

M. I. T. ANNUAL CATALOGUES AND BULLETINS  
1887/88

01 OF 02

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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TWENTY-THIRD  
ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION,

*AND A LIST OF THE ALUMNI.*

1887-1888.

---

BOSTON:  
THOMAS TODD, PRINTER, CONGREGATIONAL HOUSE,  
CORNER BEACON AND SOMERSET STREETS.

1887.



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1887.

## GENERAL SUMMARY OF STUDENTS.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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### STUDENTS.

School of Industrial Science . . . . .	719
School of Mechanic Arts . . . . .	37
School of Design . . . . .	62
<hr/>	
Total . . . . .	818

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### CALENDAR FOR 1887-88.

School year began . . . . .	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.

### CALENDAR FOR 1888-89.

School year will begin . . . . .	Monday, Sept. 24, 1888.
Second term will begin . . . . .	Tuesday, Jan. 29, 1889.
Degrees conferred . . . . .	Tuesday, May 28, 1889.
First Entrance Examinations . . . . .	{ Thursday, May 30, 1889, and Friday, May 31, 1889.
Second Entrance Examinations . . . . .	{ Tuesday, Sept. 24, 1889, and Wednesday, Sept. 25, 1889.
Examinations for Advanced Standing . . . . .	Thursday, Sept. 26, 1889.
School year of 1889-90 will begin . . . . .	Monday, Sept. 30, 1889.

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## MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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*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. An account of the work 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 111 to 121. 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 128 to 129; the other, the School of Mechanic Arts, an account of which will be found on pages 124 and 125.

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, literature, history, political science, 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; (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.

---

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CHARLES L. FLINT.  
ALEXANDER H. RICE.  
M. DENMAN ROSS.  
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THORNTON K. LOTHROP.  
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---

**On the Part of the Commonwealth.**

HIS EXCELLENCY, Gov. OLIVER AMES.

HON. MARCUS MORTON, *Chief Justice of the Supreme Court.*

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



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JOHN CUMMINGS, } *Ex Officio.*  
FRANCIS H. WILLIAMS.      AUGUSTUS LOWELL.  
HENRY SALTONSTALL.      ALEXANDER S. WHEELER.  
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**AUDITING COMMITTEE.**

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FRANCIS A. WALKER.

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PERCIVAL LOWELL.

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**Departments of Mining and Metallurgy.**

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**Department of Architecture.**

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HENRY L. PIERCE.

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**Departments of Chemistry, Physics, and Biology.**

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SCHOOL OF INDUSTRIAL SCIENCE.

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*Instructor in Military Tactics.*
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- PETER BURNS,  
*Instructor in General Chemistry.*
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*Assistant in Mining and Metallurgy.*
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*Assistant in Chemical Analysis.*
- JOSEPH P. GRABFIELD, PH.D.,  
*Assistant in General Chemistry.*

WILLIAM E. ROBERTS,  
*Assistant in Drawing.*

The Instructors and Assistants in the Mechanic Arts are :

THEODORE B. MERRICK,  
*Instructor in Wood-work and Foundry-work.*

JAMES R. LAMBIRTH,  
*Instructor in Forging.*

ROBERT H. SMITH,  
*Instructor in Machine-Tool work.*

JOHN W. RAYMOND, Jr.,  
*Assistant in Forging.*

FRANK M. LEAVITT,  
*Assistant in Wood-work.*

WILLIAM S. CARPENTER,  
*Assistant in Machine-Tool work.*

---

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 History of Ornament.*

ROSS TURNER, *on Water Color and Sketching.*

CHARLES W. HINMAN, S.B., *on the Manufacture of Illuminating Gas.*

WALTER S. ALLEN, S.B., *on the Manufacture of Fertilizers.*

ELIOT HOLBROOK, S.B., *on Railroad Maintenance.*

CHARLES E. MILLS, *in charge of Life Class.*

DAVID A. GREGG, *on Fine Art.*

DAVID L. BARNES, *on Locomotive Construction.*

ANTHONY C. WHITE, S.B., *on the Distribution of Electricity for Commercial Purposes.*

EDWARD BLAKE, Ph.B., *on the Construction and Applications of Electro-motors.*



## 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.

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JULES LUQUIENS.

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LEWIS M. NORTON.

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ALFRED E. BURTON.

PETER SCHWAMB.

CECIL H. PEABODY.

THOMAS E. POPE.

LINUS FAUNCE.

DWIGHT PORTER.

FREDERICK W. CLARK.

C. FRANK ALLEN.

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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 Science; 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 shown by 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.

I.	CIVIL AND TOPOGRAPHICAL ENGINEERING . . .	p. 22.
II.	MECHANICAL ENGINEERING . . . . .	p. 24.
III.	MINING ENGINEERING . . . . .	p. 26.
IV.	ARCHITECTURE . . . . .	p. 28.
V.	CHEMISTRY . . . . .	p. 30.
VI.	ELECTRICAL ENGINEERING . . . . .	p. 32.
VII.	NATURAL HISTORY . . . . .	p. 34.
VIII.	PHYSICS . . . . .	p. 36.
IX.	GENERAL COURSE . . . . .	p. 38.

**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. 22 to 40, 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. 76 to 93.

**Five Years' Course.** Students purposing to take the degree of the Institute, but for exceptional reasons (as ill-health or inadequate preparation) finding it advantageous to take fewer studies at any one time than are prescribed in the schedules for the regular four years' courses, may pursue a course arranged with a view to a fifth year, without becoming classified as special students. The five years' course includes in any department all the studies of the regular course, in general in the same sequence. This is all that is required, yet owing to the additional time taken, an opportunity for more extended study of professional or other topics will be possible. Students in this course are under the especial direction of a committee appointed by the Faculty.

**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. 122.

**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 70; and by referring, at the same time, to the "Schedule of Topics," pp. 76 to 93.

**Methods and Apparatus of Instruction.** The statements on pp. 41 to 70 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 the more advanced work towards which the course is directed. See p. 76.



**REGULAR COURSES.***SCHEDULES OF PRESCRIBED AND OPTIONAL STUDIES.*

## FIRST YEAR.

## COMMON TO ALL REGULAR COURSES.

FIRST TERM.	SECOND TERM.
Solid Geometry. Algebra. General Chemistry. Chemical Laboratory. History of the English Language. English Composition. French (or German). Mechanical and Freehand Drawing. Military Drill.	Algebra. Plane Trigonometry. General Chemistry. Chemical Laboratory. Political History since 1815. French (or German). Mechanical and Freehand Drawing. Military Drill.

For descriptions of the methods, etc., used in the above instruction, see pp. 41 to 48, and p. 68.

## I.—CIVIL ENGINEERING.

This course is designed to give the student a thorough training, both theoretical and practical, in the sciences and principles upon which the sound practice of civil engineering is based. The principles taught are exemplified in the solution of many practical examples, and the student is made familiar with the instruments and the problems of general occurrence. The fourth year is devoted to purely professional work.

The rapid specialization now going on in the various departments of civil engineering renders it desirable that students should be allowed some choice of direction in their more advanced studies. The course therefore offers, principally in the fourth year, a selection among three options or lines of study; namely, a General Course in Civil Engineering; a course in which more than usual attention is devoted to roads, railroads, and railroad management; and a course giving special attention to geodesy, geology, and topography.

The more purely professional work is divided as follows: In the second year a full course in surveying, with extended practice in the field, supplemented by work in the drawing-room, prepares the student for the more advanced work to follow; the subjects of topographical drawing and mineralogy are also completed. In the third year the subject of railroads is taken up, with structure drawing, plane-table work, and mechanics. In the fourth year, equipped with his knowledge of mechanics, the student takes up the subjects of hydraulics, bridges, strength of materials, sanitary engineering, etc., as well as the advanced courses in railroads and in geodesy.

In the summer vacation following the third year, students taking the geodetic option are required to devote several weeks to field work in geology, topography, and geodesy.

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. 63.

I.—CIVIL ENGINEERING.

FIRST YEAR.	
Same for all Courses. See p. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Surveying: Compass and Transit. Plotting from Notes. Analytic Geometry. Physics. Political Economy. German. Spherical Trigonometry. <i>Options.</i> 1, 2. Adv. Geometrical Drawing. 3 { Topographical Drawing. { Descriptive Astronomy.	Levelling: Profiles and Contours. Differential Calculus. Physics. Physical Geography. English Prose. German. <i>Options.</i> 1 { Topographical Drawing. 2 { 3 { Mineralogy.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Railroad Engineering. Field Work and Drawing in Railroad Location. Structure Drawing. Integral Calculus. General Statics. Physics: Lectures and Laboratory. Structural Geology. Literature. German. <i>Options.</i> 1 { Foundations. 2 { 3. Chemical Geology.	Railroad Engineering. Field Work and Drawing in Railroad Location. Plane-Table Work. Physical Laboratory. Historical Geology. European History. German. <i>Options.</i> 1 { Kinematics and Dynamics. 2 { Strength of Materials. 3 { Stereotomy. { Determinants. { Spherical and Prac. Astronomy.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Principles of Construction. Bridges and Roofs. Hydraulic Engineering. Strength of Materials. Bridge Design. Metallurgy of Iron. Hydraulic Field Work. <i>Options.</i> 1 { Sanitary Engineering. { R. R. Management, or Heating and Ventilation. 2. R. R. Eng. and Management. 3 { Not definitely arranged; but to include Geodesy, Least Squares, Mining, and Special Geological Research.	Bridges and Roofs. Principles of Construction. Thesis Work. <i>Options.</i> 1 { Hydraulic Engineering. { Bridge or Hydraulic Design. { Geodesy and Astronomy, or Machinery and Motors. 2 { Hygiene and Public Health, or Advanced Bridge Work. { Bridge Design. Railroads. { Machinery and Motors. 3 { Not definitely arranged; but to include Advanced Geodesy, Geology, and Topography, with Mining and other subjects.

## 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, rotative 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. 21.	
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. English Prose. 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. European History. 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.  <i>Options.</i> 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.  <i>Options.</i> 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. The first, for mine engineers, includes courses in calculus, applied mechanics, and motors. 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 zoological 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. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Physics. German. Analytic Geometry. Surveying. Drawing. Blowpipe Analysis.	Chemical Analysis. Physics. German. Mineralogy and Blowpipe Analysis. <i>Options.</i> 1. Surveying; Diff. Calculus. 2. Physical Geography; Microscopy; Chemistry. 3. Surveying; Physical Geography; Chemistry.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Geology. German. Mining. Physics: Lectures. <i>Options.</i> 1. Chemistry; Integral Calculus and Applied Mechanics. 2. Chemistry; Literature; Physical Laboratory; Zoölogy and Palæontology. 3. Literature; Special Methods; Physical Laboratory; Theoretical Chemistry.	Chemical Analysis. Assaying. German. Mining. Geology. European History. <i>Options.</i> 1. Applied Mechanics. 2. Chemistry; Physical Laboratory; Zoölogy and Palæontology. 3. Chemistry; Physical Laboratory.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Mining Laboratory. Modern History. Ore Dressing. Metallurgy. Memoirs. <i>Options.</i> 1. Applied Mechanics. 2. Special Geological Work. 3. Special Metallurgical Work.	Chemical Analysis. Modern History. Metallurgy. Memoirs. <i>Options.</i> 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 Architecture.	Original Design.
Sketching and Water Color.	Sketching and Water Color.
Mechanical and Freehand Drawing.	Mechanical and Freehand Drawing.
Materials.	Shades, Shadows, and Perspective.
Elementary Mechanics.	Common Constructions.
Architectural History.	Graphical Statics.
	Architectural History.

## SECOND YEAR.

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

See pp. 67, 68 and 75.



## IV.—ARCHITECTURE.

FIRST YEAR.	
Same for all Courses. See p. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Materials. Architectural History. Drawing. The Orders and Elements of Architecture. Analytic Geometry. Physics. Descriptive Geometry. Political Economy. German.	Original Design. Common Constructions. Architectural History. Shades, Shadows, and Perspective. Sketching. Differential Calculus. Physics. English Prose. German.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Original Design. Sketching and Water Color. Working-Drawings and Framing. Lectures on Fine Art. Integral Calculus. General Statics. Structural Geology. Physics: Lectures and Laboratory. German.	Original Design. Sketching and Water Color. Iron Construction. Kinematics and Dynamics. Strength of Materials. Stereotomy. Physical Laboratory. European History. German. Acoustics.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Advanced Original Design. History of Ornament. Sketching in Water Color. Problems in Construction. Specifications. Strength of Materials. Lectures on Fine Art. Heating and Ventilation. Advanced French.	Advanced Original Design. Sketching in Water Color. Planning. Schools, Theatres, and Churches. Problems in Construction. Specifications and Contracts. Constitutional History. Heating and Ventilation. 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 for their 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 investigations, involving original 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.

## V.—CHEMISTRY.

FIRST YEAR.	
Same for all Courses. See p. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Theoretical Chemistry. Physics. German. Political Economy. Analytic Geometry.	Chemical Analysis. Mineralogy and Blowpipe Analysis. Physics. German. English Prose. <i>Options.</i> Differential Calculus. { Physical Geography. } Microscopy.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Special Methods. Industrial Chemistry. Physics: Lectures and Laboratory. German. Literature. <i>Options.</i> Integral Calculus. Geology. General Physics (Electricity). Sanitary Chemistry.	Chemical Analysis. Theoretical Chemistry. Industrial Chemistry. Physical Laboratory. German. European History. <i>Options.</i> Physics. Geology. Sanitary Chemistry. Industrial Chemistry.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Chemical Analysis. Abstracts. Organic Chemistry. Physics. Metallurgy. <i>Options.</i> Physics. Language. Sanitary Chemistry. <i>Laboratory Options.</i> Analytical Laboratory. Organic Laboratory. Metallurgical Laboratory. Industrial Laboratory.	Organic Chemistry. Thesis Work.

## 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. Mechanics and Acoustics. Analytic Geometry. Descriptive Geometry. Mechanism. Carpentry and Wood-turning. Political Economy. German.	Physics: Lectures. Physical Laboratory. Acoustics and Electricity. Differential Calculus. Mechanism. Drawing. Metal Turning. English Prose. German.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Physics: Lectures and Laboratory. Electricity: Readings. Integral Calculus. General Statics. Mechanical Engineering. Drawing. Literature. German.	Physical Lab.: Heat, Electricity. Electricity: Readings. Kinematics and Dynamics. Strength of Materials. Mechanical Engineering. Mech. Engineering Laboratory. Drawing. European History. German.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Technical Applications of Electricity to Telegraph, Telephone, Electric Lighting, etc.: Lectures. Phys. Lab.: Electrical Testing and Construction of Instruments. Testing of Telegraph Lines, Dynamo Machines, etc. Advanced Physics: Memoirs, etc. Photometry. Method of Least Squares. Mechanical Engineering. Mech. Engineering Laboratory. Applied Mechanics, Thermodynamics, Hydraulics, etc.	Technical Applications of Electricity. Advanced Physics, Memoirs, etc. Physical Research. Differential Equations. Calculus of Variations. Mech. Engineering Laboratory. Discussion of the Precision of Measurements. <i>Options.</i> 1. Quaternions. 2. Physical Laboratory. 3. Theory of Potential.
NOTE.—The student is advised to take Advanced German.	

## VII.—NATURAL HISTORY.

The characteristic feature of this course is that it affords a general education in the natural sciences—physiology, mineralogy, zoölogy, geology, botany, etc.,—with special opportunities in biology or geology. It is intended (1) for those who are preparing for medical studies; (2) for those who wish to become naturalists (geologists, botanists, and zoölogists); (3) for those who wish to fit themselves for teachers of, or desire a general education in, the natural sciences.

The two great divisions of the course are Biology, treating of plants, the lower animals, and man (living things); and Geology, dealing with the history of the earth, rocks, minerals, fossils, etc. (lifeless things). To one of these, chosen as a major subject, the student chiefly devotes his attention, although much time must still be given to the other, minor, subject. Beginning with a substantial foundation of chemistry, physics, drawing, and the modern languages, the subjects peculiar to the course are early introduced, although history, political economy, and literature receive due emphasis as essentials to broad training or auxiliaries to the scientific studies (see pp. 43 to 51). The intimate relations existing between physics, chemistry, and biology on the one hand, and the medical sciences—physiology, hygiene, etc.—on the other, make a course like this peculiarly valuable as a preparation for the professional study of medicine. To this end the student of biology is made familiar not only with the essentials of physics and chemistry, but also with the comparative anatomy and physiology of the lower animals, especially vertebrates (see p. 65).

Abundant opportunities are secured for practical laboratory studies in the geological, biological, and mineralogical laboratories (see p. 62), while somewhat unusual advantages are offered by the library and museum of the Boston Society of Natural History (see p. 66).

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

## VII.—NATURAL HISTORY.

FIRST YEAR.	
Same for all Courses. See p. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Physics. Chemical Analysis. General Biology. Political Economy. German.  Those who cannot show that they have already enough proficiency in Latin to satisfy the department, must devote considerable time to that subject during this term.	Comparative Anatomy and Embryology. Physics. English Prose. Physical Geography. German.  <i>Options.</i> 1. Volumetric Analysis and Sanitary Chemistry. 2. { Mineralogy and Blowpipe Analysis. { Natural History: Field Work.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Structural Geology. Physics. Zoölogy and Palæontology. English Literature. German. Botany (Cryptogamic). Natural History: Field Work.  <i>Options.</i> 1. Anatomical Preparations. 2. Geological Laboratory.	Historical Geology. Physical Laboratory. Zoölogy and Palæontology. Botany (Systematic). European History. German. Natural History: Field Work.  <i>Options.</i> 1. Herbaria. 2. Geological Laboratory.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Advanced German. Climatology. Higher Biology. Bibliography: Abstracts. Natural History: Field Work.  <i>Options.</i> 1. { Comparative Physiology. { Microscopic Anatomy. 2. Geological Research.	History of the Natural Sciences. The Teaching of Natural History. Advanced German. Natural History: Field Work. Higher Biology. Thesis Work.  <i>Options.</i> 1. { Comparative Physiology. { Microscopic Anatomy. 2. Geological Research.

