OFFICERS OF INSTRUCTION.

FRANCIS A. WALKER, LL.D., *President.*
PETER SCHWAMB, S.B., *Director.*
CLARENCE W. FEARING, A.M., *Instructor in English and Mathematics.*
CHARLES L. ADAMS, *Instructor in Drawing.*
WILLIAM H. PICKERING, S.B., *Instructor in Physics.*
GEORGE T. DIPPOLD, PH. D., *Instructor in French.*
CHARLES H. STEPHENSON, *Instructor in Machine-Tool work.*
THEODORE B. MERRICK, *Instructor in Wood-work and Foundry-work.*
JAMES R. LAMBIRTH, *Instructor in Forging.*
JAMES G. LANGDON, *Assistant in Wood-work.*
ROBERT H. SMITH, *Assistant in Machine-Tool work.*
HERBERT W. ADAMS, *Assistant in Drawing.*
JOHN W. RAYMOND, JUN., *Assistant in Forging.*

Special instruction is given also by members of the Faculty of the School of Industrial Science.

SCHOOL OF MECHANIC ARTS.

REGISTER OF STUDENTS.

REGULAR STUDENTS.

SECOND YEAR.

NAME.	HOME.	RESIDENCE.
Bockus, Charles E., Jun.,	*Dorchester.*	Ashland St.
Gleason, Albert H.,	*Rock Bottom.*	84 W. Rutland Sq.
Hutchinson, Edward P.,	*Danvers Centre.*	Danvers Centre.
Lynde, Frank W.,	*Melrose.*	Melrose.
Ruggles, Horace F.,	*Brookline.*	Brookline.
Sperry, Horace B.,	*Oakland, Cal.*	741 Tremont St.
Walker, Ambrose,	*Boston.*	237 Beacon St.

FIRST YEAR.

Baker, George V.,	*Roslindale.*	Roslindale.
Davis, Arthur S.,	*Somerville.*	Somerville.
Dean, James L.,	*Shrewsbury.*	Shrewsbury.
Edwards, William,	*Quincy.*	Quincy.
Elder, George J.,	*East Boston.*	12 Falcon St.
Hindes, Stetson G.,	*Burlington, Vt.*	Lexington.
Lenz, Charles O.,	*Providence, R.I.*	
Lobenstine, Horace G.,	*Chicago, Ill.*	544 Col'mb's Ave.
Macdonald, Alec F.,	*Chelsea.*	Chelsea.
Miller, H. Dwight,	*Sacramento, Cal.*	Hingham.
Putnam, Charles H.,	*Fitchburg.*	204 W. Sp'gfi'd St.
Savage, Arthur C.,	*Hyde Park.*	Hyde Park.
Smith, Darius B.,	*Pine Meadow, Conn.*	307 Col'mb's Ave.
Stanford, Philip W.,	*San Francisco, Cal.*	141 Warren Ave.
Stevens, Jesse F.,	*Boston.*	581 Tremont St.

SPECIAL STUDENTS.

Bullard, Albert M., Shop., Draw.	*Boston.*	Hotel Edinburgh.
Dodd, Walter S., Shop., Draw.	*Roxbury.*	43 Moreland St.
Greeley, Guy H., Shop., Draw.	*Nashua, N.H.*	290 Col'mb's Ave.

NAME.	HOME.	RESIDENCE.
Grover, William H., Shop., Draw.	*Charleston, S.C.*	
Hunting, Herbert A., Geom., Alg., Shop., Draw.	*Charlestown.*	28 Mead St.
Landers, John T., Shop., Draw., Eng., Alg.	*Hurricane Isle, Me.*	
Leavitt, Frank M., Shop., Draw.	*Roxbury.*	24 Akron St.
Morse, William A., Shop., Draw.	*Foxboro'.*	Foxboro'.
Pickels, Robert F., Shop., Draw.	*Lawrence.*	Lawrence.
Ridgway, Charles J., Shop., Draw.	*Everett.*	Everett.
Smith, Gilbert H., Shop., Draw., Fr., Phys., Alg.	*Dorchester.*	2 Granville Pl.
Smith, Robert B., Shop., Draw., Alg., Geom.	*Lawrence.*	Lawrence.
Stevens, Fred N., Shop., Draw.	*No. Hoosac, N.Y.*	
Tapp, Will. W., Draw., Eng.	*Louisville, Ky.*	357 Col'mb's Ave.
Thomas, John H., Shop., Draw.	*Louisville, Ky.*	357 Col'mb's Ave.
Trefethen, Charles G., Shop., Draw.	*Taunton.*	Taunton.

SUMMARY: SCHOOL OF MECHANIC ARTS.

REGULAR STUDENTS, 2d YEAR	7
" " 1st "	15
SPECIAL "	16
Total	38

LOWELL SCHOOL OF PRACTICAL DESIGN.

LOWELL SCHOOL OF PRACTICAL DESIGN.

The Lowell School of Practical Design was established in 1872, by the Trustee of the Lowell Institute, for the purpose of promoting Industrial Art in the United States. The Corporation of the Massachusetts Institute of Technology, having approved the purpose and general plan of the school as proposed by the Trustee of the Lowell Institute, assumed the responsibility of conducting it; and, in the same year, the first pupils were admitted.

The expenses of this school are borne by the Lowell Institute, and tuition is free to all pupils.

The school occupies a drawing-room and a weaving-room in the building of the Institute on Garrison Street. The weaving-room affords students an opportunity of working their designs into actual fabrics of commercial sizes and of every variety of material and of texture. The room is supplied with two fancy chain-looms for dress goods, three fancy chain-looms for fancy woollen cassimeres, one gingham loom, and one Jacquard loom. The school is constantly provided with samples of all the novelties in textile fabrics from Paris, such as brocaded silks, ribbons, alpacas, armures, and fancy woollen goods.

Course of Study. — Students are taught the art of making patterns for prints, ginghams, delaines, silks, laces, paper-hangings, carpets, oil-cloths, etc. The course is of three years' duration, and embraces, —

1. Technical manipulations; 2. Copying and variations of designs; 3. Original designs or composition of patterns; 4. The making of working drawings, and finishing of designs.

Instruction is given personally to each student over his work, with occasional general exercises. Students supply their own instruments and materials, the cost of which is about $5 per year.

The class is under the personal direction of Mr. CHARLES KASTNER, assisted in the weaving department by Mr. Everett W. Ricker, and in the designing department by Miss Delphina Weston.

Requirements for Admission. — To teach drawing is not among the objects of this school. Applicants must therefore possess a knowledge of drawing adequate to enable them advantageously to begin the work of composition and design. A considerable degree of skill in freehand drawing from nature, and in the use of the brush, will be positively required for entrance to the school.

Applicants for admission, or persons desiring further information regarding this school, may apply by letter to the President of the Institute.

Regulations of the School. — The next school-year will begin on Sept. 26, 1887. The number of students in the school, including those to be admitted, will be limited to sixty. Examinations for applicants for admission will be held on Sept. 20, 1887. Students are required to be regular in their attendance, the hours being from 9.30 A.M. to 12 M., and from 2 P.M. to 4.30 P.M. Only those students can be retained in the school who, after a fair and patient trial, are found to have some aptitude for the work. At the close of each half-year, the director will, with the approval of the President of the Institute, convey the needed information to such students as shall be found gravely deficient in qualifications for an advantageous pursuit of their studies. No publication will be made of the fact, and such students will be left to withdraw as of their own motion.

STUDENTS.

NAME.	HOME.	RESIDENCE.
Akin, Thomas B.,	*New Bedford.*	New Bedford.
Baker, Grace T.,	*Weymouth.*	Weymouth.
Barstow, Annie H.,	*New Bedford.*	New Bedford.
Blood, Grace C.,	*Lowell.*	Lowell.
Bonney, John C. G.,	*New Bedford.*	New Bedford.
Brown, Adelaide L. C.,	*Boston.*	172 W. Newt'n St.
Bryant, Albert,	*Melrose.*	Melrose.
Campbell, Annie P.,	*Boston.*	180 Harrison Av.
Center, Lizzie M.,	*Gloucester.*	Gloucester.
Codding, William A.,	*New Bedford.*	New Bedford.
Coffey, Ella C.,	*Roxbury.*	4 Gardner Av.
Cohn, Luona,	*Dorchester.*	25 Arcadia St.
Crowther, Frank,	*Canton.*	Canton.
Curtis, Marion B.,	*Boston.*	133 St. Bot'lph St.
Doane, Julia S.,	*Newtonville.*	Newtonville.
Emery, Fred. A.,	*Boston.*	201 Ruggles St.
Felton, Louis E.,	*Natick.*	Natick.
Foster, Winfred C.,	*Fitchburg.*	Fitchburg.
Fowle, Willard K.,	*Woburn.*	Woburn.
Frajean, John,	*New Bedford.*	15 Buck'gham St.
French, Isabelle C.,	*Dedham.*	Dedham.
Gardner, Harriet E.,	*Brockton.*	Brockton.
Goodwin, George I.,	*Boston.*	12 Gray St.
Green, Fred. W.,	*Boston.*	365 Silver St.
Hadley, Walter C.,	*New Bedford.*	New Bedford.
Hall, Albert G.,	*Boston.*	7 Walden Park.
Haushalter, Leona M.,	*Glenwood.*	Glenwood.
Hawes, Nellie L.,	*Dorchester.*	Harrison Sq.
Hawes, William C.,	*New Bedford.*	New Bedford.
Henchman, Russel B., Jun.,	*Hyde Park.*	Hyde Park.
Hoogs, Margaret I.,	*Hyde Park.*	Hyde Park.
Howell, Lottie E.,	*Melville, N.Y.*	40 Berkeley St.
Hunt, William C.,	*New Bedford.*	New Bedford.
Jennings, Philip B.,	*Warren.*	Warren.
Knowland, Thomas E.,	*'Middleboro'.*	Middleboro'.
Lamprey, Belle,	*Charlestown.*	137 High St.