## 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, is required 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. 21.	
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. Microscopy. English Prose. German. <i>Options.</i> 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. <i>Options.</i> 1 { Chemistry. Physiology of the Senses, or Shopwork. Analytic Geometry of Three Dimensions. 2 { Physiology of the Senses, or Shopwork.	Physical Laboratory: Heat, Electricity. Optics, Electricity, or Heat: Readings. Kinematics and Dynamics. Strength of Materials. Theoretical Chemistry. European History. German. <i>Options.</i> 1. Chemistry. 2. Advanced Analytic Geometry and Calculus.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Physical Laboratory. General Physics. Advanced Physics: Memoirs, etc. Principles of Scientific Investigation. History of Physical Science. Photography. Applied Mechanics: Thermodynamics. Method of Least Squares. <i>Options.</i> 1. Chemistry. 2. Definite Integrals.	Physical Research. General Physics. Advanced Physics: Memoirs, etc. Differential Equations. Calculus of Variations. Discussion of the Precision of Measurements. <i>Options.</i> Physiological Measurements. Physical Laboratory. Quaternions. Theory of Potential.

## IX.—GENERAL STUDIES.

This course has been recently revised, to meet, as far as possible, the needs of an increasing class of students who desire a general scientific education, or are looking forward to engaging in some branch of commerce, in the administration of public or private trusts, in banking, in manufacturing or other business enterprises. It is accordingly somewhat less restricted in its range of studies than the other courses of the school, though not less exacting in its requirements or less thorough in its educational discipline.

It will be noticed that physical science makes a considerable demand upon the time and attention of the student. He is required to study chemistry one year; physics, two years; structural and historical geology, one year; zoölogy, one year; and each of the following subjects one-half year; viz., physical geography, metallurgy, climatology, descriptive astronomy, and sanitary science. In addition, he may take a science option in chemical analysis, mineralogy, and blowpipe analysis, extending over one year; or in general biology, physiology, and botany for the same period of time; besides an extra half-year in the general physical laboratory; or, instead, the same amount of time in the forging-shops. In brief, the studies of this course 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 possible with the technical requirements of the other courses.

The special opportunities offered by the department of General Studies are: (1) The more extended study of French and German; (2) the more extended study of the so-called English subjects; viz., history, especially the history of the United States, English literature, political, commercial, and industrial geography, and political economy; (3) the special study 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 affairs or which minister to general culture: e. g., finance, statistics, and commercial and international law.

## IX.—GENERAL STUDIES.

FIRST YEAR.	
Same for all Courses. See p. 21.	
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Physics : Lectures. Political Economy. German. Advanced French. English Composition. Shopwork : Carpentry and Wood <i>Options.</i> [Turning. 1. Chemical Analysis. 2. General Biology. 3. Analytic Geometry.	Physics : Lectures. English Prose. German. Advanced French. Physical Geography. Shopwork : Metal Turning. <i>Options.</i> 1. Mineralogy and Blowpipe An- 2. Physiology. [alysis. 3. Differential Calculus.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Physics : Lectures and Laboratory. Literature. Logic. Statistics and Graphical Methods. Financial History of the U. S. Tariff Legislation. Structural Geology. Zoölogy and Palæontology. German. French Language and Literature. <i>Options.</i> 1. History of Architecture. 2. Shopwork : Forging. 3. Physical Laboratory. 4. Integral Calculus.	Physical Laboratory. European History. International Law and American Illustrations. Commercial Geography. History of Commerce. Industrial History. German. French Language and Literature. Historical Geology. Zoölogy and Palæontology. <i>Options.</i> 1. <i>History</i> of the U. S. under the Constitution. 2. <i>Political Science</i> : Theories of Socialism, Communism, Co- operation, and Profit-sharing. 3. Sp <sup>1</sup> Work in German or French. 4. <i>Literature</i> : Age of Elizabeth.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
National Taxation and Budgets. Administration. Commercial Practice. Constitutional History of England. Advanced German. English Literature. Railroad Management. Metallurgy. Descriptive Astronomy. Climatology. <i>Options.</i> 1. <i>History</i> . The Era of the Re- formation. 2. <i>Political Science</i> . Statistics of Sociology. 3. <i>Language</i> . French, German, Italian, or Spanish. 4. <i>Literature</i> of the 17th Century.	Constitutional History of the U. S. History of Economic Theory. Commercial or Industrial History. English Literature. Sanitary Science. Business Law. Advanced German. Banking and Finance. Thesis Work. <i>Options.</i> 1. <i>History</i> . England under the Stuarts. 2. <i>Political Science</i> . European Systems of Administration. 3. <i>Language</i> . French, German, Italian, or Spanish. 4. <i>Literature</i> . American Authors of the 19th Century.

### 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. 20 and 76. 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. 28 and for admission to which the full entrance examinations are required. (See pp. 70 to 73.) Special students in Chemistry must pass the entrance examinations. (See pp. 70 and 75.)

### 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 dismissal, 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. 78.)

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. (*Optional in the General Course.*)

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. 70) is continued through one year, and German through two years, for all regular students. In certain courses, especially in IX, there is advanced and special work in French and German, both optional and required. 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 English Composition, in the History and Composition of the English Language, in the elements of Inductive and Deductive Logic, and in the History of English Literature. Practice in composition, under the personal supervision and criticism of the instructor, is required, and the principles of good style are further studied and illustrated by the critical reading of standard English authors. In this connection a brief study is made of the history of the English language and the sources of its vocabulary. All regular students are required, in their third year, to attend a course of instruction on some one great period in the history of English literature. More extended instruction in these subjects is given in course IX.

**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 degrees 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 student has practice in the solution of stoichiometrical 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 special laboratories have been equipped for the purpose. For all who choose to pursue this subject, a minimum amount of work is laid out, consisting of practice in the methods commonly used in the chemical examination of air and water, of milk and of butter. For those who wish to take a more extended course 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 dyeing and printing tests, and qualitative tests to determine the dyes present upon fibers. The students also become familiar with many of the most useful methods of commercial analysis. The laboratory instruction is supplemented by frequent 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. The researches undertaken in this laboratory deal for the most part with those problems in organic chemistry which have a distinctively technical bearing. Ample opportunities are afforded for the prosecution of investigations in the domain of pure 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. These 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 fourteen laboratories, two lecture-rooms, a reading-room and library, balance-room, offices, and supply-rooms: in all, twenty-three 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 laboratories contain places for sixteen students. They possess a very complete outfit for the analysis of air and water, and for the investigation of san-

itary 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 William Ripley Nichols Library of Chemistry, numbering more than twenty-eight hundred volumes and two thousand pamphlets, is kept in the reading-room of the department. This library contains complete sets of most of the important chemical periodicals. It is primarily designed to aid in the instruction, but is open to all persons who desire to consult it.

**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 discussion of the effects of these on the results obtained.

The particular line of work assigned to each person is determined, to some extent, by 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. 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.

**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; Professor Elihu Thomson, Electrician of the Thomson-Houston Electric Company, on the Construction and Design of Dynamo Machines; Mr. A. C. White, late of the Western Edison Electric Light Co., on Methods of Wiring for the Distribution of Electricity; Mr. Edward Blake, of the Sprague Electric Railway and Power Company, on Electro-Motors; 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 possesses several dynamo machines of various patterns, both for arc and incandescent lighting, which are devoted to purposes of instruction.

**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.

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. Apparatus for testing the strength of ropes.
7. The accessory apparatus needed for measuring stretch, deflection, and twist.

The classes are divided into small sections when making tests with the 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 thoroughly 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 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 connection 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.

In the summer vacation following the third year, students taking the topographical option are required to attend a summer course in Topography, Geology, and Geodesy, during from four to six weeks in the early part of the summer. This course is held at some convenient and suitable point in the country, and its object is to give the students opportunity for more extended and more continuous field practice in these branches than is possible during the term. The work done consists of a topographical survey of a certain district, with

field practice in geodesy and geology. The course is open, without extra charge for tuition, to all students in the department who have completed the third year, as well as to properly qualified students in other departments. Persons not connected with the Institute may also be permitted to attend, upon giving satisfactory evidence of being properly qualified, and upon payment of the tuition fee of \$25.00.

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 & Albany Railroad, and of Mr. James T. Furber, General Manager of the Boston & 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.

During the past year, lectures have been given by Mr. Eliot Holbrook, on Railway Maintenance and Equipment; by Prof. Arthur T. Hadley, on Railroad Economy; by Dr. John S. Billings, on Public Health; and by Mr. E. S. Philbrick, on Matters of Engineering Practice. A course of Emergency Lectures, on the treatment of accidental injuries, by Dr. R. W. Lovett, was also given before the students. Students in this department also attend the lectures of Mr. Geo. W. Blodgett, on Railway Signaling.

**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 Mr. H. A. Hill, on the Indicator; Mr. James N. Lauder of the Old Colony Railroad, on the Locomotive; Mr. Henry R. Towne, President of the Yale & Towne Co., on Shop Management; Mr. Edward Burgess, on Naval Architecture; and Mr. Geo. H. Barrus, on Cylinder Condensation.

**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. An eight-horse-power steam engine used for giving instruction in valve-setting, etc.

4. Three 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.

5. 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.

6. 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; also two other portable brakes.

7. 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.

8. 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.

9. Three calorimeters.

10. A dynamometer.
11. Cotton-machinery as follows: viz., a card, a drawing-frame, a speeder, a fly-frame, a ring-frame, and a mule.
12. Apparatus for testing injectors.
13. A mercurial pressure column.
14. A mercurial vacuum column.
15. Apparatus for determining the quantity of steam issuing from a given orifice under a given difference of pressure.
16. Apparatus for testing dynamometers.
17. A good supply of indicators, gauges, thermometers, anemometers, and other accessory apparatus.
18. 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.

**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 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 requisite, 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 two dynamos for deposition of metals.

This laboratory contains also the following auxiliary apparatus: A steam-engine, a Bogardus mill, a Root blower, a Sturtevant dust-fan and blower, 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 coöperation 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, Virginia, Vermont, Pennsylvania, Lake Champlain, New Brunswick, and Nova Scotia. Shorter excur-

sions 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 charac-

ters. 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 Physical Geography and Geology.**—

The topics of these closely allied sciences are taught in the order of their logical succession, hence the work done in one class is a preparation for the next.

I. *Physical Geography.*—The student who has studied Physical Geography at a good preparatory school will not find this course a repetition of what he has already received. The position of the study as a general science is recognized and fitly taught, while its relations to the progress and destinies of mankind receive that special attention they should have in a technological institution. Much of the success which attends engineering, commerce, manufacturing, and many other branches of industry, is in a measure dependent upon the control or utilization of great terrestrial forces. It is, therefore, just to claim that a scientific knowledge of the efficiency of these forces in nature, and of the physical laws of their action, is eminently important.

These forces are likewise geological agents, and it is through them alone that the student can interpret the structure of the earth. It is in this connection that Dynamical Geology is taught as directly preparatory to the courses which follow.

The instruction consists essentially of a course of lectures, but at each exercise questions are asked, to which answers are given either orally by a few, or are written by all the members of the class. The students are required to take notes and present them for examination. The lectures are amply illustrated.

II. *Structural Geology.*—This division includes a systematic course in Lithology, in which observation or laboratory



work is combined in an unusual degree with oral instruction. At each lesson a tray containing a typical hand-specimen of every type to be studied is placed before each student; and the lessons consist largely in the examination, testing and description of the specimens by the students themselves, the instructors simply directing and supplementing the work of the class. 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. 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. The unusually favorable opportunities which the local geology of Boston presents for the illustration of these topics are utilized by means of frequent field lessons. The instruction in Chemical Geology is also introduced here and embraces 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.

III. *Historical Geology.*—It is intended to give all the students in this branch a good general knowledge of the physical history of the earth. That the technical applications of geological knowledge may be suitably taught, the students are grouped into three classes.

One class is composed of those who are in the department of Civil Engineering. With these, special attention is given to those portions of geological history which determined the topographic and hydrographic features, with which their professional labors may be more or less associated.

Another class is for the students in the departments of Mining Engineering and Chemistry. Particular attention is here given to the geological history and the modes of occurrence of ore deposits and other mineral resources. This, added to portions of Structural and Chemical Geology previously taught, completes the class-room instruction in Economic Geology.

A third class includes the students in Natural History and



in the General Course. With these more time is devoted to the life of the past ages, to the relations of life to physical conditions, and to the geologic events which led to the present distribution of beings upon the earth. To be admitted to this class the student must have had the requisite instruction in Biology and Zoölogy.

The instruction combines both lectures and recitations. The collections at the Institute are for teaching and not for exhibition. The classes are conducted with the belief that the more intimate the students become with the natural objects and features, the better the instruction. There are serious obstacles to a liberal amount of field practice, but every available opportunity is improved, and the amount is steadily increasing. There is a valuable geological library.

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 Climatology.**—The elements of physical science which are fundamental in the study of Meteorology are taught in the course in Physics, and in the physical laboratory the students have some practice with the ordinary meteorological instruments. The course in Climatology is introduced by a general outline of Meteorology, and concluded by a discussion of the known influences of climates upon the nature and distribution of plants and animals, upon the resources of countries, and upon the health, vigor, and prosperity of communities and nations.

**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 vegetable 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 is followed by more special work in comparative anatomy and embryology (chiefly of vertebrates), accompanied likewise by practical laboratory studies, with dissections, the histology of the embryo chick, etc. The third year in Biology is devoted to lectures, recitations, laboratory work, and excursions in Zoölogy and Botany.

In the fourth year comparative 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 valuable privileges in connection with the Boston Society of Natural History, of which the museum, the library, etc., 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 kymo-

graph, Du Bois-Reymond induction machines, and a rotating drum for smoked paper, a moist chamber, pendulum myograph, bacteriological apparatus, etc. Frog-tanks 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 instruction in this subject is practical as well as theoretical. Besides the scientific study of construction and materials, it comprises the study of building processes and of professional practice, as well as that of composition and design, and of the history of the art. It is so arranged as to meet the wants, both of those who commence their professional studies at the beginning, and of experienced draughtsmen who desire to make up deficiencies in their training, or to qualify themselves for undertaking the responsibilities of practice.

The more strictly professional work begins with the study of the Five Orders and their applications, and of Architectural History; while, with constant practice in drawing, the students are familiarized with the material elements of their future work by a course in practical construction, illustrated by lectures, problems, and by visits to buildings. During the following years the subject of specifications and contracts is thoroughly gone over; and problems in construction of all kinds serve to fix in the memory the principles already learned, and to supplement them by more advanced instruction.

The students are continually practiced in architectural design. Each set of drawings is examined, and criticised before the classes. Instruction is also given in sketching in black and white, and water-color; and evening classes are held during the winter for drawing, both from the life and from the cast, to which all students in the department are admitted.

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 many 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 middle and 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, open to all students 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. Rogers, of several hundred books and pamphlets from the library of the late President William B. 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 nearly 500,000 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. 2). Attendance on both days of one examination or the other is required.

Entrance examinations were held in June, 1887, in New York City, Philadelphia, Chicago, Cincinnati, St. Louis, Washington, San Francisco, St. Paul, Nashville, Atlanta, Pittsburg, and Montreal. Arrangements will probably be made for examining applicants in June, 1888, 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. 2).

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 radicals; 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 September, 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. At least a year of careful work upon Part I. of Otto's Grammar, and 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 may substitute an equivalent in German. Otis' "Elementary German" represents the required amount. In this case the German will be continued and finished during the first year, and the following two years will be devoted to French.

5. *English.* — The applicant will be expected to be reasonably well acquainted with the essentials of English grammar, and to be able to detect common errors in style; but it is recommended to teachers that in preparing candidates their chief attention be given to simple practical exercises in English composition.

6. *History and Literature.* — The candidate will be expected to give evidence of a *real* acquaintance with some portion of History. The examination-paper will presume acquaintance with the main facts of the history of the nineteenth century. But any candidate who may so elect will be given, as a substitute therefor, a paper which presumes acquaintance with (1) the history of England since the Great Rebellion; or (2) the history of the North American Colonies and the United States; or (3) the history of Greece and Rome. This choice is offered in order that the requirements of the Institute may not unduly disturb the courses of study in the various preparatory schools.

In Literature the applicant must give evidence that he has really read and is familiar with some of the classical English writers in prose and verse, and that he has at least a general knowledge of the place in English history of England's greatest writers.

Experience having shown that the specifying of books or of particular courses of study, in subjects where the methods of teaching vary so widely, proves a great inconvenience to many teachers in the arrangement of their classes, the above requirements have designedly been made as general as possible, in



the hope that this course may lead to a more genuine style of preparation in English subjects, and to the avoidance of all "cranning" of text-books.

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. 71 as far as Quadratic Equations, and Plane Geometry. The second divided examination will be held in June and 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 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. 71 to 73, and pp. 21 to 39.

Graduates of colleges are admitted to the Institute without examination, and will be permitted to enter any of the courses at such a point as their previous range of studies shall allow. If prepared to enter upon most of the studies of the third year they 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. 21 to 39, and to the schedule of topics on pp. 78 to 93. It is highly desirable that students contemplating professional courses after graduation from college shall arrange their college electives to cover the earlier subjects of the chosen course, in order that the number of deficiencies to be made up may be as small as possible; and such students are advised to communicate with the Secretary of the Faculty, from whom detailed information may be obtained as to the requirements for entering any particular year of any 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. In view of the large amount of highly technical work embraced in the course in Mechanical Engineering, it

should be understood that only good scholars, who have paid much attention to mathematics, can hope to enter the third year on first coming to the Institute. It is exceedingly important that students applying for advanced standing in this course should have had considerable practice in mechanical drawing.

#### 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 must pass the regular entrance examination to the first-year class (p. 71), and are required to take as a minimum the full two years' partial course given on p. 28, but may, with the consent of the Faculty, substitute equivalent studies, or take such additional ones as they may desire. All special students desiring to take Chemistry of the first year must pass the full entrance examinations, except that an equivalent in some other subject may be substituted for Plane Geometry. Communications in regard to such substitution should be addressed to the Secretary.

### SCHEDULE OF TOPICS.

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The following sixteen 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" (40 to 69), 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. 71 to 73.

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

## MATHEMATICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	N. of Weeks.	Hours per Week.	Preparation Required
26	Algebra . . . . .	Rec.	{ Wells, Skinner, French, Patterson. }	All reg. students. . .	1	1, 2	11	4	(1) (2) (3)
27	Solid Geometry . . . . .	Rec.	{ Wells, Skinner, French, Patterson. }	All reg. students. . .	1	1	9	4	(1) (2) (3)
28	Plane Analytic Geometry . . . . .	{ Lect., Rec. }	{ Runkle, Skinner, Bartlett. }	All reg. students. . .	2	1	15	3	(29A)
29A	Logarithms and Plane Trigonometry . . . . .	Rec.	{ Wells, Skinner, French, Patterson. }	All reg. students. . .	1	2	10	5	(26) (27)
29B	Spherical Trigonometry . . . . .	Rec.	Osborne.	I. . . . .	2	1	5	3	(29A)
30	Differential Calculus . . . . .	{ Lect., Rec. }	{ Runkle, Osborne, Bartlett. }	{ All courses except VII. . . . . }	2	2	15	3	(28)
31	Integral Calculus . . . . .	{ Lect., Rec. }	Runkle, Osborne.	{ All courses except VII. . . . . }	3	1	5	4	(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, Dynamics and Machinery and Motors) . . .	{ Lect., } { Rec., } { Lab.	Lanza, Sondericker.	I, II, III. . . . .	4	2	15	3	(34)
36A	General Theory of Eq uations,	{ Lect., } { Rec.	Wells.	I, VIII. . . . .	2, 3	2	15	2	(26)
36B	Determinants . . . . .	{ Lect., } { Rec.	Wells.	I, VI, VIII. . . . .	2, 3, 4	2	15	1	(26)
38	Analytic Geometry of Three Dimensions . . . . .	{ Lect., } { Rec., } { Rec.	Wells.	VIII. . . . .	3, 4	1	15	2	(30)
39	Advanced Analytic Geome- try and Calculus . . . . .	{ Lect., } { Rec., } { Rec.	Wells.	I, VIII. . . . .	3, 4	2	15	3	(30) (36B)
40	Definite Integrals . . . . .	{ Lect., } { Rec.	Wells.	VIII. . . . .	4	1	15	2	(31) (36A) (37)
41	Differential Equations . . . . .	{ Lect., } { Rec.	Osborne.	I, VI, VIII. . . . .	4	2	15	3	(31)
42	Theory of Probability and Method of Least Squares, }	{ Lect., } { Rec.	Partlett.	I, VI, VIII. . . . .	4	1	15	2	(31)
43	Quaternions . . . . .	{ Lect., } { Rec.	Osborne.	I, VI. . . . .	4	2	15	3	(31)

DRAWING.									
	Subject.	Lect., Re., Lab., Tra., 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	15	6	
52	Descriptive Geometry . . . . .	{ Lect., Rec., Draw. }	Faunce.	II., IV., VI. . . . .	2	1	15	5	(27) (51) (53)
53	Freehand Drawing . . . . .	{ Draw. }	Adams.	All reg. students .	1	1, 2	30	1	
NON-PROFESSIONAL STUDIES.									
76	History English Language and English Composition, } Political History since 1815 .	{ Lect., Rec. }	Wheelock, Emery.	All reg. students .	1	1	15	2	(5) (6)
77	Political Economy . . . . .	{ 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	English Prose . . . . .	{ Lect., Rec. }	Wheelock.	All reg. students .	2	2	15	2	(76)
79	Industrial History . . . . .	{ Lect., Rec. }	Dewey.	IX. . . . .	3	2	15	2	
80A	English Literature . . . . .	{ Rec., Writ., Read. }	Atkinson.	{ All courses ex- cept II. and IV. }	3	1	15	2	(78B)
80B	English Literature . . . . .	{ Rec., Writ., Read. }	Atkinson.	II., IV. . . . .	4	2	15	2	(78B)



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. . . . .	4	1, 2	15	3	(78A)
82	English History and Literature (special studies) . . . . .	Read.	Atkinson.	IX. . . . .	4	1, 2	30	2	(80A)
83	Modern History . . . . .	Lect.	Atkinson.	III. . . . .	4	1, 2	30	2	
84	European History (General Survey) . . . . .	{ Lect., Rec. }	Atkinson.	All reg. students . . . . .	3	2	15	2	(77)
85	International Law . . . . .	{ Lect., Rec. }	Wheelock.	IX. . . . .	3	2	15	2	(78A)
86A	Banking and Finance . . . . .	{ Lect., Rec. }	The President.	IX. . . . .	4	2	15	2	(85)
86B	National Taxation and Budgets . . . . .	{ Lect., Rec. }	Dewey.	IX. . . . .	4	2	15	1	(85)
94A	Commercial Geography and History of Commerce . . . . .	{ Lect., Rec. }	Niles, Dewey.	IX. . . . .	3	2	15	2	(79)
94B	Commercial Practice . . . . .	{ Lect., Rec. }	Dewey.	IX. . . . .	4	1	15	2	(94A)
95	Logic . . . . .	{ Lect., Rec. }	Wheelock.	IX. . . . .	3	1	15	1	
96	Financial Hist. U. S. and Tariff Legislation . . . . .	{ Lect., Rec. }	Dewey.	IX. . . . .	3	1	15	2	(94B)
97	English Composition . . . . .	Rec.	Emery.	IX. . . . .	2	1	15	1	(76)

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	1	15	2	(96)
99	Statistics and Graph. Methods . . . . .	{ Lect., } { Rec. }	Dewey.	IX. . . . .	3	1	15	1	(96)
87	French (grammar and translation) . . . . .	{ Lect., } { Rec. }	Luquiens, Dippold, Babbitt.	All reg. students .	1	1, 2	30	3	(4)
88A	Advanced French . . . . .	{ Lect., } { Rec. }	Luquiens.	IV., V., IX. . . . .	-	1, 2	30	3	(87)
88B	French Language and Lit. . . . .	{ Lect., } { Rec. }	Luquiens.	IX. . . . .	3	1, 2	15	3	(88A)
90	German (elementary) . . . . .	{ Lect., } { Rec. }	Otis, Dippold, Babbitt.	All reg. students .	2	1, 2	30	3	(90)
91	German (grammar and translation) . . . . .	{ Lect., } { Rec. }	Otis, Babbitt.	All reg. students .	3	1, 2	30	3	(90)
92	German (advanced) . . . . .	{ Lect., } { Rec. }	Otis.	VII., IX. . . . .	4	1, 2	30	3	(91)
93	Language . . . . .	{ Lect., } { Rec. }	Otis, Luquiens, Machado.	IV., V., VII., IX. .	3, 4	1, 2	30	2	(87) (90)

SCHEDULE OF TOPICS.

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, Talbot.	{ III., V., VII., VIII., IX. }	2	1, 2	30	-	(87) (101)
103A	Theoretical Chemistry . . . .	{ Lect., Rec. }	Pope.	{ III., V., VII., VIII. }	2 or 3	1	15	2	(101)
103B	Theoretical Chemistry . . . .	{ Lect., Rec. }	Andrews.	V., VIII. . . . .	3	2	15	1	(103A)
104	Chemical Analysis . . . .	Lab.	Drown, Talbot.	III., V., VII., VIII.	3	1, 2	30	-	(90) (102)
106	Special Methods . . . .	Rec.	Drown.	III., V. . . . .	3	1	15	2	(90) (102)
107	Industrial Chemistry . . . .	Lect.	Norton.	V. . . . .	3	1, 2	30	2	(51) (90) (102)
108	Chemical Analysis . . . .	Lab.	Drown, Talbot.	III., V., VIII. . . .	4	1	15	-	(104)
109	Chemical Analysis . . . .	Lab.	Drown, Talbot.	III., V. . . . .	4	2	15	-	(108)
110	Organic Chemistry . . . .	Lect.	Norton.	V. . . . .	4	1, 2	30	2	(90) (103B) (104)
111	Organic Chemistry . . . .	Lab.	Norton, Andrews.	V. . . . .	4	1, 2	30	12	(110)
112	Industrial Chemistry . . . .	Lab.	Norton, Underwood.	V. . . . .	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	1, 2	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	(29A)
127	Descriptive Astronomy . . .	Rec.	Clifford.	I, VIII, IX. . . .	2 or 4	1	15	1	(29B)
128	Mechanics, Acoustics, and Electricity (in connection with 126) . . . . .	Rec.	Clifford.	VI, VIII. . . . .	2	1, 2	30	2	(29A)
129	Physical Laboratory . . . . .	Lab.	{ Holman, Woodbridge. }	VI, VIII. . . . .	2	2	15	2	(126) <sup>1</sup> (128)
132A	Physics: Heat . . . . .	Lect.	Holman.	All reg. students . .	3	1	8	2	(126)
132B	Physical Laboratory . . . . .	Lab.	{ Holman, Woodbridge, Puffer. }	All courses . . . . .	3	1, 2	22	2	(132A)
133	Physical Laboratory . . . . .	Lab.	Cross, Holman.	V, VIII. . . . .	3	-	-	-	(126)

<sup>1</sup> The student must also be qualified to enter VI., as a regular, 2d year, 1st term.





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, Robbins.	I. . . . .	2	1, 2	30	10	(29A) (51)
151B	Surveying . . . . .	{ Lect., Rec., Field, Draw. }	Burton, Robbins.	III. . . . .	2	1, 2	30	8	(29A) (51)
151C	Adv. Surveying . . . . .	{ Lect., Draw., Field. }	Burton.	I. . . . .	3	1	15	4	(151A) (152)
152	Topographical Drawing . . . . .	Draw.	Burton.	I. . . . .	2	1 or 2	15	5	(51)
153	Plane-Table and Map Work, Structure Drawing . . . . .	{ Field, Draw. }	Burton.	I. . . . .	3	2	7	4	(151A) (152)
154	Advanced Geometrical Drawing . . . . .	Draw.	Burton.	I. . . . .	3	1	15	4	(151A)
155	Stereotomy . . . . .	{ Lect., Draw. }	Porter.	I. . . . .	2	1	15	4	(51)
156	Geodesy and Astronomy . . . . .	{ Lect., Rec., Field. }	Burton.	I. . . . .	4	2	18	6	(154) (155)
157				I. . . . .	4	2	15	3	(29B) (127) (153)

SCHEDULE OF TOPICS.

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. . . . .	3	2	15	3	(29B) (127) (151C)
159	Higher Geodesy . . . . .	{ Lect., Rec., Field. }	Burton.	I. . . . .	4	1, 2	30	3	(158)
160A	Roads and Railroads . . . . .	{ Lect., Rec. }	Allen.	I. . . . .	3	1, 2	30	3	(151A) (152)
160B	Railroad Engineering . . . . .	{ Lect., Rec., Draw. }	Allen.	I. . . . .	4	1	15	3	(33) (160A)
160C	Railroads: Transportation, Rolling-Stock, Management, etc. . . . .	{ Lect., Rec., Draw. }	Allen.	I. . . . .	4	2	15	4	(160B)
161	Railroad Field Work, etc. . . . .	{ Field., Draw. }	Allen.	I. . . . .	3	1, 2	30	4	(151A) (152)
162	Railroad Management . . . . .	Lect.	Allen.	I, IX. . . . .	4	1	15	2	
163	Foundations . . . . .	Lect.	Swain.	I. . . . .	3	1	15	1	(151)
164	Sanitary Engineering and Designing . . . . .	{ Lect., Rec., Draw. }	Porter.	I. . . . .	4	1 2	15 8	3 6	(151A) (152)

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 and Designing . . . . .	{ Lect., Rec., Draw., Field, Draw. }	Swain.	I. . . . .	4	2	15	4	(165) (167)
167	Hydraulic Measurements . . .	{ Field, Draw. }	Swain.	I. . . . .	4	1	6	5	(165)
168	Principles of Construction . . .	{ Lect., Rec. }	Swain.	I. . . . .	4	1	15	2	(33)
169	Bridges and Similar Structures . . . . .	{ Lect., Rec. }	Swain.	I. . . . .	4	2	15	2	(33) (168)
170	Bridge Design . . . . .	Draw.	Swain.	I. . . . .	4	1, 2	30	6	(154) (169)
MECHANICAL ENGINEERING.									
176	Mechanism (must take also 28 and 52) . . . . .	{ Lect., Rec., Draw. }	{ Schwamb, Purinton, Stephens. }	II, VI. . . . .	2	1	15	4	(29A) (51)
177	Mechanism (must take also 30) . . . . .	{ Lect., Rec., Draw. }	{ Schwamb, Stephens. }	II, VI. . . . .	2	2	15	2	(176)
178	Mechanical Engineering (must take also 31, 32, and 132) . . . . .	{ Lect., Rec., Draw. }	{ Peabody, Stephens. }	II, VI. . . . .	3	1	15	2	(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 take also 33 and 132)	{ Lect., Rec., Draw., Lab. }	{ Peabody, Schwamb, 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.	VI.	4	1	15	5 3	(179)
181	Designing (must take also 34)	Draw.	Schwamb.	II.	4	1	15	8	(179)
182	Mechanical Engineering	Lab.	{ Lanza, Peabody, Merril. }	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)
185A	Forging	Shop.	Lambirth.	II., IX.	3	1	15	6	
185B	Chipping and Filing	Shop.	Smith.	II.	3	2	10	4 4	
186	Machine Tool Work	Shop.	Smith.	II.	4	1	4	6	(185B)
187	Metal Turning	Shop.	Stephenson.	VI., IX.	2	2	15	2	

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 Crystal- lography) . . . . .	{ Lect., Lab. }	Crosby, Barton.	I, 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 of Iron . . . . .	Lect.	Richards.	I, II, IX. . . . .	4	1	15	1	(101)
205	Metallurgy . . . . .	Lect.	Richards, Howe.	III, V. . . . .	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 . . .	Homer.	IV., IX. . . . .	2	1, 2	30	1	Students in Architecture must follow the regular course (p. 29), or the partial two-year course (p. 28). The regular examinations for admission (see p. 71) are required for either course.	
227	Orders . . . . .	Homer.	IV. . . . .	2	1	12	4		
228	Materials of Architecture . .	Clark.	IV. . . . .	2.	1	15	2		
229	Practical Construction . . .	Clark.	IV. . . . .	2	2	15	1		
230	Shades, Shadows, and Perspective . . . . .	Clark, Homer.	IV. . . . .	2	2	7	2		
231	Working Drawings . . . . .	Clark.	IV. . . . .	3	1	15	1		
232	Iron Construction . . . . .	Clark.	IV. . . . .	3	2	15	1		
233	Fine Art . . . . .	Homer, Walker.	IV. . . . .	3, 4	1	15	1		
234	Sketching . . . . .	Turner.	IV. . . . .	3, 4	1, 2	30	2		
235	Specifications and Contracts,	Clark.	IV. . . . .	4	1, 2	30	1		
236	Problems in Construction . .	Clark.	IV. . . . .	4	1, 2	30	1		
238	Schools, Theatres, Churches, Hospitals, etc.	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.	Homer.	IV. (Partial) . . . . .	1	1, 2	30	3	
242	History of Ornament . . . .	Lect.	Homer.	IV. . . . .	4	1	15	2	
NATURAL SCIENCES.									
251	Physical Geography . . . .	Lect. { Lect., Rec., Lab. }	Niles.	I, III, V, VII, IX.	2	2	15	3	(7)
252	General Biology and Botany,	{ Lect., Rec., Lab. }	Sedgwick.	VII, IX. . . . .	2	1, 2	15	-	(tot)
253	Microscopy . . . . .	{ Lect., Rec., Lab. }	Sedgwick.	{ III, V, VII, VIII, IX. . . . . }	2	2	15	2	(tot)
254	Zoölogy and Palæontology .	{ Lect., Lab. }	Hyatt.	III, VII, IX. . . . .	3	1, 2	30	2	
256	Geology (Elements of Lith- ology and Structural Ge- ology) . . . . .	{ Lect., Lab. }	Crosby.	I, IV, VII, B, IX.,	3	1	15	2	(tot)



SCHEDULE OF TOPICS.

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)	Crosby.	I, III, V, VII.	3	1	15	3	(201)	
258	Historical Geology . . . . .	Niles.	I, III, V, VII, IX.	3	2	15	3	(256) or (257)	
259	General Biology . . . . .	Sedgwick.	VII, IX. . . . .	3	1	15	-		
261	Comparative Physiology . . . . .	Sedgwick.	VII, IX. . . . .	4	1, 2	30	-	(262)	
262	Comparative Anatomy and Embryology . . . . .	Gardiner.	VII, IX. . . . .	3	2	15	6	(252) (259)	
264	Climatology . . . . .	Niles.	VII, IX. . . . .	4	2	15	2		
265	Sanitary Science . . . . .	Sedgwick.	VII, IX. . . . .	4	2	15	1	(101)	
266	Natural History . . . . .	Sedgwick.	VII. . . . .	2	2	15	4	(252)	

## 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 1887-88.

School year began . . . . .	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.

## CALENDAR FOR 1889-90.

School year will begin . . . . .	Monday, Sept. 24, 1888.
Second term will begin . . . . .	Tuesday, Jan. 29, 1889.
Degrees conferred . . . . .	Tuesday, May 28, 1889.
First Entrance Examinations . . . . .	{ Thursday, May 30, 1889, and Friday, May 31, 1889.
Second Entrance Examinations . . . . .	{ Tuesday, Sept. 24, 1889, and Wednesday, Sept. 25, 1889.
Examinations for Advanced Standing . . . . .	Thursday, Sept. 26, 1889.
School year of 1889-90 will begin . . . . .	Monday, Sept. 30, 1889.

**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 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 the first of March 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 discontinue 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.

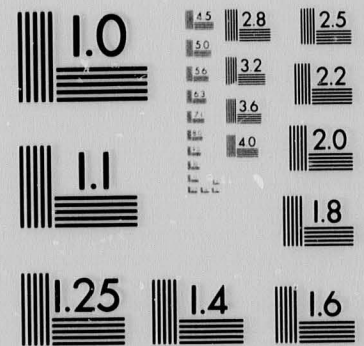
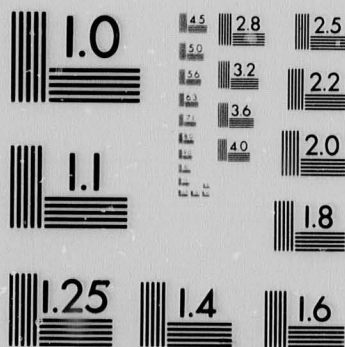
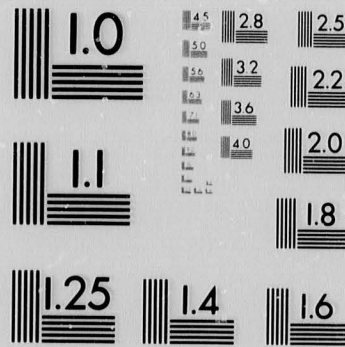
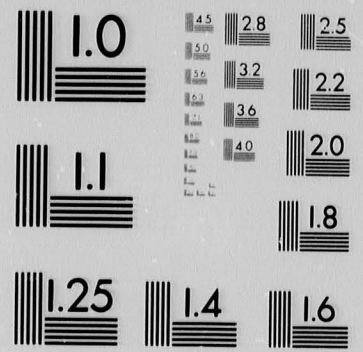
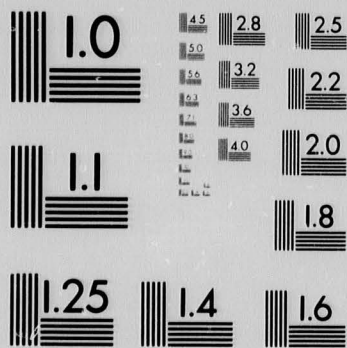
**Fees.** — The tuition-fee for regular students is \$200 per year, and must be paid in advance, as follows: \$125 on or before Oct. 10, and \$75 on or before Feb. 10. For one-half, or any less fraction, of the school year, the fee is \$125. Payment is also required of the cost of apparatus injured or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





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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 residents of the town of Milton, is conferred upon such former pupil of the Milton high school as the master of that school and the school committee of the town 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 an expenditure.