NAME.	HOME.	RESIDENCE.
Lawrie, Fred. H.,	*Medford.*	Medford.
Mathewson, Frank C.,	*Providence, R.I.*	18 Claremont Pk.
McNab, James M.,	*Hope, R.I.*	15 Buck'gham St.
Nealley, Grace H.,	*Dover, N.H.*	
Philbrick, Eliza,	*Newton Centre.*	Newton Centre.
Rand, James L. G.,	*Dover, N.H.*	14 Gates St.
Reed, Eaton V.,	*So. Weymouth.*	So. Weymouth.
Richards, Caroline,	*Boston.*	33 Hollis St.
Robbins, Anna S.,	*Dorchester.*	11 St. James Ave.
Robinson, Lilian V.,	*Boston.*	286 Beacon St.
Sheehy, William C.,	*New Bedford.*	New Bedford.
Sjöström, Ebba S. C.,	*Lawrence.*	Lawrence.
Smith, Annette,	*East Boston.*	177 Lexington St.
Smith, William C.,	*Taunton.*	Taunton.
Stantial, Susie M.,	*Melrose.*	Melrose.
Stedman, Joseph C.,	*Jamaica Plain.*	Jamaica Plain.
Stetson, Clarabel,	*Roxbury.*	9 Copeland Place.
Stone, Thomas,	*Taftsville, Conn.*	40 Tennyson St.
Strahan, Thomas E.,	*Chelsea.*	Chelsea.
Sweet, Mary R.,	*Hyde Park.*	Hyde Park.
Thompson, James H.,	*Elmira, N.Y.*	516 Shawmut Av.
Tirrell, Herbert W.,	*East Weymouth.*	East Weymouth.
Tolman, Andrew,	*Norwich, Conn.*	40 Tennyson St.
Turner, Frances E.,	*Boston.*	7 Hereford St.
Underwood, Carleton J.,	*Fitchburg.*	Fitchburg.
Vogel, Emma C.,	*So. Boston.*	53 B St.
Whitman, Grace,	*Newton.*	Newton.

Total 63

THE SOCIETY OF ARTS.

THE SOCIETY OF ARTS.

President.
FRANCIS A. WALKER, LL.D.

Secretary.
LINUS FAUNCE.

Executive Committee.

GEORGE W. BLODGETT, *Chairman.*

HOWARD A. CARSON,
C. J. H. WOODBURY,
HENRY M. HOWE,
GEORGE O. CARPENTER.

THIS Society was the first organized of the three distinct component parts, of which, as set forth in the act of incorporation, it was originally intended that the Institute should consist. Its first meeting was held on April 8, 1862; and meetings are now regularly held in the Institute building on the second and fourth Thursdays of each month, from October to May inclusive.

The objects of the Society are to awaken and maintain an active interest in the practical sciences, and to aid generally in their advancement and development in connection with arts, agriculture, manufactures, and commerce. All who have valuable knowledge of this kind, which they are willing to contribute, are invited to attend its meetings, and become members. Persons having valuable inventions, or discoveries which they wish to explain, will find a suitable occasion in the Society's meetings; and while the Society will never indorse, by vote or diploma, or other official recognition, any invention, discovery, theory, or machine, it will give every facility to those who wish to discuss the principles and intentions of their own machines or inventions, and will endeavor at its meetings, or through properly constituted committees, to show how far any communications made to it are likely to prove of real service to the community.

Abstracts of the proceedings of the Society are printed in one or more of the Boston daily papers, and are also published in an annual report.

Candidates for Associate Membership must be recommended by not less than two members, whose signatures shall be affixed to a written or printed form to that effect. Each nomination is referred to the Executive Committee, and when reported upon favorably by it, and read by the Secretary, may be acted upon at the same meeting.

Associate Members pay an admission fee of five dollars before being entitled to the privileges of membership, and an annual assessment of five dollars on the first of October.

An Associate Member who shall have paid at any one time the sum of fifty dollars, or annual assessments for twenty years, shall become a member for life, and be thereafter exempt from annual assessments.

Among the papers that have been read before the Society during the past year may be mentioned the following: Relative Poisonous Properties of Coal and Water Gas, by Prof. W. T. Sedgwick; Improvements in Steam Heating, by Mr. Frederic Tudor; An Electrical System of Propulsion on Elevated Railroads, by Lieut. F. J. Sprague; The Pneumatic Dynamite Gun and the Use of High Explosives in Warfare, by Lieut. E. L. Zalinski, U.S.A.; Transmission of Power by Belting, by Prof. Gaetano Lanza; The Cowles Electric Furnace, and the Production of Aluminum and its Alloys, by Mr. A. H. Cowles; The Distribution of Steam, by Mr. C. E. Emery; The Roadways of New Mexico, by Hon. Clarence Pullen; Labor Differences and Arbitration, by Mr. Joseph D. Weeks; The Chemistry of Foods and Nutrition, by Prof. W. O. Atwater; The Micro-Membrane Filter, by Prof. W. R. Nichols; The Creque System of Circulating Water for Domestic Purposes, by Mr. Allen P. Creque; The Latest Development of the Bessemer Process, or the Blowing of Small Charges, by Prof. T. M. Drown.

During the present year a number of interesting papers are expected, among which may be mentioned the following: The Bessemerizing of Copper, by Dr. Edward D. Peters; Yacht Designing, by Mr. Edward Burgess; Steel for Warfare, by Mr. H. M. Howe; Railroad Inspection, by Mr. Dudley; and others.

GRADUATES

FROM THE

SCHOOL OF INDUSTRIAL SCIENCE.

The Roman numerals in the column marked "Course" denote the course in which the Graduate received the degree of S.B. For description of courses, see p. 16.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ELLERY C. APPLETON, Lincoln, Neb.	III.	Assistant Engineer, Burlington and Missouri River Railroad.
WHITNEY CONANT, Long Branch, N.J.	III.	Secretary, Long Branch Water-Supply Company.
*FRANK R. FIRTH,	I.	Died June 9, 1872.
ELI FORBES, Clinton, Mass.	Sci. and Lit.	Chemist at the Lancaster Mills.
CHARLES C. GILMAN, Marshalltown, Marshall Co., Io.	III.	Railroad Contractor.
CHAS. E. GREENE, A.M., C.E., Ann Arbor, Mich.	I.	Professor of Civil Engineering, University of Michigan.
ALBERT F. HALL, Boston, Mass.	II.	Draughtsman in the employ of the George F. Blake M'f'g Company.
WILLIAM E. HOYT, Portsmouth, N.H.	I.	Chief Eng. of Buffalo, Rochester, and Pittsburg R.R.Co., Rochester, N.Y.
ROBERT H. RICHARDS, Boston, Mass.	III.	Professor of Mining and Metallurgy, Mass. Institute of Technology.
WALTER H. SEARS, 35 Congress St., Boston, Mass.	I.	Engineer of Water-Works at Beverly and Plymouth.
*CHARLES A. SMITH,	I.	Died Feb. 4, 1884.
JOSEPH STONE, Lawrence, Mass.	I.	Superintendent Worsted Department, Lower Pacific Mills.
BRYANT P. TILDEN, Carrington, D.T.	III.	Chief Engineer, Jamestown and Northern Railroad.
JAMES P. TOLMAN, West Newton, Mass.	III.	Manufacturer of Cordage, 164 High Street, Boston.

1869.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM H. BAKER, New Kiowa, Kan.	I.	Resident Engineer, Kiowa Extension, Southern Kansas Ry.
HOWARD A. CARSON, 68 Devonshire Street, Boston, Mass.	I.	Civil Engineer.
J. RAYNER EDMANDS, Cambridge, Mass.	II.	In Charge of Time Service at the Observatory of Harvard University.
*WILLIAM RIPLEY NICHOLS,	V.	Died July 14, 1886.
CHANNING WHITAKER, Box 524, Lowell, Mass.	II.	Mill and Steam Engineering.

1870.

*EDWARD K. CLARK,	II.	Died Sept. 10, 1878.
CHARLES R. CROSS, Boston, Mass.	Sci. and Lit.	Professor of Physics, Massachusetts Institute of Technology.
RUSSELL H. CURTIS, 59 So. Clark Street, Chicago, Ill.	I.	Lawyer.
CHARLES W. HINMAN, 32 Hawley Street, Boston, Mass.	III.	State Inspector of Gas.
SAMPSON D. MASON, St. Paul, Minn.	I.	Principal Assistant Engineer, Northern Pacific Railroad.
N. FREDERICK MERRILL, Burlington, Vt.	V.	Professor of Chemistry, University of Vermont.
THEODORE F. TILLINGHAST, 570 Warren Street, Boston.	I.	
EDMUND K. TURNER, Fitchburg, Mass.	I.	Chief Engineer, Fitchburg Railroad.
DANIEL W. WILLARD, 55 Broadway, New York, N.Y.	II.	Of the firm of Babb, Cook, & Willard, Architects.
LAWRENCE F. J. WRINKLE, Virginia City, Nev.	III.	Mining Engineer.

1871.

FOSTER E. L. BEAL, Fitchburg, Mass.	I.	Fruit-farming.
ADDISON CONNOR, A.B., New York, N.Y.	I.	In the Public Works Department.
*HENRY M. CUTLER,	I.	Died May 16, 1877.
*ELMER FAUNCE,	III.	Died July 6, 1882.
EDWARD H. FOOTE, 10 No. Market St., Boston, Mass.	I.	Of the firm of Skelton, Foote, & Co.
FRANK L. FULLER, 7 Exchange Pl., Boston, Mass.	I.	Civil Engineer. Engineer, Wellesley Water-Works.
HENRY M. HOWE, A.M., Hotel Oxford, Boston, Mass.	III.	Mining Engineer and Lecturer on Metallurgy, Mass. Institute Tech.

NAME AND ADDRESS.	COURSE	OCCUPATION.
ALBERT H. HOWLAND, A.M., 12 West Street, Boston, Mass.	I.	Civil Engineer.
G. RUSSELL LINCOLN, Box 65, Harrisburg, Penn.	III.	In business.
WILLIAM A. PIKE, Minneapolis, Minn.	I.	Professor of Engineering, University of Minnesota.
GEORGE H. PRATT, 1 Longmeadow St., Dorch'r, Mass.	V.	Chemist.
EDWARD W. ROLLINS, Box 2157, Denver, Col.	III.	Dealer in Municipal Bonds.
WALTER W. SMITH, Dayton, O.	II.	Builder of Steam Pumps and Hydraulic Mch'y (Smith, Vaile, & Co.)
CHARLES F. STONE, Waltham, Mass.	III.	Lawyer.
*ALMARIN TROWBRIDGE, Jun.	II.	Died Dec. 5, 1878.
ISAIAH S. P. WEEKS, Lincoln, Neb.	I.	Chief Engineer, Burlington and Missouri Railroad in Nebraska.
RANDALL WHITTIER, 96 Broadway, New York, N.Y.	V.	Cashier, N.Y. Agency, Union Mutual Life Insurance Company.

1872.

C. FRANK ALLEN, Albuquerque, N.M.	I.	With Atchison, Topeka, and Santa Fé Railroad.
BENJAMIN E. BREWSTER, Cheyenne, Wyoming Ter.	III.	Manager, War Bonnet Live Stock Company.
WILLIAM B. DODGE, Columbus, O.	I.	Scale Inspector, P.C. & St. L. R.R., and Chicago, St. L., & P. R.R.
FREDERIC A. EMMERTON, Joliet, Ill.	V.	Supt. Blast Furnaces, Joliet Iron and Steel Company's Works.
JAMES A. HERRICK, Pittsburg, Penn.	V.	General Superintendent, Spang Steel and Iron Company.
JAMES M. HODGE, Plymouth, Mass.	III.	Geologist, Kentucky Geological Survey.
BRADFORD H. LOCKE, Central City, Col.	III.	Mining Engineer.
CHAS. S. MINOT, S.D. (Harv.), Boston, Mass.	V.	Lecturer on Histology and Embryology, Harvard Medical School.
MAURICE B. PATCH, Lake Linden, Mich.	III.	Superintendent of Calumet & Hecla Smelting Company.
WALTER SHEPARD, A.B., Arion Street, Dorchester, Mass.	I.	Division Engineer, Boston and Albany Railroad.
RICHARD H. SOULE, A.B., Buffalo, N.Y.	II.	Supt. of Motive Power, N. Y., L. E., & W. Ry., and N. Y., P., & O. R. R.
CLARENCE S. WARD, Allston, Mass.	III.	Lawyer.