The James Henry Mirrlees scholarship, founded by James B. Mirrlees, Esq., of Glasgow, Scotland, in memory of his son who died in May, 1886, while attending the school, is to be enjoyed by a third-year student in Mechanical Engineering.

By a bequest of the late Richard Perkins of Boston, the income of \$50,000 is available for aiding needy students in such amounts as shall be recommended by the Faculty.

**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.

## CANDIDATE FOR ADVANCED DEGREE.

NAME.	HOME.	RESIDENCE.
Newell, Frederick H., S.B., Mass. Institute of Technology.	<i>Bradford, Pa.</i>	Brookline.
Blake, Henry W., Ph.B., Yale University.	<i>New Haven, Ct.</i>	323 Columbus Ave.
Burnham, Edward C., A.B., Brown University.	<i>Pawtucket, R. I.</i>	89 Warren Ave.
Dauchy, Samuel O., A.B., Beloit College.	<i>Chicago, Ill.</i>	354 Columbus Ave.
Doak, John E., Ph.B., University of the Pacific.	<i>Stockton, Cal.</i>	85 Dartmouth St.
Donnell, Francis M., A.B., Colby University.	<i>Houlton, Me.</i>	108 Appleton St.
Emery, Elwood A., B.L., University of Minnesota.	<i>Minneapolis, Minn.</i>	27 St. James Ave.
Garfield, Alexander S., S.B., Mass. Institute of Technology.	<i>Lexington.</i>	Lexington.
Hazen, Allen, B.S., New Hampshire College of Agriculture.	<i>Hartford, Vt.</i>	Auburndale.
Maltby, M. Eliza, A.B., Oberlin College.	<i>Oberlin, O.</i>	331 Columbus Ave.
Moore, Daniel A., A.B., Yale University.	<i>St. Louis, Mo.</i>	92 Chandler St.
Peterson, Charles A., A.B., Harvard University.	<i>Boston.</i>	180 Cambridge St.
Plaisted, Sheridan, A.B., Colby University.	<i>Waterville, Me.</i>	296 Columbus Ave.
Richmond, Knight C., B.P., Brown University.	<i>Providence, R. I.</i>	79 Dartmouth St.
Roberts, Odin B., A.B., Harvard University.	<i>Boston.</i>	81 Mt. Vernon St.
Sabine, Annie W., M.A., Ohio State University.	<i>Columbus, O.</i>	Cambridge.
Smith, Clarence W., A.B., Harvard University.	<i>Cambridge.</i>	Cambridge.
Smith, Frank W., A.B., Harvard University.	<i>Dorchester.</i>	Mill St.
Spencer, Robert C., Jr., B.M.E., University of Wisconsin.	<i>Milwaukee, Wis.</i>	760 Tremont St.
Storrow, Samuel, A.B., Harvard University.	<i>Boston.</i>	417 Beacon St.
Talbot, Marion, A.M., Boston University.	<i>Boston.</i>	66 Marlboro' St.
Wood, George B., A.B., Haverford College.	<i>Philadelphia, Pa.</i>	84 Charles St.
Woodman, Caroline A., A.B., Vassar College.	<i>Lewiston, Me.</i>	148 W. Newton St.

## REGULAR STUDENTS.

## FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Bates, Henry D.	IV.	<i>Racine, Wis.</i>	236 W. Canton St.
Bigelow, Henry F.	IV.	<i>Clinton.</i>	7 W. Cedar St.
Binney, Harold O.	VI.	<i>Newport, R. I.</i>	297 Beacon St.
Bird, Herbert S.	V.	<i>City Mills.</i>	City Mills.
Blanchard, Winslow.	II.	<i>Dorchester.</i>	Park St.
Bradlee, Arthur T.	II.	<i>Boston.</i>	113 Beacon St.
Buttolph, Benjamin G.	II.	<i>Buffalo, N. Y.</i>	165 W. Canton St.
Carleton, Elbridge S.	IV.	<i>Rochdale.</i>	2 Ashburton Pl.
Center, David A.	VI.	<i>Gloucester.</i>	Grant St.
Child, Stephen.	I.	<i>West Newton.</i>	West Newton.
Claffin, George E.	VI.	<i>Providence, R. I.</i>	12 Highland Ave.
Cobb, Syivanus H.	VI.	<i>Hyde Park.</i>	Hyde Park.
Colby, Russell H.	V.	<i>Leominster.</i>	50 Monument Sq.
Cole, Fred. B.	II.	<i>Kingston.</i>	Kingston.
Collins, Bertrand R. T.	II.	<i>Kezar Falls, Me.</i>	87 Appleton St.
Collins, Edward, Jr.	VI.	<i>Milton.</i>	Milton.
Conner, Arthur J.	V.	<i>Boston.</i>	437 Columbus Ave.
Cromwell, Charles H.	II.	<i>Baltimore, Md.</i>	26 Holyoke St.
Devens, Richard.	II.	<i>Boston.</i>	6 Louisburg Sq.
Dutton, Edgar F.	VI.	<i>Boston.</i>	534 Warren St.
Eastman, Henry F.	II.	<i>Lowell.</i>	142 Chandler St.
Ellsworth, Alfred B.	I.	<i>Buffalo, N. Y.</i>	4 Ashburton Pl.
Eppes, Richard, Jr.	II.	<i>City Point, Va.</i>	233 W. Canton St.
Ferguson, Louis A.	VI.	<i>South Boston.</i>	121 K St.
Flint, Bertram P.	II.	<i>Roxbury.</i>	27 Linwood St.
Foque, Theodore A.	II.	<i>Malden.</i>	Malden.
Fukuzawa, Stejiro.	I.	<i>Tokyo, Japan.</i>	40 Bowdoin St.
Fuller, J. Edward, Jr.	IV.	<i>Worcester.</i>	408 Columbus Ave.
Gerrish, William H.	II.	<i>Lowell.</i>	Lowell.
Greene, Irving G.	I.	<i>Boston.</i>	40 Rutland Sq.
Gross, Harold G.	VII.	<i>Eureka, Cal.</i>	29 Union Park.
Hamblet, George W.	II.	<i>Lawrence.</i>	Lawrence.
Harris, William L.	VII.	<i>Boston.</i>	6 Louisburg Sq.
Harvey, George L.	II.	<i>Chicago, Ill.</i>	68 Chandler St.
Hastings, Charles F.	III.	<i>West Newton.</i>	West Newton.
Hathaway, Savory C., Jr.	VI.	<i>New Bedford.</i>	148 Warren Ave.
Heath, George L.	V.	<i>Everett.</i>	Everett.
Herrick, Edward W.	II.	<i>Northampton.</i>	311 Columbus Ave.
Holman, George U. G.	VI.	<i>East Boston.</i>	20 Chelsea St.
Holton, Edward C.	V.	<i>Winchester.</i>	Winchester.
Horn, Henry J., Jr.	I.	<i>St. Paul, Minn.</i>	161 W. Brookline St.
James, Frank M.	II.	<i>Haverhill.</i>	50 Appleton St.
Jones, Arthur W.	VI.	<i>Roxbury.</i>	Norfolk House.
Jordan, Edwin O.	VII.	<i>Auburndale.</i>	Auburndale.

## REGISTER OF STUDENTS.

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NAME.	COURSE.	HOME.	RESIDENCE.
Keough, William T.	II.	East Boston.	234 Saratoga St.
Lee, George S.	I.	Revere.	Revere.
Loveland, James W.	V.	East Boston.	25 Princeton St.
Mann, Arthur S.	II.	West Medway.	West Medway.
McLauthlin, George V.	V.	East Bridgewater.	East Bridgewater.
Merrell, Charles G.	V.	Cincinnati, O.	21 Pinckney St.
Moore, Frank A.	IV.	Worcester.	403 Columbus Ave.
Moore, Harry C.	II.	Brookline.	Brookline.
Nickerson, Addison D.	I.	Harwichport.	117 Dartmouth St.
Pearson, Edwin R.	VI.	Portsmouth, N. H.	14 Temple St.
Peterson, Charles A., A. B.	VI.	Boston.	180 Cambridge St.
Pierce, Herbert F.	I.	South Braintree.	South Braintree.
Pool, George B.	VI.	Forest Hills.	3604 Washington St.
Ray, John.	II.	Boston.	3 Oxford Terrace.
Robb, Russell.	VI.	Detroit, Mich.	6 Louisburg Sq.
Roberts, Odin B., A. B.	II.	Boston.	81 Mt. Vernon St.
Sabine, Annie W., M.A.	VIII.	Columbus, O.	Cambridge.
Safford, Frederick H.	VI.	Lawrence.	Lawrence.
Sauveur, Albert.	III.	St. Paul, Minn.	373 Columbus Ave.
Sawyer, Alfred H.	II.	Concord.	Concord.
Sayer, Frederick L.	II.	New Bedford.	1 Yarmouth St.
Shaw, Walter K.	II.	Lexington.	Lexington.
Smith, Edward M.	II.	No. Hampton, N. H.	251 Lamartine St.
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.	
Vorce, Clarence B.	I.	Farmington, Ct.	26 Holyoke St.
Warren, A. Sydney.	III.	Newport, R. I.	29 West Cedar St.
Webster, Edwin S.	VI.	Boston.	232 Newbury St.
Weil, Charles L.	II.	North Andover.	50 Appleton St.
Williams, Arthur S.	VI.	Boston.	15 Arlington St.
Woodward, Amos E.	III.	East Somerville.	East Somerville.
Young, John E.	I.	Danielsonville, Ct.	309 Columbus Ave.

## THIRD YEAR.

Ayer, Arthur W.	II.	East Somerville.	East Somerville.
Bartlett, Spaulding.	V.	Webster.	3 Oxford Terrace.
Basford, George M.	II.	Roxbury.	Parker Hill Ave.
Beach, Edward J.	V.	Dubuque, Ia.	71 Rutland St.
Beals, Charles E.	II.	Stoughton.	Stoughton.
Beaman, William M.	I.	Charlestown.	Navy Yard.
Bixby, Willard G.	II.	Salem.	Salem.
Bliss, Zenas W.	II.	Providence, R. I.	3 Oxford Terrace.
Borden, Charles N.	II.	Fall River.	369 Columbus Ave.
Bradley, Frederick W.	VI.	Lowell.	Lowell.



NAME.	COURSE.	HOME.	RESIDENCE.
Brown, Charles L.	III.	<i>Stoughton.</i>	Stoughton.
Bulkley, J. Norman.	VI.	<i>New York, N. Y.</i>	
Crabtree, Fred.	V.	<i>Lawrence.</i>	Lawrence.
Craigin, Henry A.	II.	<i>Boston.</i>	152 Huntington Ave.
Cutter, Roland N.	I.	<i>Winchester.</i>	Winchester.
Dame, Frank L.	VI.	<i>Boston.</i>	19 Temple Pl.
Davenport, William S.	V.	<i>Roxbury.</i>	2 Homer Pl.
Davis, Arthur L.	II.	<i>San Francisco, Cal.</i>	85 Dartmouth St.
Dodge, Charles B.	IX.	<i>Skowhegan, Me.</i>	18 Temple St.
Duane, William M.	I.	<i>West Newton.</i>	West Newton.
Durfee, Nathan.	II.	<i>Fall River.</i>	369 Columbus Ave.
Dwellely, Edwin F.	I.	<i>West Hanover.</i>	West Hanover.
Dyar, Harrison G.	V.	<i>Rhinebeck, N. Y.</i>	170 W. Chester Pk.
Edgett, Horace P.	VIII.	<i>Beverly.</i>	Beverly.
Edwards, Arthur V.	IV.	<i>Milton.</i>	Milton.
Fiske, J. Parker B.	VI.	<i>Auburndale.</i>	Auburndale.
French, Edward V.	II.	<i>Lynn.</i>	Lynn.
French, Hollis.	VI.	<i>Boston.</i>	200 Com'w'lth Ave.
Gannett, Earl W.	VI.	<i>Omaha, Neb.</i>	235 W. Canton St.
Goodrich, David P.	IV.	<i>South Boston.</i>	801 Broadway.
Greeley, James T.	V.	<i>Nashua, N. H.</i>	
Guppy, Benjamin W.	I.	<i>Jamaica Plain.</i>	8 Myrtle St.
Harrington, Edward M.	V.	<i>Reading.</i>	Reading.
Hart, Francis R.	VI.	<i>New Bedford.</i>	Forest Hills St.
Hobart, Henry M.	VI.	<i>Boston.</i>	60 W. Rutland Sq.
Hobbs, Franklin W.	II.	<i>Brookline.</i>	Brookline.
Hooker, Richard.	IV.	<i>Roxbury.</i>	19 Whiting St.
Hopkins, Fred. L.	V.	<i>Lawrence.</i>	Lawrence.
Hunt, Harry H.	VI.	<i>Melrose.</i>	Melrose.
Hutchins, Edward S.	II.	<i>Providence, R. I.</i>	5 St. James Ave.
Johnson, William S.	I.	<i>Saxonville.</i>	Saxonville.
Kilham, Walter H.	IV.	<i>Beverly.</i>	Beverly.
Kinsman, Arthur D.	VIII.	<i>Ipswich.</i>	E. Somerville.
Kunhardt, Lewis H.	II.	<i>Melrose Highlands.</i>	Melrose Highlands.
Lauder, George B.	VI.	<i>Concord, N. H.</i>	218 W. Newton St.
Laws, Frank A.	VI.	<i>Brockton.</i>	Brockton.
Lewis, William W.	II.	<i>Hyde Park.</i>	Hyde Park.
McConnell, George B.	I.	<i>Roxbury.</i>	153 Blue Hill Ave.
Mildram, Samuel H.	I.	<i>Neponset.</i>	Wood St.
Norris, Almon E.	II.	<i>Lexington.</i>	Lexington.
Norris, Clarence G.	I.	<i>Hyde Park.</i>	Hyde Park.
Pike, Clayton W.	VI.	<i>Fryeburg, Me.</i>	165 Boylston St.
Power, Charles W.	VI.	<i>Pittsfield.</i>	19 Upton St.
Ranno, Fred. W.	I.	<i>Manchester, N. H.</i>	136 Huntington Ave.
Richardson, George L.	I.	<i>San Rafael, Cal.</i>	85 Dartmouth St.
Rounds, George W.	VI.	<i>Malden.</i>	Malden.
Russel, Richard L.	I.	<i>Pottsville, Pa.</i>	198 Beacon St.

## REGISTER OF STUDENTS.

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NAME.	COURSE.	HOME.	RESIDENCE.
Sanborn, Frank E.	II.	<i>Roxbury.</i>	103 Moreland St.
Shepard, Edward V.	I.	<i>Salem.</i>	Salem.
Smith, William L.	VI.	<i>Boston.</i>	360 Marlboro' St.
Smythe, Frank A.	I.	<i>Somerville.</i>	Somerville.
Storrow, Samuel, A. B.	I.	<i>Boston.</i>	417 Beacon St.
Thompson, Sanford E.	I.	<i>Newton Highlands.</i>	Newton Highlands.
Thurber, William B.	IX.	<i>Plymouth.</i>	Plymouth.
Truesdell, Arthur E.	VI.	<i>West Stockbridge.</i>	Newton.
Underhill, William W.	II.	<i>Winchester.</i>	Winchester.
Wadsworth, Oliver F., Jr.	IV.	<i>Boston.</i>	139 Boylston St.
Warner, Charles H.	VI.	<i>Fall River.</i>	275 Newbury St.
Whipple, George C.	I.	<i>Chelsea.</i>	Chelsea.
Whiting, Jasper.	III.	<i>Charlestown.</i>	100 Main St.
Whitmore, George A.	VI.	<i>Boston.</i>	Hotel Helvetia.
Whitney, Frank P.	VI.	<i>Dorchester.</i>	592 Adams St.
Williams, Robert C.	III.	<i>Marquette, Mich.</i>	116 Chandler St.
Williams, Theodore G.	VI.	<i>Roxbury.</i>	28 High'nd P'k Ave.
Williston, Arthur L.	II.	<i>Cambridge.</i>	Cambridge.
Wilson, Benjamin F., Jr.	III.	<i>Norfolk, Va.</i>	16 Upton St.
Windett, Victor.	II.	<i>Chicago, Ill.</i>	179 Warren Ave.
Wuichet, Walter G.	II.	<i>Dayton, O.</i>	116 Chandler St.

## SECOND YEAR.

Adams, Arthur H.	II.	<i>Watertown.</i>	Watertown.
Alden, Charles H., Jr.	IV.	<i>West Point, N. Y.</i>	27 St. James Ave.
Atwood, Frank W.	V.	<i>East Boston.</i>	81 Lexington St.
Babb, Cyrus C.	I.	<i>Boston.</i>	12 Somerset St.
Batchelder, John L., Jr.	VII.	<i>Jamaica Plain.</i>	Pond St.
Beals, Edward M.	IX.	<i>Boston.</i>	125 Newbury St.
Blood, John B.	VI.	<i>Newburyport.</i>	Newburyport.
Blume, J. Cristóbal.	II.	<i>Lima, Peru.</i>	48 Chester Sq.
Brand, Horace L.	II.	<i>Chicago, Ill.</i>	772 Dudley St.
Brown, Albert F.	I.	<i>Roxbury.</i>	106 Zeigler St.
Brown, Edward D.	VI.	<i>Reading.</i>	Reading.
Brown, Ralph G.	II.	<i>Boston.</i>	486 Columbus Ave.
Burley, Harry B.	I.	<i>North Epping, N. H.</i>	19 Union Park.
Burnham, Edward C., A.B.	II.	<i>Pawtucket, R. I.</i>	89 Warren Ave.
Butters, R. G. Walker.	II.	<i>Haverhill.</i>	107 W. Chester Pk.
Calkins, Gary N.	IX.	<i>Chicago, Ill.</i>	436 Columbus Ave.
Carlisle, Morten.	VI.	<i>Cincinnati, O.</i>	312 Columbus Ave.
Carlton, Chester V.	I.	<i>Milford, N. H.</i>	564 Columbus Ave.
Carney, James A.	V.	<i>Lowell.</i>	Lowell.
Chapman, George D.	II.	<i>Fitchburg.</i>	321 Columbus Ave.
Clapp, Homer C.	II.	<i>South Boston.</i>	729 E. Fourth St.
Clark, James, Jr.	VI.	<i>Louisville, Ky.</i>	325 Columbus Ave.
Clement, Harry W.	II.	<i>Rutland, Vt.</i>	316 Shawmut Ave.