1873.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
AMORY AUSTIN, A.B., 45 Kilby St., Boston, Mass.	V.	Of Lee & Austin, Analytical and Consulting Chemists.
GEORGE W. BLODGETT, 63 Kilby St., Boston, Mass.	I.	Asst. Eng., B. & A. R. R., and Manufacturing Electrician.
WILLIAM E. BROTHERTON, Cincinnati, O.	V.	Book-keeper, Second National Bank.
*SAMUEL A. FABENS, Jun.,	I.	Died March 14, 1875.
SAMUEL M. FELTON, Jun., 21 Cortlandt St., New York, N.Y.	I.	Vice-President of N. Y., L. E., & W. Railway Co.
FREDERICK L. FISHER, Medway, Mass.	I.	Insurance Agent and Broker, 35 Kilby St., Boston.
FREDERICK GUILD, Jun., Boston, Mass.	Sci. and Lit.	With Whittier Machine Company, 1176 Tremont St.
WILLIAM D. HARRIS, 292 Nelson St., Ottawa, P.Q., Can.	I.	Assistant Chief Engineer, P. P. & J. Railway.
CLAR. L. HOWES, A.B., M.D., Hanover, Mass.	I.	Physician.
*WILLIAM P. JEWETT,	I.	Died Jan. 4, 1881.
WILLIAM A. KIMBALL, San Bernardino, Cal.	II.	
*WILLIAM C. MAY,	V.	Died March 11, 1878.
FRANK B. MORSE, Murphy's, Cal.	I.	Superintendent, Willard Mining Company.
CHARLES O. PARSONS, 77 State St., Boston, Mass.	III.	Mining Engineer.
HENRY A. PHILLIPS, Worcester, Mass.	IV.	Superintendent, Worcester Division, Fitchburg R.R.
GEORGE PHILLIPPS, Marshfield, Mass.	III.	Mining Engineer.
ELLEN H. RICHARDS, A.M., Boston, Mass.	V.	Instructor in Sanitary Chemistry, Mass. Institute of Technology.
HENRY L. RIPLEY, Care Horatio Adams, Box 2526, Boston, Mass.	I.	1st Lieutenant 24th Infantry. Acting Chief Engineer, Dept. of the Missouri, Ft. Leavenworth, Kan.
ROBERT A. SHAILER, 36 Montauk Block, Chicago, Ill.	I.	Of the firm, W. G. Coolidge & Co., Engineers and Contractors.
C. EDWARD STAFFORD, Care Schoenberger & Co., Pittsburg, Penn.	III.	Supt. Bessemer and Open Hearth Departments, Juniata Iron and Steel Works.
SAMUEL E. TINKHAM, 58 Thornton St., Roxbury, Mass.	I.	Civil Engineer, City Engineer's Office, Boston.
FRANK W. VERY, Allegheny, Penn.	V.	Assistant Astronomer, Allegheny Observatory.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WEBSTER WELLS, Boston, Mass.	I.	Associate Professor of Mathematics, Mass. Institute of Technology.
RANDALL WHITTIER,	I.	(See Record of Class of 1871.)
FRANCIS H. WILLIAMS, M.D., Cor. Newbury and Dartmouth Streets, Boston, Mass.	V.	Physician and Instructor in Materia Medica and Therapeutics, Harvard Medical School.
LOUIS F. WOOD, 34 Oliver St., Boston, Mass.	V.	Chemical and Color Manufacturer.

1874.

HERBERT BARROWS, Reading, Mass.	I.	Real Estate First-Mortgage Loans.
GEORGE H. BARRUS, 81 Milk St., Boston, Mass.	II.	Consulting Steam Engineer.
WILLIAM T. BLUNT, Cleveland, O.	I.	Principal Inspector, U. S. Engineer's Office.
GEORGE E. DOANE, Middleborough, Mass.	I.	Of the firm of J. & G. E. Doane, Hardware.
WILLIAM B. DOWSE, 33 Oliver St., Boston, Mass.	IV.	Of the Chauncy Rubber Company.
JOSEPH S. EMERSON, Honolulu, Hawaiian Islands.	I.	Field Assistant, Government Survey.
ELIOT HOLBROOK, Hartford, Conn.	I.	Superintendent, Hartford Division, N. Y. & N. E. R. R.
AECHIRAU HONGMA, Tokio, Japan.	I.	Civil Engineer.
CHARLES P. HOWARD, Hartford, Conn.	I.	Secretary, with J. L. Howard & Co., dealers in Railway and Car Builders' Supplies.
FRANK H. JACKSON, Maple Hill, Kan.	III.	Stock-raising.
*WILLIS H. MYRICK,	II.	Died Oct. 17, 1875.
HERBERT B. PERKINS, Appleton, Wis.	I.	Professor of Mathematics and Astronomy, Lawrence University.
FRANK H. POND, 707 Market St., St. Louis, Mo.	II.	Proprietor, Pond Engineering Company.
EDWARD S. SHAW, 3 Pemberton Sq., Boston, Mass.	I.	Consulting Engineer.
FRANCIS H. SILSBEE, Lawrence, Mass.	II.	Mechanical Engineer, Cotton Dept., Pacific Mills.
*ARTHUR W. SWEETSER,	I.	Died April 10, 1878.
*ROBERT C. WARE,	Sci. and Lit.	Died June 25, 1883.
STEPHEN H. WILDER, 65 West Third St., Cincinnati, O.	Sci. and Lit.	Of the firm of Ferris & Wilder, Attorneys-at-Law.

1875.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
SAMUEL E. ALLEN, 65 Chauncy St., Boston, Mass.	I.	Agent for the Nashawanuck Manufacturing Company.
JAMES L. ARNOTT, Thompsonville, Conn.	Sci. and Lit.	
AMOS J. BOYDEN, 413 Walnut St., Philadelphia, Penn.	IV.	Architect.
MOSES D. BURNET, Ocala, Marion County, Fla.	III.	Of the firm of Robinson, Burnet, & Co., Milling Business.
HENRY K. BURRISON, Boston, Mass.	I.	Instructor in Drawing in the Mass. Institute of Technology.
CHRISTOPHER A. CHURCH, Lewisburg, Greenbriar County, W. Va.	I.	Sheep-farming.
FRANK S. DODGE, Chicago, Ill.	I.	Civil Engineer.
EDGAR S. DORR, City Hall, Boston, Mass.	I.	Employed in the Sewer Department.
WILLIAM C. EDES, 24 Hotel Baldwin, Boston, Mass.	I.	Civil Engineer.
CHARLES W. GOODALE, Butte City, M.T.	III.	Superintendent of Colorado Smelting and Mining Co.
EDWARD A. W. HAMMATT, 5 Pemberton Square, Boston, Mass.	I.	Civil Engineer.
EDWARD A. HANDY, Laredo, Tex.	I.	Engineer, Northern Division, Mexican National Railway.
*JAMES H. HEAD,	II.	Died Aug. 18, 1875.
THOMAS HIBBARD, 214 Walnut St., Holyoke, Mass.	II.	Head Draughtsman, Deane Steam Pump Company.
*WILLIAM F. HUNTINGTON,	I.	Died Aug. 7, 1877.
L. P. KINNICUTT, S.D. (Harv.), Worcester, Mass.	V.	Professor of Chemistry at Worcester Institute of Ind. Science.
WILFRED LEWIS, Philadelphia, Penn.	II.	Mechanical Engineer, with William Sellers & Co.
SAMUEL J. MIXTER, M.D., 180 Marlborough Street, Boston, Mass.	VIII.	Assistant Demonstrator of Anatomy, Harvard Medical School.
BENJAMIN A. OXNARD, Brooklyn, N.Y.	III.	Superintendent of Fulton Sugar Refinery.
THOMAS D. PLIMPTON, Hyde Park, Mass.	II.	Employed in the Manufacture of Woollen Goods.
WILLIAM A. PRENTISS, Holyoke, Mass.	Sci. and Lit.	Of the firm of Geo. W. Prentiss & Co., Manufacturers of Iron Wire.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
FRANCIS T. SARGENT, 515 Sixth Ave., N.Y. City.	II.	President of Poultney Slate Works.
WELLAND F. SARGENT, Pullman, Ill.	I.	In charge of Civil Engineering Department, Pullman Palace Car Co.
WILLIAM H. SHOCKLEY, Candalaria, Esmeralda Co., Nev.	III.	Superintendent, Mount Diablo Mill and Mining Company.
JAMES B. STANWOOD, Cleveland, O.	II.	Engineer with Arctic Ice Machine Manufacturing Company.
H. L. J. WARREN, Castle, Eagle Co., Colo.	III.	Mining Engineer and Stock Raiser.
WILLIAM R. WEBSTER, 424 Walnut St., Phila., Penn.	III.	Bridge Inspector for Kellogg & Maurice.

1876.