NAME.	COURSE.	HOME.	RESIDENCE.
Cook, Walter F.	IX.	<i>Dorchester.</i>	332 Boston St.
Creden, William L.	II.	<i>South Boston.</i>	940 Broadway.
Crossman, Fred A.	II.	<i>Providence, R. I.</i>	West Medford.
Curtis, William G.	I.	<i>Flatbush, N. Y.</i>	1 Oxford Terrace.
de Bullet, John C. E.	I.	<i>Carroll P. O., Md.</i>	Hotel Brunswick.
de Lancey, Darragh.	II.	<i>Plainfield, N. J.</i>	9 Park Sq.
Deiano, Alexander J.	I.	<i>Roxbury.</i>	231 Dudley St.
De Wolf, John O.	II.	<i>Greenfield.</i>	14 Winthrop St.
Dodge, Fred. H.	II.	<i>Toledo, O.</i>	8 Columbus Sq.
Dore, Walter J.	IX.	<i>Chicago, Ill.</i>	84 Charles St.
Dow, William H.	I.	<i>Portland, Me.</i>	42 Concord Sq.
Dunbar, Frank W.	VI.	<i>Canton.</i>	Canton.
du Pont, Pierre S.	IX.	<i>Philadelphia, Pa.</i>	
Eldridge, George F.	V.	<i>Hyde Park.</i>	Hyde Park.
Ellis, Walter.	VI.	<i>Newton.</i>	Newton.
Emery, Elwood A., B.L.	IV.	<i>Minneapolis, Minn.</i>	27 St. James Ave.
Fenn, William H.	I.	<i>Jersey City, N. J.</i>	148 Warren Ave.
Flint, William P.	II.	<i>Brookline.</i>	Brookline.
Flood, S. Douglas.	II.	<i>Hyde Park, Ill.</i>	12 St. James Ave.
Foster, Cassius M.	II.	<i>Toledo, O.</i>	151 Worcester St.
Fuller, George W.	V.	<i>West Medway.</i>	West Medway.
Gardiner, Irving L'H.	II.	<i>Milford, Pa.</i>	
Gilmore, George L.	II.	<i>Charlestown.</i>	212 Bunker Hill St.
Glidden, John W.	II.	<i>De Kalb, Ill.</i>	601 Tremont St.
Goodwin, Harry M.	VIII.	<i>Roxbury.</i>	3 Townsend St.
Greenlaw, Frank M.	VI.	<i>Roxbury.</i>	5 Willoughby Pl.
Hale, George E.	VIII.	<i>Chicago, Ill.</i>	3 Wheatland Ave.
Hall, Frederic B.	II.	<i>Charlestown.</i>	70 Winthrop St.
Hall, John R.	VI.	<i>Longwood.</i>	Longwood.
Hamilton, Edgar L.	IX.	<i>Fond du Lac, Wis.</i>	107 W. Chester Pk.
Haskins, William.	III.	<i>Medford.</i>	Medford.
Hayden, Charles.	IX.	<i>Boston.</i>	166 Newbury St.
Hayden, Sophia G.	IV.	<i>Jamaica Plain.</i>	325 Lamartine St.
Hills, Leonard M.	IX.	<i>Amherst.</i>	107 W. Chester Pk.
Hilton, George A.	II.	<i>Cambridge.</i>	Cambridge.
Horton, S. Ellsworth.	II.	<i>Windsor Locks, Ct.</i>	46 Savin St.
Knight, Franklin.	I.	<i>Lynn.</i>	Lynn.
Koch, Charles F.	II.	<i>Cincinnati, O.</i>	54 Montgomery St.
Lenfest, Bertram A.	II.	<i>Reading.</i>	Reading.
Le Sueur, Ernest A.	VI.	<i>Ottawa, Can.</i>	Newton Highlands.
Machado, Ernest M. A.	IV.	<i>Salem.</i>	Salem.
Mann, Bertram H.	VI.	<i>Weymouth.</i>	Weymouth.
Martin, Waldo A.	II.	<i>Milton.</i>	Milton.
Mead, James A.	III.	<i>Grand Rapids, Mich.</i>	154 Warren Ave.
Merrick, George E.	V.	<i>Holyoke.</i>	357 Columbus Ave.
Metcalf, Frederick.	II.	<i>Providence, R. I.</i>	69 Appleton St.
Mitchell, Everett S.	I.	<i>Boston.</i>	Hotel Middlesex.

NAME.	COURSE.	HOME.	RESIDENCE.
Moody, Burdett.	I.	<i>Deadwood, Dak.</i>	154 Warren Ave.
Moody, Frederick C.	II.	<i>Boston.</i>	116 Appleton St.
Moore, S. Wallace.	II.	<i>Newton.</i>	Newton.
Mossman, William.	VI.	<i>Mattapan.</i>	Norfolk St.
Newell, Allan H.	II.	<i>Stockton, Cal.</i>	323 Columbus Ave.
Noyes, Harry L.	I.	<i>Boone, Ia.</i>	Parker Hill Ave.
Noyes, Joseph K.	I.	<i>Binghamton, N. Y.</i>	77 Dartmouth St.
Packard, George A.	III.	<i>Wakefield.</i>	Wakefield.
Palmer, Edwin A.	II.	<i>Richmond, Va.</i>	235 W. Canton St.
Peyton, William R.	II.	<i>Duluth, Minn.</i>	154 Warren Ave.
Poland, William B.	I.	<i>Boston.</i>	115 Berkeley St.
Raymond, Edward B.	VI.	<i>Somerville.</i>	Somerville.
Read, Carleton A.	II.	<i>Bolton.</i>	Bolton.
Reed, William B.	IV.	<i>Westfield.</i>	27 St. James Ave.
Rice, Calvin W.	VI.	<i>Winchester.</i>	Winchester.
Richmond, Knight C., B.P.	II.	<i>Providence, R. I.</i>	79 Dartmouth St.
Ripley, Charles E.	II.	<i>Rutland, Vt.</i>	148 W. Canton St.
Ripley, William Z.	I.	<i>Newton.</i>	Newton.
Robinson, Edward.	II.	<i>Hudson.</i>	24 Isabella St.
Rogers, Allen H.	III.	<i>South Boston.</i>	707 East Broadway.
Rogers, Minnie.	IX.	<i>Jamaica Plain.</i>	53 Bowe St.
Roots, Willard H.	IX.	<i>Little Rock, Ark.</i>	55 Pinckney St.
Royce, Frederick P.	VI.	<i>Boston.</i>	256 Newbury St.
Schieffelin, Schuyler.	VI.	<i>New York, N. Y.</i>	Hotel Oxford.
Schroeter, Hugo E.	III.	<i>Roxbury.</i>	7 Sudbury Pl.
Sherman, Charles W.	I.	<i>Kingston.</i>	Kingston.
Simpson, Edmund T.	V.	<i>Lowell.</i>	Lowell.
Slater, Howard C.	II.	<i>Providence, R. I.</i>	75 Warren Ave.
Sonnemann, George A.	III.	<i>Boston.</i>	228 Tremont St.
Southworth, Martin O.	VI.	<i>Stoughton.</i>	Stoughton.
Spaulding, Henry P.	VI.	<i>Newton.</i>	Newton.
Spring, Andrew H.	III.	<i>Somerville.</i>	Somerville.
Stearns, Arthur B.	II.	<i>Framingham.</i>	Framingham.
Stearns, Edward B.	I.	<i>East Watertown.</i>	East Watertown.
Sturges, Benton.	IX.	<i>Lake Geneva, Wis.</i>	6 Louisburg Sq.
Sturtevant, Thomas J.	VI.	<i>South Framingham.</i>	South Framingham.
Swanton, Frederic W.	VI.	<i>Bath, Me.</i>	1 Columbus Sq.
Tallant, George P.	II.	<i>San Francisco, Cal.</i>	Hotel Oxford.
Taylor, Gordon H.	I.	<i>East Cambridge.</i>	East Cambridge.
Thompson, Herbert A.	VIII.	<i>Amherst.</i>	
Towne, John H.	II.	<i>Stamford, Ct.</i>	6 Louisburg Sq.
Voorhees, Gardner T.	II.	<i>Cambridgeport.</i>	Cambridgeport.
Waite, Henry M.	I.	<i>Toledo, O.</i>	325 Columbus Ave.
Walker, Elton D.	I.	<i>Taunton.</i>	101 Appleton St.
Walker, Robert T.	IV.	<i>Greenfield.</i>	14 Winthrop St.
Warren, Lyman O.	IV.	<i>Brighton.</i>	Brighton.
Wason, Leonard C.	VI.	<i>Brookline.</i>	Brookline.



NAME.	COURSE.	HOME.	RESIDENCE.
Watson, C. Morris.	VI.	<i>Jamaica Plain.</i>	26 Greenough Ave.
Weld, George F.	II.	<i>Falmouth.</i>	Morton St.
Wells, William F.	VI.	<i>New Haven, Ct.</i>	128 St. Botolph St.
White, Franklin W.	VII.	<i>Boston.</i>	Hotel Berwick.
Whitten, Ernest P.	I.	<i>Roxbury.</i>	59 School St.
Woodman, Andrew W.	I.	<i>Chelsea.</i>	Chelsea.
Yardley, Thomas H.	IV.	<i>Newport, R. I.</i>	46 Chestnut St.

## FIRST YEAR.

Adams, William H.		<i>Newburyport.</i>	Newburyport.
Aiken, Charles W.		<i>Franklin, N. H.</i>	Maplewood.
Alley, Arthur H.		<i>Jamaica Plain.</i>	Revere St.
Ambrose, David A.		<i>Georgetown.</i>	Georgetown.
Atkinson, George T.		<i>Chelsea.</i>	Chelsea.
Baldwin, George P.		<i>Wilton, N. H.</i>	153 W. Canton St.
Ball, Robert S.		<i>Dublin, Ireland.</i>	74 Bartlett St.
Barnes, Rowland H.		<i>Waltham.</i>	Waltham.
Barri, Joel G.		<i>Cambridgeport.</i>	Cambridgeport.
Bassett, William H.		<i>New Bedford.</i>	New Bedford.
Bell, Alfred W.		<i>West Newton.</i>	West Newton.
Bigelow, Eugene K.		<i>Natick.</i>	Natick.
Bird, Elisha B.		<i>Dorchester.</i>	122 Cottage St.
Birks, J. Henry.		<i>Montreal, P. Q.</i>	182 W. Chester Pk.
Blackmer, Edward S.		<i>Plymouth.</i>	524 Columbus Ave.
Blackmer, James W., 2d.		<i>Plymouth.</i>	Plymouth.
Blair, Burton D.		<i>Collinsville, Ct.</i>	3 Yarmouth St.
Blanchard, Frederick C.		<i>Dorchester.</i>	293 Commercial St.
Blinn, Alfred M.		<i>Roxbury.</i>	Elm Hill Ave.
Bowen, Stephen, Jr.		<i>Roxbury.</i>	7 Greenville St.
Boyd, Stephen B.		<i>Waterbury, Ct.</i>	Malden.
Brackett, William D.		<i>Minneapolis, Minn.</i>	364 Columbus Ave.
Bradlee, Henry G.		<i>Boston.</i>	113 Beacon St.
Bradley, Harry C.		<i>Boston.</i>	29 Upton St.
Brainerd, Wallace H.		<i>South Englewood, Ill.</i>	772 Dudley St.
Brooks, T. Musgrave.		<i>South Sudbury.</i>	South Sudbury.
Brown, William C.		<i>West Bridgewater.</i>	West Bridgewater.
Bryant, Dixie L.		<i>Boston.</i>	
Bryant, William P.		<i>Charleston.</i>	170 Bunker Hill St.
Bryden, George W.		<i>Chelsea.</i>	Chelsea.
Bunker, Carl H.		<i>Auburndale.</i>	Auburndale.
Burns, Robert.		<i>Somerville.</i>	Somerville.
Burton, Frank H.		<i>Providence, R. I.</i>	
Campbell, Jeremiah.		<i>Chelsea.</i>	Chelsea.
Capen, Barnard, Jr.		<i>South Boston.</i>	534 E. Fourth St.
Castle, William P.		<i>Belfast, Me.</i>	150 Chandler St.
Cater, Douglas A.		<i>New York, N. Y.</i>	117 Berkeley St.

NAME.	HOME.	RESIDENCE.
Chase, Henry M.	<i>Holyoke.</i>	Somerville.
Chickering, George W.	<i>Lawrence.</i>	Lawrence.
Childs, Arthur F.	<i>St. Albans, Vt.</i>	611 Tremont St.
Choate, F. Bradford.	<i>Salem.</i>	Salem.
Clark, Charles H.	<i>Thorndike.</i>	Wollaston Heights.
Clark, Edward A.	<i>Jamaica Plain.</i>	Greenough Ave.
Clark, Edward C.	<i>Washington, D. C.</i>	Brookline.
Clark, Joseph E.	<i>Waldoboro', Me.</i>	680 Tremont St.
Clarke, John D.	<i>Savannah, Ga.</i>	118 Boylston St.
Cleveland, E. Bartlett.	<i>Boston.</i>	7 Durham St.
Coggin, Frederick G., Jr.	<i>Lake Linden, Mich.</i>	1 Beale St.
Cogswell, Charles P., Jr.	<i>Norwich, Ct.</i>	
Colburn, Ralph D.	<i>Holliston.</i>	Holliston.
Cole, Fred. A.	<i>Camden, Me.</i>	33 Wellington St.
Cole, Harrison I.	<i>Kingston.</i>	Kingston.
Cole, John C.	<i>Newton.</i>	Newton.
Coles, Stephen L.	<i>Cincinnati, O.</i>	6 Berwick Park.
Collins, Reuben B.	<i>Braintree.</i>	Braintree.
Conant, Roger W.	<i>Gloucester.</i>	Van Winkle St.
Cook, John S.	<i>Chicago, Ill.</i>	
Cormier, Harry E.	<i>Charlestown.</i>	3 Pleasant St. Ct.
Creden, Thomas H.	<i>South Boston.</i>	940 Broadway.
Cunningham, Edward, Jr.	<i>East Milton.</i>	East Milton.
Daggett, Herbert C.	<i>Foxcroft, Me.</i>	83 Carver St.
Daland, John, Jr.	<i>Andover.</i>	Andover.
Dana, Gorham.	<i>Dorchester.</i>	Glendale St.
Dart, William C.	<i>Providence, R. I.</i>	Reservoir.
Davis, Bertram H.	<i>Ashland.</i>	Bellevue St.
Demond, Charles D.	<i>East Boston.</i>	166 Webster St.
Dillon, Arthur J.	<i>St. Louis, Mo.</i>	3 Col'umbus Sq.
Donn, Edward W., Jr.	<i>Washington, D. C.</i>	287 Columbus Ave.
Dorr, Frank H.	<i>Great Falls, N. H.</i>	67 E. Brookline St.
Douglass, Walter B.	<i>Lowell.</i>	Lowell.
Dow, Sterling T.	<i>Portland, Me.</i>	329 Shawmut Ave.
Drake, Charles K.	<i>Boston.</i>	Hotel Victoria.
Duncan, Elbridge E.	<i>Nashville, Tenn.</i>	3 Columbus Sq.
Earl, Edward.	<i>Leominster.</i>	75 Hancock St.
England, Paul W.	<i>Omaha, Neb.</i>	411 Columbus Ave.
Ensworth, Horace H.	<i>Hartford, Ct.</i>	167 W. Newton St.
Eustis, William T., Jr.	<i>Springfield.</i>	145 W. Newton St.
Favor, G. Warren.	<i>Hyde Park, Ill.</i>	788 Dudley St.
Fiske, Henry A.	<i>Roxbury.</i>	50 Elmore St.
Fitch, Herbert R.	<i>Manchester, Ct.</i>	28 Upton St.
Fitz, Charles N.	<i>Norfolk, Va.</i>	Somerville.
Forbes, Howard C.	<i>Roxbury.</i>	Elm Hill Ave.
French, Lester G.	<i>Brattleboro', Vt.</i>	7 Alban St.
Friedlander, Joseph H.	<i>New York, N. Y.</i>	8 Dale St.

NAME.	HOME.	RESIDENCE.
Füger, Frederick W.	<i>Portland, Me.</i>	323 Columbus Ave.
Fuller, Will S.	<i>Brighton.</i>	Sparhawk St.
Garrison, Charles.	<i>Roxbury.</i>	32 Linwood St.
Goodhue, Francis, Jr.	<i>Brattleboro', Vt.</i>	335 Columbus Ave.
Goodwin, Homer.	<i>Roxbury.</i>	62 Forest St.
Gottlieb, Albert S.	<i>Brooklyn, N. Y.</i>	32 Wellington St.
Greer, Medorem W.	<i>Tacoma, Wash. Ter.</i>	12 Bond St.
Haight, Charles A.	<i>Jamaica Plain.</i>	310 Centre St.
Hale, Joshua, Jr.	<i>Newburyport.</i>	Newburyport.
Hammond, Charles F.	<i>Detroit, Mich.</i>	Allston.
Hanington, Charles H.	<i>Denver, Colo.</i>	779 Tremont St.
Hansen, Charles.	<i>Chicago, Ill.</i>	3 Cheshire St.
Harwood, Harry A.	<i>Boston.</i>	212 W. Newton St.
Hatch, Arthur E.	<i>Charlestown.</i>	160 Main St.
Hathaway, Herbert E.	<i>Fall River.</i>	49 Union Park.
Hawley, George B.	<i>Hartford, Ct.</i>	62 Rutland Sq.
Hawley, William C.	<i>Malden.</i>	Malden.
Henderson, William J.	<i>Brookline.</i>	Brookline.
Hersam, Ernest A.	<i>Stoneham.</i>	Stoneham.
Highlands, John A.	<i>Fall River.</i>	
Hilliard, John D., Jr.	<i>Provincetown.</i>	28 Dwight St.
Holliday, Clyde W.	<i>Roxbury.</i>	17 Stafford St.
Holmes, Francis C.	<i>Plymouth.</i>	20 Yarmouth St.
Holmes, George A.	<i>Newton Centre.</i>	Newton Centre.
Hooper, George K.	<i>Roxbury.</i>	29 Dorr St.
Hopton, Walter E.	<i>Bridgeport, Ct.</i>	58 Rutland St.
Howard, Frank G.	<i>West Medford.</i>	West Medford.
Howard, Frank W.	<i>Hyde Park.</i>	Hyde Park.
Howland, Arthur.	<i>West Newton.</i>	West Newton.
Jacobs, Arthur L.	<i>Melrose Highlands.</i>	Melrose Highlands.
Johnson, Charles A.	<i>Norwich, Ct.</i>	
Jordan, Harry W.	<i>Kennebunk, Me.</i>	37 Winthrop St.
Keating, William E.	<i>Melrose.</i>	Melrose.
Keene, William F.	<i>Saugatuck, Ct.</i>	729 Tremont St.
Keene, Thomas M.	<i>Chelsea.</i>	Chelsea.
Kern, Harry W.	<i>Chicago, Ill.</i>	
Kimball, Herbert S.	<i>Roxbury,</i>	22 Highland Ave.
Knowles, Morris, 2d.	<i>Lawrence.</i>	Lawrence.
Knowlton, Warren F.	<i>Magnolia.</i>	Lynn.
Lawrence, William H.	<i>Dorchester.</i>	34 Sumner St.
Lee, Elisha, Jr.	<i>Port-of-Spain, Trin.</i>	729 Tremont St.
Leeming, Woodruff.	<i>Brooklyn, N. Y.</i>	28 Dwight St.
Leland, William E.	<i>Saxonville.</i>	Saxonville.
Libbey, Ernest L.	<i>Lowell.</i>	Lowell.
Liddell, D. S. Major.	<i>Denver, Colo.</i>	779 Tremont St.
Lincoln, Edward G.	<i>Chicago, Ill.</i>	Framingham.
Loewenthal, Julius W.	<i>Chicago, Ill.</i>	152 Huntington Ave.

NAME.	HOME.	RESIDENCE.
Ludington, Rowland S.	<i>Oak Park, Ill.</i>	369 Columbus Ave.
Lyman, Moses, Jr.	<i>Waverly, N. Y.</i>	309 Columbus Ave.
Mansfield, Arthur N.	<i>Wakefield.</i>	Wakefield.
Mansfield, Henry K.	<i>Salem.</i>	Salem.
Mansfield, K. William.	<i>Melrose Highlands.</i>	Melrose Highlands.
March, Clement.	<i>Cambridge.</i>	Cambridge.
McDonald, Donald.	<i>Fraserville, P. Q.</i>	
McKellops, Leo G.	<i>St. Louis, Mo.</i>	
McKenna, Alexander G.	<i>Allegheny, Pa.</i>	
McQuesten, George E.	<i>Boston.</i>	Quincy House.
McVickar, Edward.	<i>Collinsville, N. Y.</i>	Hotel Vendome.
Mead, Percy W.	<i>Darien, Ct.</i>	117 Berkeley St.
Meyer, Joseph A., Jr.	<i>Boston.</i>	10 Rutland St.
Mitchell, Guy E.	<i>Lowell.</i>	Lowell.
Moore, Frederick Campbell.	<i>Norwich, Ct.</i>	325 Columbus Ave.
Moore, Frederick Clouston.	<i>Brookline.</i>	Brookline.
Moore, Fred. F.	<i>Waltham.</i>	Waltham.
Moseley, Alexander W.	<i>Evanston, Ill.</i>	Cambridge.
Muhlenberg, Charles H.	<i>Reading, Pa.</i>	29 Berwick Park.
Nickerson, Ernest.	<i>Newton Centre.</i>	Newton Centre.
Norton, Fred. E.	<i>Little Rock, Ark.</i>	55 Pinckney St.
Otis, Hamilton.	<i>San Francisco, Cal.</i>	80 Dudley St.
Oxford, George H. K.	<i>Cambridgeport.</i>	Cambridgeport.
Page, Albion L.	<i>Stanley, N. J.</i>	15 St. James Ave.
Palmer, Charles M.	<i>Chicago, Ill.</i>	12 St. James Ave.
Palmer, William I.	<i>Winchester.</i>	Winchester.
Pierce, Albert R.	<i>New Bedford.</i>	
Pierce, Arthur W.	<i>Bardonia, Turkey.</i>	Auburndale.
Pierce, James W.	<i>Cambridge.</i>	Cambridge.
Pinto, Francisco de M.	<i>Rio de Janeiro, Brazil.</i>	241 Boylston St.
Plaisted, Sheridan, A.B.	<i>Waterville, Me.</i>	296 Columbus Ave.
Powers, Philip C.	<i>Springfield.</i>	358 Columbus Ave.
Pratt, C. Barton.	<i>Bridgewater.</i>	Mass. Gen. Hospital.
Pratt, Nathan R.	<i>Sudbury.</i>	Sudbury.
Punchard, William H.	<i>Chelsea.</i>	Chelsea.
Putnam, George.	<i>Arlington Heights.</i>	Arlington Heights.
Putnam, John.	<i>Sandwich.</i>	18 Upton St.
Quevedo, Narciso T.	<i>Guatemala, C. A.</i>	Worcester.
Reynolds, J. Frank.	<i>Marblehead.</i>	Marblehead.
Richardson, William C.	<i>Boston.</i>	365 Marlboro' St.
Ricker, Charles W.	<i>Buffalo, N. Y.</i>	377 Columbus Ave.
Rogers, George D.	<i>Salem.</i>	Salem.
Rooney, John A.	<i>Hyde Park.</i>	Hyde Park.
Ruggles, Horace F.	<i>Brookline.</i>	Brookline.
Ryder, Morrill S.	<i>Middleboro.</i>	143 W. Newton St.
Sager, Oscar F.	<i>Charlestown.</i>	52 School St.
Schwartz, John L.	<i>Pittsburgh, Pa.</i>	11 St. James Ave.



NAME.	HOME.	RESIDENCE.
Scudder, Marshall S.	<i>Brookline.</i>	Brookline.
Selfridge, Russell.	<i>Newport, R. I.</i>	198 Beacon St.
Shattuck, Arthur F.	<i>Winchester.</i>	Winchester.
Shaw, Edward H.	<i>Philadelphia, Pa.</i>	294 Columbus Ave.
Shay, William B.	<i>Roxbury.</i>	3 Warren Pl.
Shethar, Prentice.	<i>New York, N. Y.</i>	13 Arlington St.
Smith, Arthur C.	<i>Worcester.</i>	Cor. Col. Av. & Ber. St.
Smith, Edwin C.	<i>Watertown.</i>	Watertown.
Snyder, Frederick T.	<i>Chicago, Ill.</i>	385 Columbus Ave.
Soule, Frank E.	<i>Newton.</i>	Newton.
Spencer, Theodore.	<i>New London, Ct.</i>	
Spooner, George H.	<i>New Bedford.</i>	
Steel, Warner J.	<i>Philadelphia, Pa.</i>	16 Ashburton Pl.
Stickney, William.	<i>Chelsea.</i>	Chelsea.
Stix, Sol. H.	<i>Cincinnati, O.</i>	48 Chandler St.
Stix, Sylvan L.	<i>New York, N. Y.</i>	48 Chandler St.
Stoddard, Arthur B.	<i>Taunton.</i>	Taunton.
Stone, Junius.	<i>Louisville, Ky.</i>	303 Columbus Ave.
Swan, James.	<i>Dorchester.</i>	Arcadia St.
Thayer, William T.	<i>South Weymouth.</i>	South Weymouth.
Thompson, J. Gifford.	<i>Roxbury.</i>	15 Moreland St.
Trowbridge, Walter B.	<i>Newton.</i>	Newton.
Tuckerman, Samuel F.	<i>Roxbury.</i>	10 Lambert St.
Tuttle, Clarence A.	<i>Chicago, Ill.</i>	84 Charles St.
Tyler, Clifford M.	<i>Brookline.</i>	Brookline.
Urban, Charles H.	<i>Cincinnati, O.</i>	54 Montgomery St.
Vaillant, George W.	<i>New York, N. Y.</i>	13 Arlington St.
Verges, Francisco L.	<i>Maunabo, Porto Rico.</i>	14 Holyoke St.
Wait, Edward R.	<i>Glens Falls, N. Y.</i>	271 Columbus Ave.
Wait, Henry H.	<i>Chicago, Ill.</i>	82 Myrtle St.
Walker, James W. G.	<i>Washington, D. C.</i>	249 Beacon St.
Warner, George M.	<i>Fall River.</i>	275 Newbury St.
Warren, Joseph A.	<i>Cumberland Mills, Me.</i>	3 Yarmouth St.
Warren, William.	<i>Brighton.</i>	Brighton.
Waterman, Charles C.	<i>Charlestown.</i>	80 Green St.
Watson, Dudley S.	<i>Toledo, O.</i>	8 Columbus Sq.
Weed, Henry T.	<i>Brooklyn, N. Y.</i>	28 Dwight St.
Weiller, Ludwig.	<i>New York, N. Y.</i>	729 Tremont St.
Welch, James J.	<i>Salem.</i>	Salem.
Welch, Thaddeus S.	<i>Augusta, Me.</i>	5 Myrtle Pl.
Wells, Gardner F.	<i>Cambridge.</i>	Cambridge.
Wendell, Harmon.	<i>Detroit, Mich.</i>	124 Boylston St.
Weston, William H.	<i>Boston.</i>	Hotel Royal.
Wetherbee, Charles P.	<i>Detroit, Mich.</i>	Somerville.
Wetherbee, George H., Jr.	<i>East Marshfield.</i>	East Marshfield.
White, Annie E.	<i>Roxbury.</i>	233 Highland St.
White, Hartley L.	<i>Brookville.</i>	Brookville.

REGISTER OF STUDENTS.

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NAME.	HOME.	RESIDENCE.
White, J. Francis.	<i>Waterbury, Ct.</i>	271 Columbus Ave.
Whitley, Charles W.	<i>Englewood, Ill.</i>	385 Columbus Ave.
Whitney, Clarence E.	<i>Hartford, Ct.</i>	167 W. Newton St.
Wilder, Salmon W., Jr.	<i>Lowell.</i>	Lowell.
Willard, Bryant.	<i>Washington, D. C.</i>	
Wilson, Charles E.	<i>Saugus.</i>	Saugus.
Wilson, Fred. A.	<i>Nahant.</i>	40 Worcester St.
Wood, Charles H.	<i>Brookline.</i>	Brookline.
Woodward, George M.	<i>Seekonk.</i>	30 Staniford St.
Woolley, Albert P.	<i>Cincinnati, O.</i>	Medford.
Wright, Anne.	<i>Boston.</i>	4 Oxford Terrace.
Young, Harry H.	<i>Roxbury.</i>	516 Warren 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 Mechan-	Eng.,	Engl. and Pol. Sci.	Mech. and	Mechanics and
Arch.,	Architecture.	Fr.,	French.	Acoust.,	Acoustics.
Chem.,	Chemistry.	Gen. Biol.,	General Biology.	Met.,	Metallurgy.
Civ. Eng.,	Civil Engineer-	Geol.,	Geology.	Mil.,	Military Drill.
Draw.,	Mech. Drawing.	Germ.,	German.	Min.,	Mining.
Desc. Geom.,	Descriptive Ge-	Heat. and Vent.,	Heating and Ven-	Phys.,	Physics.
Elec. Eng.,	Electrical Engi-	Mech.,	Mathematics.	Shop.,	Shopwork.
Math., Chem., Draw.	ometry.	Mech.,	Mechanism.	Surv.,	Surveying.
Chem.,	neering.	Mech. Eng.,	Mechanical En-	Zoöl.,	Zoölogy.
Chem.,			gineering.		

NAME.	HOME.	RESIDENCE.
Andrews, Charles H., Math., Chem., Draw.	<i>North Easton.</i>	North Easton.
Armes, Annetta F., Chem.	<i>Nashua, N. H.</i>	
Baker, Joseph B., Eng., Shop., Chem., Math., Desc. Geom., Germ., Mech. and Acoust., Mech., Phys.	<i>Newton.</i>	Newton.
Baldwin, Frank C., Arch.	<i>Detroit, Mich.</i>	91 Newbury St.
Baldwin, James C. T., Elec. Eng., Math., Phys.	<i>Jamaica Plain.</i>	Pond St.
Beason, Charles B., Math., Mech., Phys., Fr., Desc. Geom.	<i>Nashua, N. H.</i>	30 Appleton St.
Bellows, Arthur B., Mech., Mech. Eng., App. Mech., Germ., Math., Phys., Shop.	<i>Walpole, N. H.</i>	148 C'm'nw'lth Ave.
Bickford, Lizzie E., Chem., Gen. Biol., Phys., Draw., Germ.	<i>Piermont, N. H.</i>	Franklin Park.
Bishop, Gilbert C., Arch.	<i>New London, Ct.</i>	212 W. Canton St.
Blackwell, Ethel B., Gen. Biol., Chem., Fr., Draw.	<i>Elizabeth, N. J.</i>	Boutwell Ave.

NAME.	HOME.	RESIDENCE.
Blake, Henry W., Ph.B., Elect., Elec. Eng., Math., Phys.	<i>New Haven, Ct.</i>	323 Columbus Ave.
Blood, William H., Jr., App. Mech., Elect. Eng., Math., Mech. Eng., Phys.	<i>Auburndale.</i>	Auburndale.
Bond, Sara A., Chem.	<i>East Boston.</i>	141 Trenton St.
Borden, J. Edgar, Math., Germ., Phys., Eng., Surv.	<i>Fall River.</i>	Auburndale.
Boss, Austin D., Desc. Geom., Math., Germ., Mech., Phys., Eng., Shop.	<i>Willimantic, Ct.</i>	4 Moreland St.
Boutwell, Frederic S., Math., Fr., Geol., Germ., Eng., Zoöl.	<i>Lowell.</i>	Lowell.
Boynton, Louis H., Arch.	<i>Jamaica Plain.</i>	Chestnut Ave.
Bradley, Alexander S., Jr., Chem., Math., Germ., Phys., Surv.	<i>Chicago, Ill.</i>	772 Dudley St.
Bragg, Edward F., Desc. Geom., Math., Germ., Mech., Phys., Eng., Shop.	<i>Taunton.</i>	Taunton.
Bragg, Lottie A., Chem., Fr., Germ., Draw., Phys.	<i>Braggville.</i>	Braggville.
Brainerd, Frederick H., Chem., Phys., Geol., Germ., Math., Min.	<i>So. Englewood, Ill.</i>	772 Dudley St.
Bridges, Luther W., Fr., App. Mech., Germ., Heat. and Vent., Mech. Eng., Met.	<i>So. Framingham.</i>	So. Framingham.
Burr, Charles E., Arch.	<i>Bordentown, N. J.</i>	102 Chandler St.
Buxton, Nathaniel B., Jr., Math., Chem., Draw., Phys.	<i>Woonsocket, R. I.</i>	Newtonville.
Capen, Frank I., Civ. Eng., Math., Eng., Phys., Met.	<i>Stoughton.</i>	Stoughton.
Cartwright, James W., Jr., Chem., Geol.	<i>Boston.</i>	488 Columbus Ave.
Case, John W., Arch., Fr.	<i>Detroit, Mich.</i>	306 Columbus Ave.
Chapman, Mary, Chem., Phys.	<i>Boston.</i>	52 Bowdoin St.
Chase, Arthur E., Chem., Geol., Met.	<i>Leominster.</i>	132 Chandler St.
Chase, Frank L., Draw., Math., Germ., Phys., Eng., Surv.	<i>Boston.</i>	102 Appleton St.
Chittenden, Alpheus W., Arch.	<i>Detroit, Mich.</i>	124 Boylston St.
Churchill, Charles O., Desc. Geom., Math., Germ., Mech., Phys., Eng., Shop.	<i>Abington.</i>	Abington.
Cilley, Frank H., App. Mech., Civ. Eng., Geol., Germ., Math., Eng., Phys.	<i>Dorchester.</i>	601 Dudley St.
Clemence, George H., Arch., Fr.	<i>Worcester.</i>	Worcester.
Codman, Thomas N., Chem., Germ., Eng.	<i>South Lincoln.</i>	South Lincoln.
Coffin, Winthrop, Chem.	<i>Auburndale.</i>	Auburndale.

NAME.	HOME.	RESIDENCE.
Collins, William H., Math., Chem., Germ., Phys., Eng.	<i>Phœnix, R. I.</i>	323 Columbus Ave.
Conant, Elbridge R., Civ. Eng., App. Mech., Geol., Germ., Math., Eng.	<i>Acton.</i>	381 Columbus Ave.
Crane, Edward A., Arch.	<i>Taunton.</i>	Taunton.
Crohen, George P., Arch.	<i>Brooklyn, N. Y.</i>	82 W. Newton St.
Cushing, Robert D., Math., Chem., Eng., Germ., Draw., Mil.	<i>Lunenburg.</i>	290 Columbus Ave.
Damon, J. Linfield, Jr., Math., Draw., Mil.	<i>Roxbury.</i>	34 Williams St.
Dauchy, Samuel O., A.B., Shop., Met., Draw.	<i>Chicago, Ill.</i>	354 Columbus Ave.
Deetz, Charles H., Geol., Germ., Math., Eng., Civ. Eng., App. Mech.	<i>Sellersville, Pa.</i>	196 W. Canton St.
Dittrich, Heinrich C., Arch.	<i>Kansas City, Mo.</i>	6 Lawrence St.
Doak, John E., Ph.B., Phys., Germ., Draw., Shop.	<i>Stockton, Cal.</i>	85 Dartmouth St.
Donnell, Francis M., A.B., App. Mech., Heat. and Vent., Shop., Mech. Eng., Met.	<i>Houlton, Me.</i>	108 Appleton St.
Drowne, Elizabeth R., Chem.	<i>East Boston.</i>	127 Saratoga St.
Edgerton, Charles R., Arch., Fr.	<i>Little Rock, Ark.</i>	85 Appleton St.
Ellis, Fred. E., App. Mech., Heat. and Vent., Shop., Mech. Eng., Met.	<i>Melrose.</i>	Melrose.
Emerson, Guy C., Math., Germ., Phys., Eng., Surv.	<i>Orland, Me.</i>	413 Shawmut Ave.
Estabrook, Willard W., Math., Mech., Phys., Shop., Desc. Geom.	<i>Boston.</i>	42 Rutland Sq.
Fairbairn, John T., Math., Mech., Phys., Germ., Shop., Desc. Geom.	<i>Hyde Park.</i>	Hyde Park.
Fay, Ralph M., Shop., Eng., Biol.	<i>Xenia, O.</i>	Hotel Berkshire.
Finch, Will I., Math., Chem., Fr., Germ., Eng., Shop.	<i>Scranton, Pa.</i>	
Ford, Lyman A., Arch.	<i>Cleveland, O.</i>	41 Mt. Vernon St.
Forristall, Arthur M., Chem., Germ., Geol.	<i>Boston.</i>	172 W. Newton St.
French, Alfred W., Chem., App. Mech., Civ. Eng., Geol., Germ., Math., Eng., Phys.	<i>Hartford, Ct.</i>	19 Union Park.
Gaenslen, Frederick B., Arch., Fr.	<i>San Antonio, Tex.</i>	381 Columbus Ave.
Gaines, Ambrose P., Fr., App. Mech., Chem., Math., Min., Phys.	<i>Nashville, Tenn.</i>	3 Columbus Sq.
Garfield, Alexander S., S.B., Surv., Civ. Eng., Geol., Heat. and Vent.	<i>Lexington.</i>	Lexington.
Garfield, Edmund D., Germ., Eng., Shop., Desc. Geom.	<i>Fitchburg.</i>	321 Columbus Ave.