CHARLES F. ALLEN, Occidental Hotel, San Francisco, Cal.	III.	Mining Engineer and Metallurgist.
THOMAS ASPINWALL, Brookline, Mass.	I.	Civil Engineer, 7 Exchange Place, Boston.
WILLIAM P. ATWOOD, 81 Appleton St., Lowell, Mass.	V.	Chemist at the Hamilton Print Works.
THOMAS W. BALDWIN, A.B., Bangor, Me.	I.	In business.
WALTER B. BARROWS, Washington, D.C.	VIII.	First Asst. Ornithologist, U.S. Dept. of Agriculture.
AARON D. BLODGETT, 63 Kilby St., Boston, Mass.	II.	Manufacturing Electrician.
JOSHUA B. F. BREED, 1026 Fourth Av., Louisville, Ky.	I.	Assistant City Engineer, in charge of Sewers, West. Dist.
HARRY T. BUTTOLPH, Buffalo, N.Y.	I.	Assistant City Engineer, in charge of Paving.
FREDERICK K. COPELAND, 175 Dearborn St., Chicago, Ill.	I.	Secretary, Diamond Prospecting Company.
WILLIAM O. CROSBY, Boston, Mass.	VII.	Asst. Prof. of Mineralogy and Lithology, Mass. Inst. of Technology.
WILLIS E. DAVIS, 211 Drumm St., San Francisco, Cal.	Sci. and Lit.	Employed by Davis & Cowell, Manufacturers of Santa Cruz Lime.
*CLARENCE L. DENNETT,	II.	Died June 5, 1878.
CHARLES R. FLETCHER, 3 Pemberton Sq., Boston, Mass.	V.	Consulting Chemist and Metallurgist.
JOHN R. FREEMAN, 31 Milk St., Boston, Mass.	I.	Inspector, Boston Man'frs. Mutual Fire Insurance Co.
FRANCIS E. GALLOUPE, 30 Kilby Street, Boston, Mass.	II.	Mechanical Engineer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
*Robert H. Gould,	Metallurgy.	Died Nov. 19, 1878.
John B. Henck, Jun., Longwood, Fla.	VIII.	Editor.
Frank W. Hodgdon, Arlington, Mass.	I.	Asst. Eng'r with the Harbor and Land Com. of Mass., Boston.
Sumner Hollingsworth, South Braintree, Mass.	II.	Paper-Manufacturer.
Silas W. Holman, Boston, Mass.	VIII.	Associate Professor of Physics, Mass. Institute of Technology.
Alfred E. Hunt, 98 Fourth Ave., Pittsburg, Penn.	III.	Chemist and Metallurgical Engineer, Pittsburg Testing Lab.
William W. Jacques, 95 Milk St., Boston, Mass.	VIII.	Elect'n of the Am. Bell Tele. Co., and Inst'r, Mass. Inst. of Tech.
Samuel James, Jun., Rico, Colo.	III.	Metallurgist, Pasadena Reduction Company.
Alfred C. Kilham, North Springfield, Mo.	II.	Employed in Motive Power Dept., St. Louis and San Francisco R.R.
J. Austin Knapp, Abington, Mass.	II.	Of the firm of J. B. Knapp & Co.
Theodore J. Lewis, 212 North Thirty-Fourth St., Philadelphia, Penn.	II.	With the Standard Steel Works, 220 South Fourth Street.
Albert H. Low, Denver, Colo.	V.	Chemist.
Charles T. Main, Lawrence, Mass.	II.	Assistant Superintendent, Lower Pacific Mills.
Arthur L. Mills, 56 Elm Street, Toledo, O.	I.	Principal Asst. Engineer, Maintenance of Way and Construction Dept., T., St. L., and K. C. R. R.
William E. Nickerson, 351 Broad'y, N. Somerville, Mass.	V.	Chemist.
David W. Phipps, 209 Washington St., Boston, Mass.	Phil.	Attorney-at-Law.
Charles F. Prichard, Lynn, Mass.	II.	Superintendent of the Lynn Gas-Light Company.
Henry Raeder, Jun., 218 La Salle St., Chicago, Ill.	I.	Henry Raeder & Co., Architects and Engineers.
Charles L. Rich, East Jaffrey, N.H.	I.	Clerk, Monadnock National Bank.
*Thomas W. Robinson,	III.	Died Nov. 3, 1880.
Charles A. Sawyer, Sci. and Lit. 125 Dearborn St., Chicago, Ill.		Steam Heating and Ventilating.
Theodore E. Schwarz, Silverton, Colo.	III.	Superintendent, Yankee Girl Mining Company.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JULIUS H. SUSMANN, 105 Walnut Ave., Roxbury, Mass.	III.	Merchant, Boston, Mass.
WALTER D. TOWNSEND, Yokohama, Japan.	III.	With the American Trading Company.
CHARLES N. WAITE, Medford, Mass.	V.	With H. B. Coburn & Co., 145 Milk St., Boston, Mass.
HENRY M. WAITT, Detroit, Mich.	I.	Draughtsman with Detroit Bridge and Iron Co.
*ROBERT C. WARE,	Phil.	Died June 25, 1883.
HENRY B. WOOD, South Framingham, Mass.	I.	With Boston Water-Works.

1877.

JOHN ALDEN, Lawrence, Mass.	V.	Chemist at the Pacific Mills.
CHARLES S. BACHELDER, San Francisco, Cal.	V	Exchange Teller in the Pacific Bank.
GEORGE BARTOL, Cleveland, O.	III.	In charge of Mill and Forge Dept., Otis Iron and Steel Works.
J. WILLIAMS BEAL, Hanover P.O., So. Scituate, Mass.	IV.	Architectural Draughtsman.
WILLIAM H. BEECHING, 61 Bl'kstone St., Boston, Mass.	II.	Cork-Manufacturer.
G. WALTER CAPEN, Canton, Mass.	IV.	Architect.
HENRY H. CARTER, South Framingham, Mass.	I.	Assistant Engineer, Boston Water-Works.
WILLIAM E. CHAMBERLIN, 6 Beacon St., Boston, Mass.	IV.	Of the firm of Chamberlin & Whidden, Architects.
*GEORGE H. CHAPMAN,	II.	Died Jan. 21, 1879.
LINUS FAUNCE, Boston, Mass.	II.	Assistant Professor of Drawing, Mass. Inst. of Technology.
CHARLES H. FISHER, 49 P. O. B'ld'g, Lowell, Mass.	II.	Mechanical Engineer.
*WILLIAM C. FLINT,	III.	Died June 14, 1881.
PIERCE P. FURBER, 304 N. Eighth St., St. Louis, Mo.	IV.	Manager, office of Peabody & Stearns, Architects.
MARTIN GAY, W. New Brigh'n, Staten Isl., N.Y.	I.	Assistant Engineer, Department of Public Works of New-York City.
JOSEPH P. GRAY, 125 Grand Street, Lowell, Mass.	I.	Assistant Engineer in office of Proprietors of Locks and Canals on Merrimack River.
EDMUND GROVER, Zanesville, O.	I.	Asst. Engineer, C., B., & Q. R. R.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
RICHARD A. HALE, Lawrence, Mass.	I.	Principal Asst. Engineer with the Essex Water-Power Company.
JOHN E. HARDMAN, 158 Stackpole St., Lowell, Mass.	III.	Mining Engineer; Manager, Oldham Gold Co., Oldham, N.S., and Am. Gold Co., Isaacs Harbor, N.S.
HENRY D. HIBBARD, Butte City, M.T.	III.	General Superintendent, Parrot Silver and Copper Company.
WALTER JENNEY, 55 G St., South Boston, Mass.	III.	Superintendent, Petroleum Refinery, Jenney Manufacturing Company.
JOSEPH KIRK, Worcester, Mass.	II.	Draughtsman for L. J. Knowles & Bros., Loom-Manufacturers.
GEORGE W. KITTREDGE, Columbus, Ind.	I.	Engineer, Maintenance of Way, Jeffersonville, Madison, & Indianapolis R.R.
CHARLES F. LAWTON, Anthracite, Colo.	I.	Mine Superintendent, Whitebreast Coal and Mining Co.
BENJAMIN C. MUDGE, 70 Kilby St., Boston, Mass.	I.	N. E. Sales Agent for H. R. Worthington's Hydraulic Works, etc.
CECIL H. PEABODY, Boston, Mass.	II.	Asst. Prof. of Steam Engineering, Mass. Institute of Technology.
ARTHUR L. PLIMPTON, 7 Hawthorn St., Roxbury, Mass.	I.	Civil Engineer for the Metropolitan R.R., 16 Kilby St.
HARRY C. SOUTHWORTH, Ishpeming, Mich.	III.	Manager, Rogers Gold and Silver Company.
* CHARLES E. STEWART,	I.	Died Oct. 7, 1877.
THOMAS F. STIMPSON, Providence, R.I.	III.	Overseer, Printing Dept., Silver Spring Bleaching and Dyeing Co.
GEORGE F. SWAIN, Boston, Mass.	I.	Associate Prof. of Civil Engineering, Mass. Inst. of Technology.
FRANK E. WIGGIN, Santa Fé, Argentine Republic.	I.	Engineer, *Ferro-Carril de Sta Fé a las Colonias.*
FREDERICK W. WOOD, Steelton, Dauphin Co., Penn.	III.	Superintendent, Pennsylvania Steel Company.

1878.

WILLIAM B. ALLBRIGHT, 200 Forsyth St., New York, N.Y.	V.	With Halstead & Co., Packers and Lard Refiners.
CHARLES M. BAKER, 74 Devonshire St., Boston, Mass.	IV.	With Chase & Barstow, Stock Brokers.
TAKUMA DAN, Chikugo, Japan.	III.	Gen. Supt., Mieke Imperial Coal Mines.
CHARLES S. EATON, 63 Hanover St., Boston, Mass.	IV.	In business.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ALFRED S. HIGGINS, 35 Howard St., Boston, Mass.	IV.	With R. R. Higgins & Co.
JULIAN A. KEBLER, Ottumwa, Io.	I.	General Superintendent, Whitebreast Coal Co.
FRANK H. MORGAN, Ithaca, N.Y.	V.	Instructor in Chemical Analysis, Cornell University.
EVERELL J. NICHOLS, Burlington, Io.	I.	Engineer Corps, Chicago, Burlington, and Quincy Railroad.
FREDERICK H. PRENTISS, 28 State St., Boston, Mass.	II.	Mechanical Engineer.
JAMES RITCHIE, Cleveland, O.	I.	Asst. Prof. of Civil Eng. and Math., Case School of App. Science.
JAMES W. ROLLINS, Jun., Hicksford, Va.	I.	Chief Engineer, Atlantic and Danville Railroad.
C. D. SAWIN, M.D., Sci. and Lit. 349 Main St., Charlestown, Mass.		Physician and Surgeon to Massachusetts State Prison.
PETER SCHWAMB, Boston, Mass.	II.	Asst. Prof. of Mechanism, Mass. Institute of Technology.
FREDERIC P. SPALDING, 471 Middlesex St., Lowell, Mass.	I.	Civil Engineer, City Engineer's Office, Boston, Mass.
ISAAC M. STORY, Somerville, Mass.	I.	With Keene Granite Company.
EDMUND TANEY, Washington, D.C.	I.	With the U.S. Coast and Geodetic Survey.
LINWOOD O. TOWNE, Rico, Colo.	III.	Assayer, Chemist, and Mining Engineer.
ÉMILE F. WILLIAMS, 230 Washington Street, Boston, Mass.	I.	Loans on Mortgages of Real and Personal Property.
JAMES G. WOOLWORTH, Swansea, Mass.	V.	With Swansea Dye and Bleaching Company.

1879.