NAME.	HOMEL	RESIDENCE.
Germer, Otto, Jr., Math., Draw., Mil.	<i>Erie, Pa.</i>	29 Berwick Park.
Gilbert, James P., Eng., Chem., Germ., Geol., Phys., Draw.	<i>Jamaica Plain.</i>	244 Chestnut Ave.
Goodwillie, Frank, Arch., Fr.	<i>New York, N. Y.</i>	116 W. Newton St.
Gould, Arthur H., Math., Chem., Eng., Fr., Mil.	<i>Portland, Me.</i>	46 Bowdoin St.
Gove, Anna M., Chem., Draw.	<i>Whitefield, N. H.</i>	69 Pinckney St.
Greene, William R., Math., Chem., Fr., Draw.	<i>Riverpoint, R. I.</i>	124 Chandler St.
Hale, Richard W., Math., Chem., Germ., Shop.	<i>Boston.</i>	5 Exeter St.
Harding, George C., Arch., Fr.	<i>Pittsfield.</i>	41 Appleton St.
Harnden, Frederic E., Chem., Germ., Eng.	<i>Boston.</i>	34 Rutland Sq.
Harvey, Philip, Math., Germ., Surv., Draw.	<i>Chicago, Ill.</i>	22 W. Concord Sq.
Hawes, George L., Chem., Math., Desc. Geom., Mech. and Acoust., Mech., Phys., Eng., Shop.	<i>Newton Centre.</i>	Newton Centre.
Hayden, Henry R., Jr., Arch.	<i>E. Hartford, Ct.</i>	13 Yarmouth St.
Hayes, Frank, Chem., Math., Germ., Mech., Phys., Eng., Shop., Desc. Geom.	<i>Superior, Wis.</i>	154 Warren Ave.
Hazard, Schuyler, Civ. Eng., Geol., Germ., Eng., Phys.	<i>Georgetown, S. C.</i>	Braintree.
Hazen, Allen, B. S., Chem., Met.	<i>Hartford, Vt.</i>	Auburndale.
Henderson, Walter P., Arch.	<i>Brookline.</i>	Brookline.
Hodges, Winthrop T., Math., Desc. Geom., Mech., Phys., Shop.	<i>Boston.</i>	408 Beacon St.
Hollis, Fred. S., Chem., Geol., Germ., Eng., Phys.	<i>Newton Highlands.</i>	Newton Highlands.
Holmes, Charles L., App. Mech., Heat and Vent., Mech. Eng.	<i>Waterbury, Ct.</i>	1 Yarmouth St.
Holmes, Eugene A., Math., Draw.	<i>Medford.</i>	Medford.
Howard, Henry, Eng., Geol., Germ., Chem.	<i>Longwood.</i>	Longwood.
Hyde, Edward W., Arch., Fr.	<i>Bath, Me.</i>	277 Columbus Ave.
Hyde, John S., Math. Eng., Desc. Geom.	<i>Bath, Me.</i>	277 Columbus Ave.
Jarecki, Fred. C., Chem., Math., Draw., Mil.	<i>Erie, Pa.</i>	29 Berwick Park.
Johnson, Lewis E., Fr., App. Mech., Math., Shop., Mech. Eng., Phys.	<i>Waterloo, Io.</i>	364 Columbus Ave.
Kahnweiler, Charles F., Chem.	<i>New York, N. Y.</i>	Cambridge.

NAME.	HOME.	RESIDENCE.
Kaufman, George C., Arch.	<i>Syracuse, N. Y.</i>	196 W. Canton St.
Kean, Alexander L., Biol., Eng., Fr., Germ.	<i>Elizabeth, N. J.</i>	1 Oxford Terrace.
Kendricken, Paul J., Chem., Math., Mech., Phys., Germ.	<i>Roxbury.</i>	376 Dudley St.
Kennicott, Harry A., Math., Draw., Phys., Surv.	<i>Nebraska City, Neb.</i>	Somerville.
Kingsbury, Fred. E., Chem., Eng., Fr., Germ.	<i>Keene, N. H.</i>	Mount Auburn.
Ladd, Frank M., Civ. Eng., Geol., Surv.	<i>Uncasville, Ct.</i>	26 Holyoke St.
La Rose, Anthime W., Arch.	<i>Albany, N. Y.</i>	306 Columbus Ave.
La Rose, Charles R., Arch.	<i>Albany, N. Y.</i>	306 Columbus Ave.
Latta, Louis M., Eng., Fr., Germ., Gen. Biol., Phys., Shop.	<i>Boston.</i>	180 C'm'nw'lth Ave.
Lee, John C., Chem.	<i>Roxbury.</i>	145 Cedar St.
Linzee, John W., Jr., Shop., App. Mech., Civ. Eng., Heat. and Vent., Met.	<i>Boston.</i>	3 Ashburton Pl.
Lipman, August, Arch., Math.	<i>Chicago, Ill.</i>	102 Dartmouth St.
Longfellow, Richard K., Arch.	<i>Portland, Me.</i>	6 Beacon St.
Lorenz, William M., Math., Germ., Phys., Eng., Surv.	<i>Allegheny, Pa.</i>	12 St. James Ave.
Loring, Atherton, Chem., Math., Germ., Mech., Phys., Eng., Desc. Geom.	<i>South Boston.</i>	789 Broadway.
Loring, Harrison, Jr., Chem., App. Mech., Germ., Mech. Eng., Phys., Math.	<i>South Boston.</i>	789 Broadway.
Macgregor, Wallace, Chem., Germ., Eng.	<i>East Braintree.</i>	East Braintree.
Maltby, M. Eliza, A.B., Math., Chem., Mech. and Acoust., Phys., Elect.	<i>Oberlin, O.</i>	331 Columbus Ave.
Manny, Edmund A., Jr., Arch., Fr.	<i>St. Louis, Mo.</i>	116 W. Newton St.
Mansur, George W., Arch., Fr.	<i>Lowell.</i>	Lowell.
Mansur, James H., Arch.	<i>Cleveland, O.</i>	
Markel, Pryor L., Draw., Shop., Math.	<i>Omaha, Neb.</i>	19 St. James Ave.
Marsh, Edmund P., Math., Germ., Mech., Phys., Shop., Desc. Geom.	<i>Newton.</i>	Newton.
Martin, Charles F., Chem., Fr., Germ.	<i>Philadelphia, Pa.</i>	84 Charles St.
Mathews, Mary E., Chem., Phys., Draw., Geol.	<i>Painesville, O.</i>	227 W. Canton St.
Mauran, J. Lawrence, App. Mech., Arch., Geol., Germ., Heat. and Vent., Math.	<i>Providence, R. I.</i>	7 W. Cedar St.

NAME	HOME.	RESIDENCE.
McDonald, Frank A., Math., Phys., Eng., Surv.	<i>Ellsworth, Me.</i>	11 Dartmouth Pl.
Merrill, William H., Jr., Germ., Phys., Math., Eng.	<i>New York, N. Y.</i>	27 St. James Ave.
Millard, Julian, Arch.	<i>St. Paul, Minn.</i>	56 Temple St.
Miller, Lilly, Chem.	<i>Charlestown.</i>	33 Essex St.
Mitchell, Robert C., Chem., Draw., Fr.	<i>New Britain, Ct.</i>	358 Columbus Ave.
Moore, Daniel A., A.B., App. Mech., Chem., Math., Met., Min.	<i>St. Louis, Mo.</i>	92 Chandler St.
Morse, Mary L. W., Chem., Germ., Met.	<i>Poland, O.</i>	Cambridgeport.
Moss, Samuel A., Math., Chem., Germ., Eng.	<i>New Berlin, N. Y.</i>	309 Columbus Ave.
Mott, William E., Chem., App. Mech., Phys., Civ. Eng., Heat. and Vent., Met.	<i>Burlington, N. Y.</i>	161 W. Brookline St.
Nelson, George L., Math., Desc. Geom., Germ., Mech., Phys., Eng., Shop.	<i>Geneva, N. Y.</i>	157 Boylston St.
Newhall, Louis C., Arch., Fr.	<i>Malden.</i>	Malden.
Newton, Edward T., Chem., Germ., Math., Shop.	<i>Holyoke.</i>	369 Columbus Ave.
Newton, James S., Germ., Eng., Geol., Shop., Civ. Eng.	<i>Holyoke.</i>	369 Columbus Ave.
Nims, Norman G., Math., Arch., Germ., Phys., Desc. Geom., Eng.	<i>Keene, N. H.</i>	Somerville.
Orrok, George A., Math., Chem., Fr., Germ., Phys., Eng.	<i>Boston.</i>	186 W. Brookline St.
Osborne, George C., Desc. Geom., Math., Germ., Mech., Phys., Eng., Shop.	<i>Tate, Ga.</i>	Newtonville.
Palmer, Alice W., Math., Biol.	<i>Roxbury.</i>	Bellevue St.
Parmelee, George L., Phys.	<i>Boston.</i>	15 Chester Park.
Pendleton, Lyman B., App. Mech., Civ. Eng., Math., Phys.	<i>Stonington, Ct.</i>	212 W. Canton St.
Pennell, Henry B., Arch., Fr.	<i>Portland, Me.</i>	The Warren.
Pickering, Oscar W., Chem., Geol., Germ.	<i>Malden.</i>	Malden.
Pierce, Frank L., App. Mech., Math., Mech. Eng., Phys., Shop.	<i>Springfield.</i>	136 Huntington Ave.
Pierce, Robert M., Math., Chem., Draw., Mil., Eng.	<i>Concord.</i>	Concord.
Pietsch, Theodore W., Arch., Fr., Geol., Math., Germ.	<i>Chicago, Ill.</i>	40 Clifford St.
Plumer, William G., Arch., Geol.	<i>Peabody.</i>	Peabody.
Pope, Henry H., Chem., Germ., Phys., Eng.	<i>Dorchester.</i>	1050 Adams St.

## REGISTER OF STUDENTS.

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NAME.	HOME.	RESIDENCE.
Preston, Evans, Arch., Desc. Geom.	<i>Boston.</i>	Hotel Berkeley.
Proctor, William, Jr., Arch., Fr., Heat. and Vent.	<i>Arlington.</i>	Arlington.
Pulsford, Henry A., Chem.	<i>South Orange, N. J.</i>	Cambridge.
Rankin, John H., Arch.	<i>Lock Haven, Pa.</i>	138 Boylston St.
Redd, Benoist S., App. Mech., Heat. and Vent., Mech. Eng., Met., Shop.	<i>Richmond, Va.</i>	124 Chandler St.
Rice, Arthur W., Arch.	<i>Jamaica Plain.</i>	51 Eliot St.
Rickoff, W. Monroe, Chem., App. Mech., Elect., Germ., Math., Eng., Mech. Eng., Phys.	<i>New York, N. Y.</i>	2 Oxford Terrace.
Ripley, Hubert G., Arch.	<i>Melrose Highlands.</i>	Melrose Highlands.
Roberts, Harold B., Math., Germ., Mech., Phys., Eng., Shop., Desc. Geom.	<i>Boston.</i>	81 Mt. Vernon St.
Robinson, Graham, Chem., Fr., Phys., Germ.	<i>East Taunton.</i>	East Taunton.
Rollins, Montgomery, Fr., Geol., Germ., Eng., Phys., Math., Zool.	<i>Concord, N. H.</i>	218 W. Newton St.
Ropes, Arthur D., Arch., Math.	<i>Orange, N. J.</i>	Lincoln.
Selfridge, George S., Chem., Math., Desc. Geom., Germ., Mech. and Acoust., Mech., Phys., Eng., Shop.	<i>Boston.</i>	124 Boylston St.
Shattuck, George C., Arch., App. Mech., Heat. and Vent.	<i>Nashua, N. H.</i>	408 Columbus Ave.
Sheldon, Janet R., Chem., Draw.	<i>Rutland, Vt.</i>	13 Arlington St.
Sheldon, Samuel B., Math., Chem., Germ., Phys.	<i>Manchester.</i>	Manchester.
Simonds, Frederic N., Math., Draw, Mil., Fr.	<i>Woburn.</i>	Woburn.
Sjöström, Ivar L., App. Mech., Civ. Eng., Heat. and Vent., Met.	<i>Lawrence.</i>	Lawrence.
Sloan, William J., Arch.	<i>Syracuse, N. Y.</i>	8 Isabella St.
Smith, Clarence W., A.B., Chem., Met.	<i>Cambridge.</i>	Cambridge.
Smith, Frank W., A.B., Chem.	<i>Dorchester.</i>	Mill St.
Smith, Joseph C., Chem., Met.	<i>Providence, R. I.</i>	25 Yarmouth St.
Spalding, Ephraim, Math., Chem., Draw., Eng., Fr., Mil.	<i>Salisbury.</i>	Cambridgeport.
Spencer, Robert C., Jr., B.M.E., Arch., App. Mech., Math.	<i>Milwaukee, Wis.</i>	760 Tremont St.
Stanford, Philip W., Math., Draw., Fr.	<i>San Francisco, Cal.</i>	141 Warren Ave.
Stickney, Delia, Phys., Chem.	<i>Danversport.</i>	Danversport.



NAME	HOME.	RESIDENCE.
Stickney, Lilla F., Chem.	<i>Charlestown.</i>	214 Main St.
Stone, G. Goodwin, Chem., Geol., Germ., Eng., Min., Zoöl.	<i>Evanston, Ill.</i>	80 Dudley St.
Stone, George W., Arch., Fr.	<i>Madisonville, O.</i>	W. Medford.
Sweetland, Ralph, Chem., Germ., App. Mech., Heat. and Vent., Shop.	<i>Natick.</i>	Natick.
Tamkin, Herman W., Arch.	<i>Syracuse, N. Y.</i>	56 Chandler St.
Tappan, Ernest S., Math., Chem., Draw., Eng., Fr., Mil.	<i>Roxbury.</i>	88 Cedar St.
Taylor, George W., Arch.	<i>Morristown, N. J.</i>	115 Berkeley St.
Thompson, Lewis S., Civ. Eng., Surv.	<i>New York, N. Y.</i>	13 Arlington St.
Thompson, W. Scott, Math., Draw., Mil.	<i>Erie, Pa.</i>	29 Berwick Park.
Tilson, Willard C., Math., Chem., Germ., Phys.	<i>Malden.</i>	Malden.
Tracy, Paul H., Arch.	<i>Boston.</i>	620 Tremont St.
Tripp, Thaxter N., Germ., Shop., Phys., Eng., Draw.	<i>Lynn.</i>	Lynn.
Tucker, William H., Math., Draw., Fr., Shop.	<i>Middletown, Ct.</i>	40 Tennyson St.
Tuttle, Herbert C., Germ., Chem.	<i>Concord.</i>	West Newton.
Van Nostrand, Frank B., Chem., Germ., Eng.	<i>Charlestown.</i>	10 Auburn St.
Wales, George C., Arch., Fr., Germ.	<i>Boston.</i>	202 C'm'nw'lth Ave.
Walker, Ambrose, Chem., Draw., Eng., Fr., Shop., Mil.	<i>Boston.</i>	237 Beacon St.
Walker, Charles R., Chem., Phys., Geol., Germ., Eng.	<i>Cambridgeport.</i>	Cambridgeport.
Walker, Lucy, Germ.	<i>Boston.</i>	237 Beacon St.
Weld, Edward M., Math., Draw., Fr.	<i>Dedham.</i>	Dedham.
Wheeler, Leonard A., Shop., Math., Draw., Eng., Mil.	<i>Troy, O.</i>	Lincoln.
Wheeler, Sam, Civ. Eng., App. Mech., Met.	<i>Concord.</i>	Concord.
Whipple, Frank L., Chem.	<i>Lawrence.</i>	Lawrence.
White, Joseph B., Desc. Geom., Germ., Mech., Phys., Shop.	<i>North Hanson.</i>	North Hanson.
Whitmore, Henry, 2d, Eng.	<i>Newton.</i>	Newton.
Whitney, Willis R., Chem., Germ., Phys., Eng., Fr., Math.	<i>Jamesstown, N. Y.</i>	41 Union Park.

REGISTER OF STUDENTS.

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NAME.	HOME.	RESIDENCE.
Wilber, Nathan B., Math., Phys., Surv.	<i>Bridgewater.</i>	100 Roxbury St.
Willes, Will D., Chem., Math., Germ., Phys., Surv.	<i>Trenton, N. J.</i>	248 Newbury St.
Wilson, Arthur R., Fr., Math., Germ., Phys., Eng., Surv.	<i>Oakland, Cal.</i>	
Wood, George B., A.B., Desc. Geom., Draw., Shop., Met., Mech. and Acoust., Phys., Mech. Eng., Shop.	<i>Philadelphia, Pa.</i>	84 Charles St.
Wood, J. Delano, Fr., Eng., Shop., Zool.	<i>New Bedford.</i>	86 Mt. Vernon St.
Woodman, Caroline A., A.B., Chem., Gen. Biol., Geol.	<i>Lewiston, Me.</i>	148 W. Newton St.
Woodward, Harvey G., Chem., Geol., Met., Min.	<i>Boston.</i>	34 Union Park.
Wright, Vernon A., Arch.	<i>Boston.</i>	51 Chestnut St.