WALTER S. ALLEN, 13 Beacon St., Boston, Mass.	V.	Secretary, State Gas Commission.
SAMUEL T. BRALEY, Rutland, Vt.	II.	Draughtsman, Howe Scale Company.
JOHN W. CABOT, Bellaire, O.	III.	Superintendent, Steel Works Dept., Bellaire Nail-Works.
HARRY H. CAMPBELL, Steelton, Dauphin Co., Penn.	III.	Superintendent, Open Hearth Dept., Pennsylvania Steel Company.
FRED. S. COFFIN, 152 Congress St., Boston, Mass.	III.	Manager, Wool Department, Stoddard, Lovering, & Co.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
W. OTIS DUNBAR, Altoona, Penn.	II.	In charge of Pennsylvania R.R. Test Room.
GEORGE W. FABENS, Chariton, Io.	I.	Division Roadmaster, Chicago, Burlington, & Quincy R.R.
CHARLES S. GOODING, 28 School St., Boston, Mass.	II.	Mechanical Engineer and Draughtsman.
ERNEST G. HARTWELL, 68 Devonshire Street, Boston, Mass.	IV.	With Hartwell & Richardson, Architects.
RAPHAEL M. HOSEA, Swan, Marion Co., Io.	I.	Mine Superintendent, Whitebreast Coal and Mining Company.
HORACE J. HOWE, Port Jervis, N.Y.	I.	Engineer, N. Y., L. E., & W. R. R.
FREDERICK B. KNAPP, Duxbury, Mass.	I.	Principal, Scientific Preparatory School.
FRED. H. LANE, Standard Block, Cleveland, O.	II.	With Standard Oil Company.
FRED. R. LORING, 8 Greenwich Pk., Boston, Mass.	VII.	Studying in Germany.
WILLIAM W. MACFARLANE, 110 Oxford St., Phila., Penn.	V.	Assistant Superintendent, Quaker City Dye-Works.
ARTHUR H. METCALF, Pawtucket, R.I.	II.	Mechanical Engineer.
EDWIN C. MILLER, 156 Tremont St., Boston, Mass.	II.	Assistant Superintendent, Henry F. Miller & Sons' Piano Company.
EDWARD H. OWEN, Jun., Lawrence, Mass.	II.	Superintendent, Atlantic Cotton Mills.
WILLIAM H. PICKERING, Boston, Mass.	VIII.	Instructor in Physics, Massachusetts Institute of Technology.
GEORGE F. RIGGS, Memphis, Tenn.	I.	Assistant Engineer, K. C., S., and M. R.R.
FRANK C. STANTIAL, Melrose, Mass.	V.	In charge of Cochrane Chemical Company's Ammonia Works, East Cambridge.
WILLIAM S. STEARNS, Wyoming, O.	I.	Supt., Stearns & Foster Co.'s Cotton Factory, Cincinnati, O.
ARTHUR M. WAITT, 41 Dwight St., Boston, Mass.	II.	Gen. Foreman, Car Dept., Boston and Maine R.R., Salem, Mass.

1880.

GEORGE H. BARTON, Boston, Mass.	III.	Instructor in Determinative Mineralogy, Mass. Inst. of Tech.
CHARLES H. BROWN, 668 Shawmut Av., Boston, Mass.	I.	

NAME AND ADDRESS.	COURSE.	OCCUPATION.
EDWIN E. CHASE, Central City, Colo.	I.	United-States Deputy Surveyor and Mining Engineer.
FREDERICK W. CLARK, Boston, Mass.	III.	Instructor in Mining and Metallurgy, Mass. Institute of Technology.
GEORGE W. HAMILTON, 74 Tremont St., Boston, Mass.	I.	Inspector, Charles River Embankment and Sea Wall, Park Dept.
LORING R. MILLEN, 16 Beaver St., New York, N.Y.	III.	Wholesale Lumber Dealer, with Bacon, Pike, & Co.
WILLIAM T. MILLER, 156 Tremont St., Boston, Mass.	Elective.	Salesman, with Henry F. Miller & Sons' Piano Company.
*NATHANIEL C. SMALL,	V.	Died July 14, 1880.

1881.

IRA ABBOTT, Windsor Hotel, Montreal, P.Q.	I.	Vice-President and Assistant Engineer, Dominion Bridge Company.
JOHN. H. ALLEN, Argentine, Kan.	III.	With Kansas City Smelting and Refining Company.
*JAMES S. ATKINSON,	II.	Died Dec. 17, 1883.
AMOS BINNEY, A.B., Walpole, Mass.	V.	Chemist, Walpole Dye and Chemical Works.
DAVID S. BISSELL, Pittsburg, Penn.	III.	Of Boyle & Bissell, Iron and Stone Brokers.
FRANK H. BRIGGS, 25 Hotel Berkeley, Boston, Mass.	IX.	Broker, 57 High Street, Boston.
FRANK E. CAME, Windsor Hotel, Montreal, P.Q.	I.	Assistant Engineer, Dominion Bridge Company.
FRANK D. CHASE, Dedham, Mass.	III.	
BENJAMIN G. COLLINS, Edgartown, Mass.	II.	
HARRY H. CUTLER, Akron, O.	II.	Superintendent, Citizens' Electric Light Company.
F. GRAEF DARLINGTON, Arch St., Allegheny City, Penn.	IX.	Engineer of Maintenance of Way, P. C. & St. L. Div., P. C. & St. L. R.R.
JOHN DUFF, Flint., I. T.	V.	Chemist and Assayer, Flint Mining Company.
DAVID S. GODDARD, Lowell, Mass.	III.	With Coburn Shuttle Company.
*MARIE G. HOLMAN, A.M.,	V.	Died May 5, 1885.
WALTER J. KOEHLER, Parral, Chihuahua, Mexico.	V.	Metallurgist.
EDWIN J. LEWIS, Jun., 60 Devonshire St., Boston, Mass.	IV.	Draughtsman, with Peabody and Stearns, Architects.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM B. LINDSAY, A.B., Carlisle, Penn.	V.	Professor of Chemistry, Dickinson College.
JAMES LUND, Malden, Mass.	V.	Chemist, Cochrane Chemical Co.
GEORGE A. MOWER, West Newton, Mass.	II.	Expert Engineer, Crosby Steam Gage and Valve Company.
WEBSTER NORRIS, Milwaukee, Wis.	III.	Chemist, C. M. and St. Paul Railway.
EVELYN M. ORDWAY, Tulane Univ., New Orleans, La.	V.	
THEODORE PARKER, Burlington, Io.	I.	Assistant Engineer, C., B., and Q. Railroad.
NATHANIEL W. SHED, Nashua, N.H.	V.	Chemist, with the Nashua Iron and Steel Company.
WILLIAM R. SNEAD, 318 W. Chestnut Street, Louisville, Ky.	IV.	Gen. Superintendent, Snead & Co.'s Architectural Iron Works.
HAROLD E. STEARNS, Montreal, P.Q.	II.	Treasurer, Dominion Wadding Company.
EDWARD R. WARREN, Crested Butte, Col.	VII.	United-States Deputy Mineral Surveyor.
CHARLES M. WILKES, St. Paul, Minn.	IV.	City Engineer's Office.
ARTHUR WINSLOW, Raleigh, N.C.	III.	Engineer and Geologist.

1882.

CLARA P. AMES, Northampton, Mass.	V.	Teacher in Girls' Classical School.
THOMAS B. CARSON, Iowa City, Io.	II.	In business.
EDWARD F. ELY, A.B., Brookline, Mass.	IV.	Draughtsman, with Shepley, Rutan, & Coolidge.
GEORGE FAUNCE, A.B., Mansfield Valley, Allegheny Co., Penn.	III.	Assistant Superintendent of Pennsylvania Lead Company's Works.
*HARRY A. FOSS,	II.	Died Aug. 19, 1885.
CHARLES A. FRENCH, Boston, Mass.	III.	Instructor in Mathematics, Massachusetts Institute of Technology.
HOWARD V. FROST, Arlington, Mass.	V.	Instructor in General Chemistry, Mass. Institute of Technology.
EDW. G. GARDINER, Ph.D., Boston, Mass.	VII.	Assistant in Biology, Massachusetts Institute of Technology.
FRANCIS P. HALL, Columbia St., Dorchester, Mass.	V.	Assayer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
GEORGE L. HEINS, 51 W. Tenth St., New York, N.Y.	IV.	Architect.
CHARLES D. JENKINS, 32 Hawley St., Boston, Mass.	V.	Assistant State Inspector of Gas.
JAMES W. JOHNSON, Riverside, Cal.	I.	Civil Engineer.
JOHN F. LOW, Chelsea, Mass.	V.	Of the firm of J. G. & J. F. Low, Art Tile Works.
HARRY G. MANNING, Troy, N.Y.	II.	With Richardson Balanced-Valve Company.
GEORGE W. MANSFIELD, Greenville, N.J.	III.	Assistant Electrician, Daft Electric Light Company.
FRANK C. MORRISON, 89 Court St., Boston, Mass.	I.	Engineer and Draughtsman.
JAMES P. MUNROE, 126 M. Vernon St., Boston, Mass.	III.	Secretary, Massachusetts Institute of Technology.
CARRIE L. RICE, 786 Arapahoe St., Denver, Colo.	V.	Teacher of Chemistry and Algebra, Denver High School.
WILLIAM T. RIPLEY, Centre Rutland, Vt.	II.	Superintendent, Ripley Sons' Wholesale Marble Works.
HENRY F. ROSS, Jamaica Plain, Mass.	III.	With Boston Thread and Twine Company.
JOHN H. ROSS, Jamaica Plain, Mass.	Elective.	Superintendent, Boston Thread and Twine Company.
GRENVILLE T. SNELLING, 15 Rue de Buce, Paris, Fr.	IV.	Student of Architecture, *École Nationale et Speciale des Beaux Arts.*
WALTER B. SNOW, Watertown, Mass.	II.	With Geo. F. Blake Manufacturing Company.
ANTHONY C. WHITE, 185 Dearborn St., Chicago, Ill.	VIII.	With Western Edison Electric Light Company.

1883.

HERBERT T. BARDWELL, Box 1265, Springfield, Mass.	I.	With Holyoke Water-Power Company.
GEORGE H. BRYANT, Auburn, Ala.	II.	Prof. of Mechanic Arts, Alabama Polytechnic Institute.
HARVEY S. CHASE, Great Falls, N.H.	II.	Supt., Gas-Light Co. and Gt. Falls M'f'g Co.'s Water-Works.
FRANK E. DAVIS, Boston, Mass.	II.	In business.
JOHN G. EPPENDORFF, 89 W. Genesee St., Buffalo, N.Y.	IV.	With Green & Wicks, Architects.
GEORGE J. FORAN, 95 Liberty St., New York, N.Y.	II.	With Geo. F. Blake Manufacturing Company.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM B. FULLER, 5 Banning's Block, Duluth, Minn.	I.	Assistant Village Engineer.
HORACE B. GALE, St. Louis, Mo.	II.	Professor of Dynamic Engineering, Washington University.
GEORGE H. GUSTIN, Boston, Mass.	III.	Asst. in Chem. Analysis, Mass. Institute of Technology.
FREDERIC O. HARRIMAN, Jaltipan, Mex.	I.	Civil Engineer and Contractor.
JAMES H. HUTCHINGS, 1672 Washington St., Boston, Mass.	II.	
HARVEY M. MANSFIELD, Wakefield, Mass.	III.	Chemist, with Somerset Fibre Company, Boston.
ROBERT W. SCOTT, 1227 South Sixth Street, Philadelphia, Penn.	II.	Mechanical Engineer and Draughtsman.
GEORGE A. SMITH, Arlington, Mass.	V.	Chemist, with Thos. Strahan, Paperhanging Man'fr, Chelsea, Mass.
FRANK TENNEY, Steelton, Dauphin Co., Penn.	III.	Asst. Superintendent, Blast Furnace Department, Penn. Steel Co.
CHARLES H. TOMPKINS, Jun., Boise City, I.T.	III.	Assistant Engineer, Idaho Mining and Irrigation Company.
GEORGE R. UNDERWOOD, Boston, Mass.	V.	Instructor in Industrial Chemistry, Mass. Institute of Technology.
DAVID WESSON, Eighteenth St., cor. Blackwell, Chicago, Ill.	V.	With N. K. Fairbank & Co.
CHARLES B. APPLETON, Hotel Oxford, Boston.	II.	
HENRY F. BALDWIN, Lebanon, Ky.	II.	Asst. Engineer's Office, Louisville & Nashville R.R.
FRED. L. BARDWELL, B.S., Boston, Mass.	V.	Instructor in General Chemistry, Mass. Institute of Technology.
T. HARRIS BARTLETT, Ainsworth, W.T.	III.	Civil Engineering Department, Northern Pacific R.R.
HENRY A. BOARDMAN, Providence, R.I.	V.	Chemist, Silver Spring Bleaching and Dyeing Company.
CHARLES C. BOTHFELD, Pittsburg, Penn.	I.	Asst. Engineer, Keystone Bridge Company.
ALICE I. BROWN, Brooklyn, N.Y.	V.	Teacher of Physical Geography, Central School.
W. FRANK CARR, B.S., Minneapolis, Minn.	I.	Of the firm of Spalding & Carr.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHRISTOPHER J. CARVEN, 1604 Dorchester Ave., South Boston, Mass.	I.	City Engineer's Office, Boston.
ROSCOE L. CHASE, 110 Oxford St., Phila., Penn.	V.	Chemist, Quaker-City Dye-Works.
ALFRED O. DOANE, Newtonville, Mass.	III.	Chemist.
ALFRED L. FITCH, Boston, Mass.	II.	Instructor in Mechanical Engineering, Mass. Inst. of Technology.
GEORGE L. R. FRENCH, Lincoln, Neb.	I.	With Burlington and Missouri River Railroad.
AUG. H. GILL, Boston, Mass.	V.	Instructor in General Chemistry, Mass. Institute of Technology.
FRED. M. HAINES, Boston, Mass.	III.	Assistant Engineer, Northern Pacific R.R.
GEORGE H. HEYWOOD, Gardner, Mass.	III.	With Heywood Bros., Chair Manufacturers.
JAMES G. HOLDER, 73 Broad St., Lynn, Mass.	V.	Apothecary.
GEORGE F. KNAPP, Joliet, Ill.	III.	3d Assistant, Joliet Steel Company's Laboratory.
AMY STANTIAL LUND, Malden, Mass.	V.	
CAPT. D. A. LYLE, U.S.A., Box 2253, Boston, Mass.	III.	Inspector of Ordnance, United States Army.
PHILIP S. MORSE, A.B., Box 1027, Salt Lake City, Utah.	III.	With the Jordan Mining & Milling Company.
CHARLES O. PRESCOTT, Plymouth, Mass.	V.	Teacher of Chemistry.
WILLIAM L. PUFFER, Boston, Mass.	III.	Assistant in Physical Laboratory, Mass. Institute of Technology.
ARTHUR J. PURINTON, Boston, Mass.	II.	Instructor in Mechanical Engineering, Mass. Inst. of Technology.
WILLIAM J. RICH, Lowell, Mass.	III.	Office, Proprietors of Locks and Canals of Merrimack River.
FRANKLIN B. RICHARDS, Box 6, Youngstown, O.	III.	Chemist, Brier Hill Iron and Coal Company.
C. SNELLING ROBINSON, Joliet, Ill.	III.	2d Assistant, Joliet Steel Company's Laboratory.
THEODORE W. ROBINSON, Joliet, Ill.	III.	1st Assistant, Joliet Steel Company's Laboratory.
A. LAWRENCE ROTCH, 3 Commonwealth Ave., Boston, Mass.	II.	Proprietor, Blue-Hill Meteorological Observatory, Readville, Mass.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JOSIAH P. RYDER, East Boston, Mass.	V.	Teacher, Dorchester High School.
ALFRED STEBBINS, Jun., Denver, Col.	III.	Mining Engineer.
ELLIOT T. STURGIS, Cooke City, Gallatin Co., M.T.	III.	Asst. Supt., Republic Mining Co.
HARRY W. TYLER, Boston, Mass.	V.	Instructor in Mathematics, Massachusetts Institute of Technology.
NAHUM WARD, Mt. Seaver Ave., Roxbury, Mass.	V.	Chemist, with N. Ward Co.
WILLIAM M. WHITNEY, Winchendon, Mass.	II	With Baxter D. Whitney, Manufacturers Wood-working Machinery.
FRANK C. WILLIAMS, Jun., Lincoln, Neb.	I.	Assistant Engineer, Burlington & Missouri River Railroad.

1885.

CHARLES R. ALLEN, New Bedford, Mass.	V.	Teacher of Science in New Bedford High School.
DAVID BAKER, Steelton, Penn.	III.	With the Pennsylvania Steel Company.
EDWARD R. BENTON, Ph.D., Brookline, Mass.	IV.	Draughtsman, with Shepley, Rutan, & Coolidge.
HEYWOOD COCHRAN, Louisville, Ky.	II.	Draughtsman, with Louisville Bridge and Iron Company.
EDWARD H. DEWSON, Jun., Quincy, Mass.	II.	Employed in Shops of the Old Colony R.R., Boston, Mass.
FREDERICK FOX, Jun., S.M., Boston, Mass.	V.	Assistant in Sanitary Chemistry, Mass. Institute of Technology.
THOMAS W. FRY, Chicago, Ill.	II.	With M. C. Bullock Manufacturing Company.
ROBERT R. GOODRICH, Stone Cliff, W. Va.	III.	Mining Engineer.
WALTER K. HARRINGTON, Care Union League Club, New York, N.Y.	I.	With Union Pacific Railroad.
ELEAZER B. HOMER, 68 Devonshire St., Boston, Mass.	IV.	With Hartwell & Richardson, Architects.
FRANK H. LORD, Providence, R.I.	II.	Draughtsman, Brown and Sharpe Manufacturing Company.
TRACY LYON, Tonawanda, N.Y.	II.	With Armitage, Herschel & Co., Tonawanda Eng. and Boiler W'ks.
HUGH MACRAE, Burnsville, Tancey Co., N.C.	III.	Mining Engineer.
HENRY MARTIN, Lowell, Mass.	V.	Assistant in Chemical Analysis, Mass. Institute of Technology.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ALLYNE L. MERRILL, Cambridge, Mass.	II.	Asst. in Mechanical Engineering, Mass. Institute of Technology.
EBEN G. MERRILL, Omaha, Neb.	I.	With Union Pacific Railroad Company.
EVERETT MORSS, 323 Marlboro' St., Boston, Mass.	III.	With Morss & Whyte, Wire-Workers.
FREDERICK H. NEWELL, Boston, Mass.	III.	Graduate Student, Massachusetts Institute of Technology.
JOSEPH E. NUTE, 813 South Nineteenth St., Omaha, Neb.	I.	With United Gas Improvement Company of Philadelphia, Penn.
MARCELLA I. O'GRADY, Baltimore, Md.	IX.	Science Teacher in Bryn Mawr School.
FRANK A. PICKERNELL, Boston, Mass.	VI.	With American Bell Telephone Company.
RICHARD H. PIERCE, A.B., Brockton, Mass.	VI.	With Edison Electric Light Co.
NEWBERT M. RANDALL, Steelton, Penn.	III.	Assistant Chemist, Pennsylvania Steel Company.
OTIS T. STANTIAL, Chicago, Ill.	III.	Asst. Chemist, North Chicago Rolling Mill Company.
HENRY P. TALBOT, Holliston, Mass.	V.	Assistant in Chemical Analysis, Mass. Institute of Technology.
GEORGE P. VANIER, Steelton, Penn.	III.	Chemist, Pennsylvania Steel Co.
ERASTUS WORTHINGTON, Jun., Dedham, Mass.	I.	Asst. Engineer on Water-Works and Sewerage Construction.

1886.

GEORGE P. ABORN, Warren, Mass.	II.	With the Knowles Pump-Works.
ARTHUR C. ANTHONY, 285 Marlboro' St., Boston, Mass.	III.	
DANA P. BARTLETT, Boston, Mass.	VI.	Assistant in Mathematics, Massachusetts Institute of Technology.
BIRNEY C. BATCHELLER, Fort Hamilton, N.Y. Harbor.	II.	With the Pneumatic Dynamite Gun Company.
WILLIAM L. BRAINERD, 270 Devonshire St., Boston, Mass.	IV.	Draughtsman with Allen & Kenway, Architects.
JOHN K. BURGESS, Dedham, Mass.	II.	In Europe.
CHARLES L. BURLINGHAM, 107 Dearborn St., Chicago, Ill.	III.	With N. Y. Mutual Life Insurance Company.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WM. H. CHADBOURN, Jun., Chadbourn, N.C.	III.	Chief Engineer, Wilmington, Chadbourn, and Conway Railroad.
WILLIAM L. CHURCH, Providence, R.I.	VI.	Instructor in Mathematics and Physical Science, Berkeley School.
HARRY E. H. CLIFFORD, Boston, Mass.	VI.	Assistant in Physics, Massachusetts Institute of Technology.
LOUIS R. Cobb, Lincoln, Neb.	I.	In Engineer's Office, Burlington & Missouri River R.R.
FRANCIS H. CRANE, Stoughton, Mass.	VI.	Graduate Student.
LOUIS F. CUTTER, Winchester, Mass.	I.	Field Assistant in charge of Plane-table Sheet, U.S. Geol. Survey.
CHARLES C. DOE, 224 Commonwealth Av., Boston.	VII A.	Student at Harvard Medical School.
ORRIN S. DOOLITTLE, Altoona, Penn.	V.	Assistant in Laboratory of the Pennsylvania Railroad.
JAMES C. DUFF, Milwaukee, Wis.	V.	Assistant Chemist, C. M. & St. P. R.R.
GEORGE W. FARMER, Topeka, Kan.	II.	In the Shops of the Atchison, Topeka, and Santa Fé Railroad.
EDW. S. FOSS, Boston, Mass.	V.	Assistant in General Chemistry, Mass. Institute of Technology.
FRED E. FOSS, A.B., Fairbank, Io.	I.	Resident Engineer, Chicago, St. Paul, and Kansas City Railway.
THEO. R. FOSTER, Kingston, Ont.	II.	Draughtsman with the Canadian Locomotive and Engine Co.
ALEX. S. GARFIELD, Lexington, Mass.	II.	
D. LEWIS K. HATHAWAY, 307 Charles St., Providence, R.I.	II.	With the Silver Spring Bleaching and Dyeing Company.
EDW. E. HIGGINS, St. Johnsbury, Vt.	VI.	With the Standard Electric Company of Vermont.
WILLIAM J. HOPKINS, Stanhope St., Boston, Mass.	VI.	With N. E. Weston Electric Light Company.
WALTER R. INGALLS, 115 Ocean St., Lynn, Mass.	III.	Mining Engineer, Leadville, Colo.
WILLIAM F. JORDAN, Lincoln, Neb.	I.	Engineering Department of the Burlington and Mo. River Railway.
C. BELLE KENNEY, 79 Boylston St., Boston, Mass.	V.	Teacher.
JOHN A. McC. LAWRENCE, St. John, N.B.	II.	With St. John Bolt and Nut Works.
ALBERT E. LEACH, 44 Franklin St., Lynn, Mass.	II.	With Thomson-Houston Electric Company.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
FRANK L. LOCKE, Boston, Mass.	I.	Assistant in Drawing, Massachusetts Institute of Technology.
WILSON H. LOW, Box 71, Old Town, Me.	V.	Chemist with Penobscot Chemical Fibre Company.
ELGOOD C. LUFKIN, Lockport, N.Y.	II.	With Holly Manufacturing Company.
JAMES P. LYNDE, Athol, Mass.	IX.	
ALEX. R. MCKIM, Care Mendelssohn & Cie, Berlin, Germany.	I.	Student, *Königliche Technische Hochschule.*
HARRY B. MERRIAM, Denver, Colo.	I.	Assistant to Division Engineer, Union Pacific Railway.
HENRY P. MERRIAM, Fort Hamilton, N.Y.	VI.	With Pneumatic Dynamite Gun Company.
EDW. F. MILLER, Boston, Mass.	II.	Asst. in Mechanical Engineering, Mass. Institute of Technology.
EDGAR H. MUMFORD, Omaha, Neb.	II.	In Shops of the Union Pacific R.R.
ARTHUR A. NOYES, Boston, Mass.	V.	Graduate Student, Mass. Institute of Technology.
EDW. L. PIERCE, Jun., Bennington, N.H.	II.	With the Monadnock Paper Mills.
GEORGE F. REYNOLDS, Chicago, Ill.	II.	With the M. C. Bullock Manufacturing Company.
CHARLES F. RICHARDSON, 13 Holyoke House, Cambridge, Mass.	II.	Student at Harvard Law School.
ARTHUR G. ROBBINS, Boston, Mass.	I.	Assistant in Civil Engineering, Mass. Institute of Technology
L. KIMBALL RUSSELL, Arlington, Mass.	V.	Assistant in General Chemistry, Mass. Institute of Technology.
JOHN F. SEAVEY, Lowell, Mass.	II.	In City Engineer's Office.
WILLIAM E. SHEPARD, Hartford, Conn.	VI.	Assistant Electrician with the Schuyler Electric Light Company.
JAMES E. SIMPSON, 163 Haverhill St., Lawrence, Mass.	III.	With J. R. Simpson & Company.
THEODORE STEBBINS, 185 Dearborn St., Chicago, Ill.	VI.	Electrician, with Western Edison Light Company.
AUGUSTUS B. STOUGHTON, Philadelphia, Penn.	II.	With Lewis Bros. & Co., 238 Chestnut Street.
WILLIAM M. TAYLOR, Indianapolis, Ind.	II.	With Chandler & Taylor, Phœnix Machine Works.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHARLES D. TURNBULL, 111 Beacon Street, Boston, Mass.	II.	
DAVID VAN ALSTINE, Louisville, Ky.	II.	In Repair Shops of the Louisville & Nashville Railroad.
MAURICE A. VIELÉ, B.S., Geneva, N.Y.	II.	
C. MORRIS WILDER, Cincinnati, O.	VI.	
ELWOOD J. WILSON, Red Bluff P.O., Madison Co., M. T.	III.	Assayer for the Revenue Gold Mining Company.
CHARLES WOOD, Pittsburg, Penn.	I.	With Keystone Bridge Company.
CHARLES H. WOODBURY, 22 School Street, Boston, Mass.	II.	Artist.
VERNOR F. WORCESTER, Hastings-on-the-Hudson, N.Y.	II.	With the Hastings Pavement Co.
FRED R. YOUNG, Steelton, Penn.	III.	In Bessemer Department of the Pennsylvania Steel Company.

Alumni will confer a favor by informing the Secretary of the Faculty of any change of address or occupation.

Other persons who have been connected with the Institute for one year or more, will also confer a favor by informing the Secretary of the Faculty of their address and occupation.

It should be noticed that the graduates comprise but about one-fifth of all the students who have in the past been connected with this school.

SUMMARY.

Class of 1868	14	Class of 1878	19
" " 1869	5	" " 1879	23
" " 1870	10	" " 1880	8
" " 1871	17	" " 1881	28
" " 1872	12	" " 1882	24
" " 1873	26	" " 1883	18
" " 1874	18	" " 1884	36
" " 1875	27	" " 1885	27
" " 1876	43	" " 1886	59
" " 1877	32		
Total			446
Deduct names counted twice			2
			444

TITLES OF THESES

OF SUCCESSFUL CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE, JUNE, 1886.

GEORGE PENNELL ABORN,
Experiments on the Flow of Steam through Orifices.

ARTHUR COX ANTHONY,
The Treatment of Certain Silver-bearing Ores by the Process of Pan Amalgamation.

DANA PRESCOTT BARTLETT,
The Electrical Transmission of Power. (*With H. E. H. Clifford.*)

BIRNEY CLARK BATCHELLER,
A Design for a Fork Hanger.

WILLIAM LORD BRAINERD,
Design for a Union Station for a System of Elevated Railways.

JOHN KINGSBURY BURGESS,
An Investigation on the Tensile and Transverse Strengths of Cast-Iron. (*With M. A. Vielé.*)

CHARLES LINCOLN BURLINGHAM,
Geology of the Rowe (Mass.) Pyrite Deposit.

WILLIAM HOBBS CHADBOURN, Jun.,
Siemens-Martin Process of Steel Manufacture as Practised at the Norway Iron Works, South Boston.

HARRY ELLSWORTH HOUGHTON CLIFFORD,
The Electrical Transmission of Power. (*With D. P. Bartlett.*)

WILLIAM LESTER CHURCH,
An Experimental Study of a Weston Dynamo. (*With C. M. Wilder.*)

LOUIS RENO COBB,
Sanitary House Drainage.

FRANCIS HENRY CRANE,
Compound Winding of Dynamos. (*With H. P. Merriam.*)

LOUIS FAYERWEATHER CUTTER,
Portable Barometers.

CHARLES CUTLER DOE,
The Regeneration of the Uterine Mucous Membrane of the Cat after Parturition.

ORRIN SAGE DOOLITTLE,
The Composition of Boston Illuminating Gas.

JAMES CHARLES DUFF,
The Action of Phosphoric Acid on the Alcohols of the Fat Series.

GEORGE WHITLOCK FARMER,
A Description of the Ames Petroleum Engine with Results of Some Experiments.

EDWARD SANBORN FOSS,
The Action of Dilute Nitric Acid on the Substituted Aromatic Amides.

FRED EUGENE FOSS (*A.B., Bates College*),
Design for a Highway Bridge across the Androscoggin River at Lewiston, Me. (*With W. F. Jordan.*)

THEODORE RENO FOSTER,
An Investigation of the Strength and Elasticity of Shafting under Combined Twisting and Bending.

ALEXANDER STANLEY GARFIELD,
Investigation of Several Formulæ and Tables giving the Relation between the Temperature and Pressure of Saturated Steam. (*With E. L. Pierce, Jun.*)

DAVID LEWIS HATHAWAY,
The Joy Valve Gear.

EDWARD EVERETT HIGGINS,
Tests of a Commercial Storage Battery.

WILLIAM JOHN HOPKINS,
Measurement of the Strength of Telephone Currents, with Some Special Experiments in Blake Contacts.

WALTER RENTON INGALLS,
The Treatment of a Low Grade, Blendous Silver Ore.

WILLIAM FREDERICK JORDAN,
Design for a Highway Bridge across the Androscoggin River at Lewiston, Me. (*With F. E. Foss.*)

CARRIE BELLE KENNEY,
The Determination of Small Quantities of Illuminating Gas in Air.

JOHN A. MCCALLUM LAWRENCE,
Design for a Hot Forge Nut Press, with Experiments on Shearing Strength of Hot Iron.

ALBERT ERNEST LEACH,
Results of Tests made on the Harris-Corliss and Porter-Allen Engines at the Massachusetts Institute of Technology.

FRANK LOVERING LOCKE,
A Plan for Improvement of the Railroad Terminal Facilities of Boston, Mass.

WILSON HENRY LOW,
Manufacture of Aluminum, and Study of its Sulphur Compounds.

ELGOOD CHAUNCY LUFKIN,
The Efficiency and Economy of Different Coals used for Steam Generating Purposes. (*With E. F. Miller.*)

JAMES PORTER LYNDE,
Lixiviation and Amalgamation of Silver Ore.

ALEXANDER RICE MCKIM,
A Discussion of the Relative Merits of Metallic and Wooden Sleepers for Railroads.

HARRY BAKER MERRIAM,
Railroad Signals.

HENRY PARKER MERRIAM,
Compound Winding of Dynamos. (*With F. H. Crane.*)

EDWARD FURBER MILLER,
The Efficiency and Economy of Different Coals used for Steam Generating Purposes. (*With E. C. Lufkin.*)

EDGAR HUIDEKOPER MUMFORD,
An Experimental Study of the Surface Condenser.

ARTHUR AMOS NOYES,
Action of Heat on Ethylene.

EDWARD LILLIE PIERCE, JUN.,
An Investigation of Several Formulæ and Tables giving the Relation between the Temperature and Volume of Saturated Steam. (*With A. S. Garfield.*)

GEORGE FRANK REYNOLDS,
Experiments on the Balancing of the Reciprocating Parts of the Locomotive.

CHARLES FRANKLIN RICHARDSON,
The Effect of Different Temperatures upon the Tensile Strength of Steel Boiler Plate.

ARTHUR GRAHAM ROBBINS,
A Discussion of the Methods Employed for the Control of Rivers and the Prevention of Floods.

LUCIUS KIMBALL RUSSELL,
Action of Cochituate Water on Galvanized, Brass, and Kalameined Pipes.

JOHN FRANKLIN SEAVEY,
An Investigation of the Valve Gear of a Few Stationary Engines.

WILLIAM EDWIN SHEPARD,
On the Inverse Electro-Motive Force of the Voltaic Arc.

JAMES ELISHA SIMPSON,
Smelting of an Argentiferous Galena and Treatment of Matte by the Augustin Process.

THEODORE STEBBINS,
Researches in Relation to Cable Telephony.

AUGUSTUS BURBANK STOUGHTON,
The Comparative Evenness of Cotton Slivers and Slubber Roving, Manufactured According to the American or English Process. (*With C. D. Turnbull.*)

WILLIAM MODE TAYLOR,
An Experimental Determination of the Pressures on Lathe and Planer Tools. (*With D. Van Alstine.*)

CHARLES DALE TURNBULL,
The Comparative Evenness of Cotton Slivers and Slubber Roving, Manufactured According to the American or English Process. (*With A. B. Stoughton.*)

DAVID VAN ALSTINE,
An Experimental Determination of the Pressures on Lathe and Planer Tools. (*With W. M. Taylor.*)

MAURICE AUGUSTUS VIELÉ (*B.S., Hobart College*),
An Investigation on the Tensile and Transverse Strengths of Cast-Iron. (*With J. K. Burgess.*)

CHARLES MORRIS WILDER,
An Experimental Study of a Weston Dynamo. (*With W. L. Church.*)

ELWOOD JUSTIN WILSON,
Plattner's Chlorination Process.

CHARLES WOOD,
A Design for the Superstructure for the Proposed Cantilever Bridge over the St. Lawrence River at Lachine, P.Q.

CHARLES HERBERT WOODBURY,
Design of Builder Motion and Driving Mechanism of the Roving Frame.

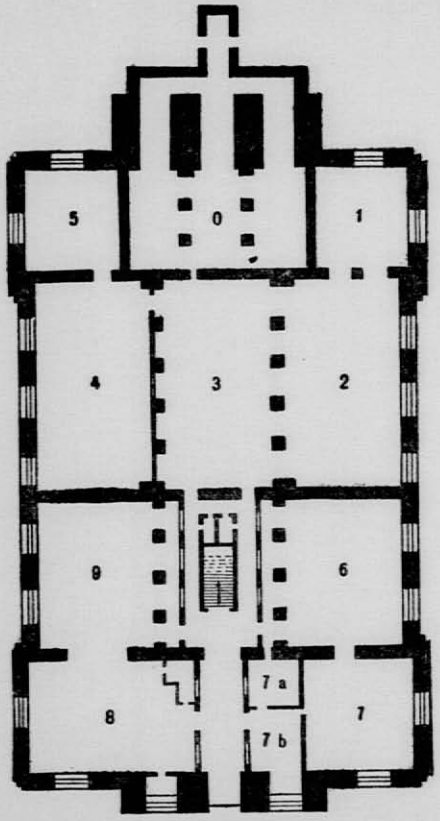
VERNOR FRANK WORCESTER,
The Transmission of Power by Rope Gearing.

FRED ROPES YOUNG,
Concentration of Calumet Sand.

ALPHABETICAL INDEX.

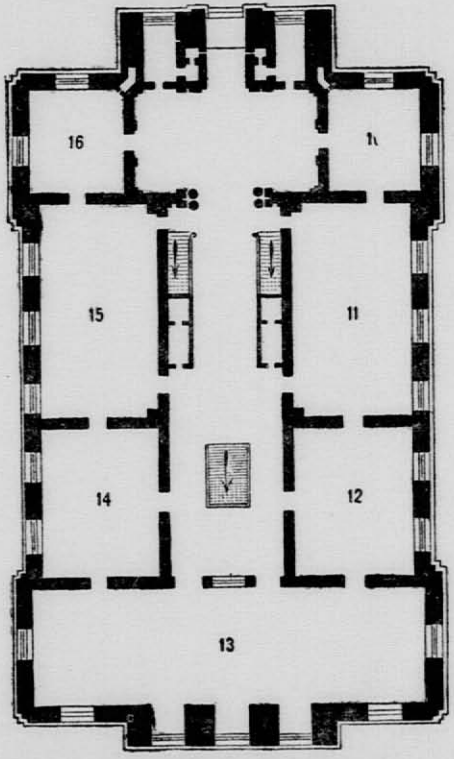
ROGERS BUILDING, BOYLSTON STREET.

(SOUTH.)



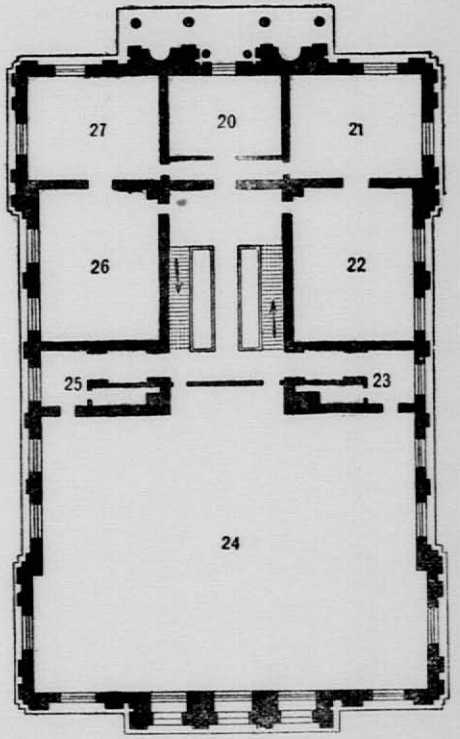
BASEMENT.

0. Boiler Room.
1. Mechan. Eng. Laboratory.
2. Mechan. Eng. Laboratory.
3. Mechan. Eng Laboratory.
4. Lab. of Applied Mechanics.
5. Lab. of Applied Mechanics.
6. Assaying Room.
7. Mining Laboratory.
8. Mining Laboratory.
9. Metallurgical Laboratory.



FIRST STORY.

10. President's Office.
11. General Reading Room for Students.
12. Mineralogical Lecture Room.
13. Biological Laboratory.
14. Geological Lecture Room.
15. Society of Arts Room.
16. Secretary's and Bursar's Offices.

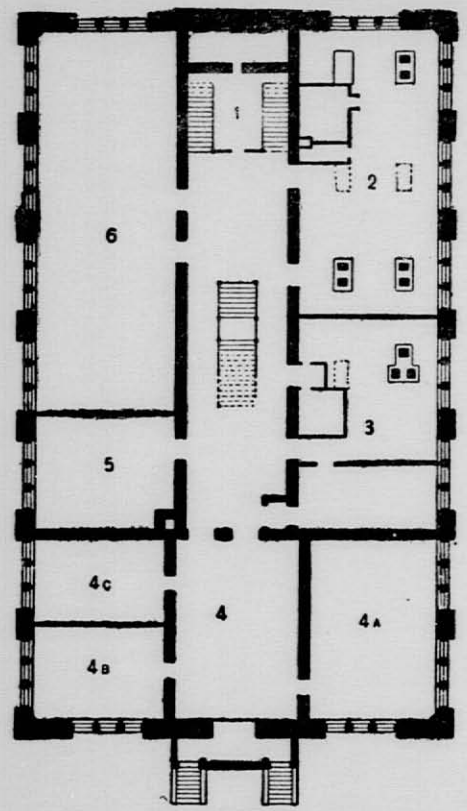


SECOND STORY.

20. Mathematical Rec. Room.
21. Mathematical Rec. Room.
22. Mathematical Rec. Room.
23. Passageway to Huntington Hall.
24. Huntington Hall. Seating capacity, 836.
25. Passageway to Hunt. Hall.
26. Mathematical Rec. Room.
27. Mathematical Rec. Room.

NEW BUILDING, BOYLSTON STREET.

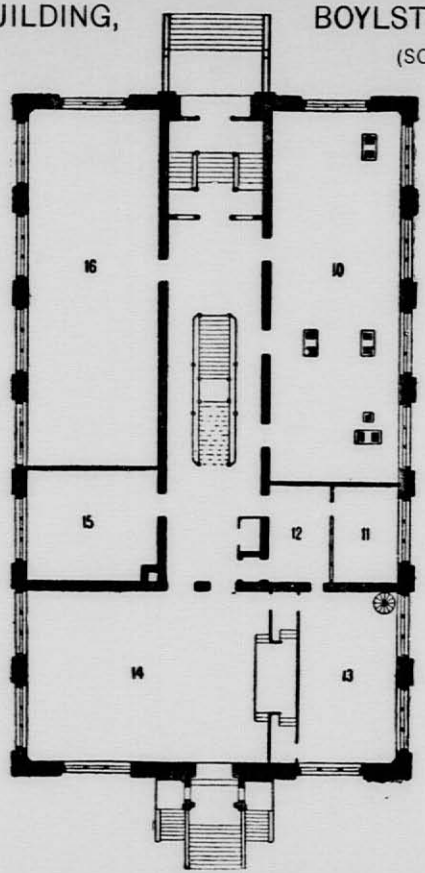
(SOUTH.)



BASEMENT.

1. Chemical Storage Room.
2. Photographic and Electrical Laboratory.
3. Industrial Chemical Lab.
4. Hall.

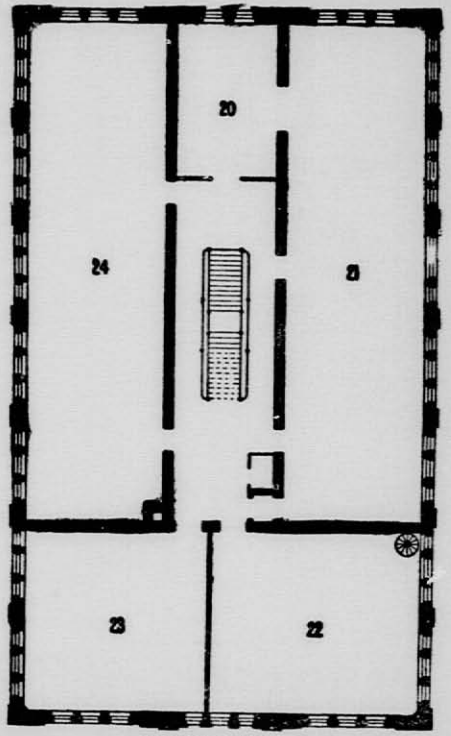
4A. Chemical Storage Room.
4B. Recitation Room.
4C. Carpenter's Shop.
5. Ventilation and Heating.
6. Electrical Eng. Laboratory.



FIRST STORY.

10. Advanced Physical Laboratory.
11. Small Physical Lecture Room.
12. Apparatus Room.
13. Priv. Study and Lab. of Physics.

14. Lecture Room.
15. Physical Library.
16. Physical Laboratory.



SECOND STORY.

20. Architectural Library.
21. Architectural Drawing Room.
22. Physical Lecture Room.

23. Civil Engineering Reading and Drawing Room.
24. Civil Engineering Drawing Room.