SUMMARY: SCHOOL OF INDUSTRIAL SCIENCE.

GRADUATE STUDENTS . . . . .	23
REGULAR STUDENTS, 4th year . . . . .	79
"        "        3d " . . . . .	78
"        "        2d " . . . . .	124
"        "        1st " . . . . .	237
SPECIAL STUDENTS . . . . .	200
	<hr/>
	741
Deduct names counted twice . . . . .	22
	<hr/>
Total . . . . .	719

### 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 1887-88 are on the following subjects:—

I. *Light*.—Twelve lectures by Professor Cross, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 7.

II. *Chemistry of Dyeing and Coloring*.—Twelve lectures by Associate Professor Norton, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 7.

III. *History of the Biological Sciences*.—Twelve lectures by Associate Professor Sedgwick, on Tuesdays and Thursdays at 7.30 P.M., beginning Nov. 8.

IV. *Theory of the Steam Engine*.—Twelve lectures by Assistant Professor Peabody, on Tuesdays and Thursdays at 7.30 P.M., beginning Nov. 8.

V. *Assaying*.—Twelve laboratory exercises by Assistant Professor Clark, on Saturdays at 2 P.M., beginning Nov. 12.

VI. *Analytic Geometry*.—Twelve lectures by Professor Runkle, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 14.

VII. Twelve lectures *in French* on literary subjects by Associate Professor Luquiens, on Mondays and Fridays at 7.30 P.M., beginning Nov. 28.

VIII. *House Drainage and the Disposal of Sewage*.—Twelve lectures by Assistant Professor Porter, on Mondays and Wednesdays at 7.30 P.M., beginning Jan. 9.

IX. *Map Sketching and the Use of Pocket Surveying Instruments*.—Twelve lectures by Assistant Professor Burton, on Tuesdays and Fridays at 7.30 P.M., beginning Feb. 3.

X. *Introduction to Middle High German*.—Twelve lectures by Professor Otis, at 7.30 P.M., to begin early in February.



SCHOOL OF MECHANIC ARTS.

LOWELL SCHOOL OF PRACTICAL DESIGN.

## SCHOOL OF MECHANIC ARTS.

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This school, established by the Corporation in 1876, is essentially a High School, with some of the familiar studies replaced by extended instruction in mechanical and freehand drawing, and in carpentry, wood and iron turning, pattern making, forging, chipping and filing, etc. (see p. 52). The course of study is of two years' duration, the minimum age of admission being fifteen years, and the requirements for entrance embracing the ordinary studies of a good grammar school. The tuition fees are \$150 a year. The school is in charge of Mr. Clarence W. Fearing, instructor in mathematics and English, instruction in the remaining studies being given by some of the instructors in the School of Industrial Science (see p. 12).

### REGISTER OF STUDENTS.

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#### REGULAR STUDENTS.

##### SECOND YEAR.

NAME.	HOME.	RESIDENCE.
Edwards, William,	<i>Quincy.</i>	Quincy.
Hindes, Stetson G.,	<i>Burlington, Vt.</i>	
Lenz, Charles O.,	<i>Providence, R. I.</i>	312 Shawmut Ave.
Lobenstine, Horace G.,	<i>Boston.</i>	544 Columbus Ave.
Morse, William A.,	<i>Foxboro'.</i>	Foxboro'.
Savage, Arthur C.,	<i>Hyde Park.</i>	Hyde Park.

##### FIRST YEAR.

Barrows, George S.,	<i>Auburndale.</i>	Auburndale.
Breed, Stephen A.,	<i>Lynn.</i>	Lynn.
Chadwick, James E.,	<i>Edgartown.</i>	
Elder, George J.,	<i>East Boston.</i>	12 Falcon St.

NAME.	HOME.	RESIDENCE.
Fuller, Arthur B.,	<i>Middleton.</i>	11 Bulfinch St.
Gilson, Henry Y.,	<i>Somerville.</i>	Somerville.
Killilea, James J.,	<i>East Boston.</i>	74 Everett St.
Ledwith, Joseph M.,	<i>New York, N. Y.</i>	385 Columbus Ave.
Lincoln, Louis L.,	<i>Taunton.</i>	Taunton.
Noyes, Herman L.,	<i>Abington.</i>	Abington.
Porter, Edward A.,	<i>Calais, Me.</i>	
Tilson, George M.,	<i>Malden.</i>	Malden.
Webster, Laurence J.,	<i>Boston.</i>	232 Newbury St.
Westcott, Charles H.,	<i>Kennebunkport, Me.</i>	Maplewood.
Williams, Walter W.,	<i>Boston.</i>	321 Dudley St.
Wright, Ernest V.,	<i>Boston.</i>	423 Shawmut Ave.

SPECIAL STUDENTS.

Barnard, S. Martin, Shop., Math., Draw.	<i>Mt. Cuba, Del.</i>	Waltham.
Bockus, Charles E., Shop., Math., Draw., Phys.	<i>Dorchester.</i>	3 Ashland St.
Folsom, Charles B., Shop., Draw.	<i>Boston.</i>	22 Indiana Pl.
Grover, William H., Shop., Draw.	<i>Charleston, S. C.</i>	Allston.
Hall, Frederic D., Shop., Draw.	<i>East Boston.</i>	43 White St.
Hayes, Alfred C., Fr., Math., Draw.	<i>Kittery, Me.</i>	760 Tremont St.
Hunting, Herbert A., Shop., Math., Draw.	<i>Charlestown.</i>	28 Mead St.
Macdonald, Alec. F., Shop., Draw.	<i>Chelsea.</i>	Chelsea.
Miller, Dwight, Eng., Math., Phys.	<i>Sacramento, Cal.</i>	3 Yarmouth St.
Paine, Herbert W., Shop., Draw.	<i>Elmwood.</i>	Elmwood.
Pattison, Edwin H., Shop., Draw.	<i>Webster.</i>	236 W. Canton St.
Putnam, Charles H., Math., Draw., Fr., Eng., Shop.	<i>Fitchburg.</i>	335 Columbus Ave.
Sherman, Edward F., Shop., Math., Draw., Phys.	<i>New Haven, Ct.</i>	92 Chandler St.
Skinner, Theodore H., Shop., Draw.	<i>Boston.</i>	126 Berkeley St.
Sperry, Horace B., Math., Fr., Shop., Draw.	<i>Boston.</i>	741 Tremont St.

TOTAL . . . . . 37

## LOWELL SCHOOL OF PRACTICAL DESIGN.

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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-loom for dress goods, three fancy chain-loom 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 a competent weaver, 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. 24, 1888. 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. 18, 1888. 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.

## LOWELL SCHOOL OF PRACTICAL DESIGN.

### STUDENTS.

NAME.	HOME.	RESIDENCE.
Baker, Grace T.,	<i>Weymouth.</i>	Weymouth.
Bates, Elizabeth E.,	<i>Newton.</i>	Newton.
Baylor, Armistead K.,	<i>Jamaica Plain.</i>	Boylston St.
Blood, Grace C.,	<i>Lowell.</i>	Lowell.
Brooks, Jenny,	<i>Salem.</i>	Salem.
Brown, Harold H.,	<i>Malden.</i>	Malden.
Bryant, Albert,	<i>Melrose.</i>	Melrose.
Cain, Leonard L.,	<i>West Hingham.</i>	West Hingham.
Campbell, Annie P.,	<i>Plymouth.</i>	Cambridgeport.
Carr, Benjamin K.,	<i>Cambridgeport.</i>	Cambridgeport.
Choate, Jeanette H.,	<i>Newton Centre.</i>	Newton Centre.
Clark, Louis W.,	<i>Middleboro'.</i>	Middleboro'.
Coffey, Ella C.,	<i>Boston.</i>	4 Gardner Ave.
Cohn, Luona,	<i>Milford.</i>	68 Warrenton St.
Connor, Katherine L.,	<i>South Boston.</i>	8 Pacific St.
Converse, L. S.,	<i>Stafford Springs, Ct.</i>	426 Columbus Ave.
Dawson, George W.,	<i>Jamaica Plain.</i>	Centre St.
Dickinson, Marion,	<i>Boston.</i>	151 West Newton St.
Doane, Julia S.,	<i>Newtonville.</i>	Newtonville.
Edson, Alice,	<i>Jamaica Plain.</i>	Rockview St.
Emery, Fred. A.,	<i>Roxbury.</i>	201 Ruggles St.
Felton, Louis E.,	<i>Natick.</i>	Natick.
Foster, Winfred C.,	<i>Fitchburg.</i>	Fitchburg.
Fowle, Willard C.,	<i>Woburn.</i>	Woburn.
French, Grace E.,	<i>Rockland.</i>	Rockland.
Gilleran, James F.,	<i>Mapleville, R. I.</i>	
Girdler, John L.,	<i>Boston.</i>	143 Warren Ave.
Hall, James,	<i>Jamaica Plain.</i>	Rockview St.
Hathaway, Anna M.,	<i>Brockton.</i>	Brockton.
Hawes, Nellie L.,	<i>Dorchester.</i>	Harrison Sq.
Henchman, Russel B., Jr.,	<i>Hyde Park.</i>	Hyde Park.
Hill, William L.,	<i>Somerville.</i>	Somerville.

## STUDENTS.

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NAME.	HOME.	RESIDENCE.
Howell, Charlotte E.,	<i>Millville, N. J.</i>	40 Berkeley St.
Hunt, William C.,	<i>New Bedford.</i>	New Bedford.
Knowland, Thomas E.,	<i>Middleboro'.</i>	Middleboro'.
Lamprey, Belle,	<i>Charlestown.</i>	137 High St.
Lawrie, Fred. H.,	<i>Medford.</i>	Medford.
Lynch, Michael J.,	<i>Boston.</i>	45 Emerald St.
Meehan, William F.,	<i>Melrose Highlands.</i>	Melrose Highlands.
Moore, Fred. C.,	<i>Newton Highlands.</i>	Newton Highlands.
Morse, Edith O.,	<i>Salem.</i>	Salem.
Newton, Annie H.,	<i>Greenfield.</i>	Cambridge.
Norton, William A.,	<i>Killingly, Ct.</i>	
Parsons, Winslow A.,	<i>Saugus.</i>	Saugus.
Philbrick, Lizzie,	<i>Newton Centre.</i>	Newton Centre.
Pratt, Walter F.,	<i>North Weymouth.</i>	North Weymouth.
Prouty, Annah R.,	<i>Chelsea.</i>	Chelsea.
Puffer, Mary P.,	<i>West Newton.</i>	West Newton.
Sanford, Charles E.,	<i>Fall River.</i>	Fall River.
Shaw, Otis,	<i>Hyde Park.</i>	Hyde Park.
Sidelinger, William F.,	<i>Quincy Point.</i>	Quincy Point.
Smith, Annette S.,	<i>East Boston.</i>	177 Lexington St.
Stantial, Susie M.,	<i>Melrose.</i>	Melrose.
Stetson, Ada Z.,	<i>Charlestown.</i>	55 High St.
Stetson, Clarabel,	<i>Malden.</i>	Malden.
Thacher, Elizabeth M.,	<i>Dorchester.</i>	Stoughton St.
Thompson, Hathorn J.,	<i>Elmira, N. Y.</i>	112 W. Concord St.
Tirrell, Herbert W.,	<i>Weymouth.</i>	Weymouth.
Turner, Frances E.,	<i>Boston.</i>	7 Hereford St.
Underwood, Carleton J.,	<i>Groton.</i>	709 East Fourth St.
West, Frederic W.,	<i>Haverhill.</i>	Haverhill.
Wheeler, Frank E.,	<i>Fitchburg.</i>	Fitchburg.

TOTAL . . . . . 62

THE SOCIETY OF ARTS.



## THE SOCIETY OF ARTS.

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*President.*

FRANCIS A. WALKER, LL.D.

*Secretary.*

LINUS FAUNCE.

*Executive Committee.*

GEORGE W. BLODGETT, *Chairman.*

C. J. H. WOODBURY,  
HENRY M. HOWE,

GEORGE O. CARPENTER.  
JOHN W. TUFTS.

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 of Technology 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: Steel for Warfare, by Mr. H. M. Howe; Railroad Engineering Education, by Mr. C. D. Jameson; Incandescent Lighting from Arc-Light Circuits, by Mr. Frank Ridlon; The New Art of Electric Welding, by Prof. Elihu Thomson; Stellar Photography, by Prof. E. C. Pickering; The Evolution of the Modern Yacht, by Mr. Edward Burgess; The Use of the Freezing Process for Excavating in Soft Materials, by Mr. Charles Spoonsmith; Experimental Comparison of Some Different Methods of Measuring the Flow of Water, by Prof. George F. Swain; The Water Power of the United States, by Mr. Dwight Porter; The Bessemerizing of Copper Mattes, by Dr. E. D. Peters, Jun.; Coal Mining, by Mr. Stuart M. Buck; The Source of Business Profits, by Pres. Francis A. Walker; Railway Tracks, by Mr. P. H. Dudley; The Martin-Wilson Automatic Fire Alarm, by Messrs. A. H. Kendall and M. Martin; Electrical Distribution by the Aid of Induction Coils, by Mr. M. M. Slattery.

# GRADUATES

FROM THE  
SCHOOL OF INDUSTRIAL SCIENCE.

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With the exception of names marked with a † the addresses have been corrected to the present year.

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. 18.

1868.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
† ELLERY C. APPLETON, Lincoln, Neb.	III.	Assistant Engineer, Burlington & 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'fg Company.
WILLIAM E. HOYT, Rochester, N. Y.	I.	Chief Eng. of Buffalo, Rochester & Pittsburg R. R. Co.
ROBERT H. RICHARDS, Boston, Mass.	III.	Professor of Mining and Metallurgy, Mass. Institute of Technology.
WALTER H. SEARS, 35 Congress St., Boston, Mass.	I.	Civil Engineer.
*CHARLES A. SMITH.	I.	Died February 4, 1884.
JOSEPH STONE, 85 Milk St., Boston, Mass.	I.	In Business.
†BRYANT P. TILDEN, Carrington, D. T.	III.	Chief Engineer, Jamestown & 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, E. Las Vegas, N. M.	I.	Assistant Engineer, New Mexico Division A., T. & S. F. R. R.
HOWARD A. CARSON, 21 Hamilton St., cor. Franklin, Boston, Mass.	I.	Civil Engineer.
J. RAYNER EDMANDS, Cambridge, Mass.	II.	In charge of Time Service at Harvard College Observatory.
*WILLIAM RIPLEY NICHOLS.	V.	Died July 14, 1886.
CHANNING WHITAKER, 23, 24, and 25 P. O. Building, Lowell, Mass.	II.	Mill and Steam Engineering, Construction, Consultation, and Expert Work.

## 1870.

*EDWARD K. CLARK.	II.	Died September 10, 1878.
CHARLES R. CROSS, Boston, Mass.	Sci. and Lit.	Thayer Professor of Physics, Massachusetts Institute of Technology.
RUSSELL H. CURTIS, 59 Clark Street, Chicago, Ill.	I.	Lawyer.
CHARLES W. HINMAN, 32 Hawley St., 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, Mass.	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.
LAURENCE 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 N. Market St., Boston, Mass.	I.	Of the firm of Skilton, Foote & Co., Manufacturers of Pickles.



136 GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
FRANK L. FULLER, Rooms 35, 36, 12 Pearl St., Boston, Mass.	I.	Engineer, Marblehead Water Works.
HENRY M. HOWE, A.M., Hotel Oxford, Boston, Mass.	III.	Mining Engineer and Lecturer on Metallurgy, Mass. Institute Tech.
ALBERT H. HOWLAND, A.M., 12 West Street, Boston, Mass.	I.	Civil Engineer.
G. RUSSELL LINCOLN, Pottstown, Penn.	III.	Chemist, Pottstown Iron Co.
WILLIAM A. PIKE, 2525 University Avenue S. E., Minneapolis, Minn.	I.	Professor of Engineering and Director of the College of Mechanic Arts of the University of Minnesota.
GEORGE H. PRATT, 1 Longmeadow St., Dorchester, Mass.	V.	Chemist, with Merrimac Chemical Co., So. Wilmington, Mass.
EDWARD W. ROLLINS, Box 2157, Denver, Col.	III.	Dealer in Municipal Bonds.
WALTER W. SMITH, Dayton, O.	II.	Builder of Steam Pumps and Hydraulic Machinery (Smith, Vaile & Co.).
CHARLES F. STONE, Waltham, Mass.	III.	Lawyer.
*ALMARIN TROWBRIDGE, Jr.	II.	Died December 5, 1878.
ISAIAH S. P. WEEKS, Lincoln, Neb.	I.	Chief Engineer, Burlington & Missouri Railroad in Nebraska.
RANDAL WHITTIER, 444 W. Jefferson St., Louis- ville, Ky.	V.	Cashier, Kentucky Branch office N. Y. Life Insurance Company,

1872.

C. FRANK ALLEN, Boston, Mass.	I.	Assistant Professor of R. R. Engineering, Mass. Institute of Technology.
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 Steel Company.
JAMES A. HERRICK, 6 Crosby Sq., Bishopsgate St., London, Eng.	V.	Agent for a Gas Producer.
JAMES M. HODGE, Plymouth, Mass.	III.	
BRADFORD H. LOCKE, Central City, Colo.	III.	Mining Engineer.
CHAS. S. MINOT, S. D. (Harv.), Boston, Mass.	V.	Assistant Professor of Histology and Embryology, Harvard Med. School.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 137

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
MAURICE B. PATCH, Lake Linden, Mich.	III.	Superintendent of Calumet & Hecla Smelting Company.
WALTER SHEPARD, A.B., Arion St., Dorchester, Mass.	I.	Assistant Engineer, Boston & Albany Railroad.
RICHARD H. SOULE, A.B., 21 Cortlandt St., New York, N. Y.	II.	General Manager, N. Y., L. E. & W. R. R. Co.
CLARENCE S. WARD, Allston, Mass.	III.	Lawyer.
<b>1873.</b>		
AMORY AUSTIN, A.B., 14 Kilby St., Boston, Mass.	V.	Analytic and Sanitary Chemist.
GEORGE W. BLODGETT, 63 Kilby St., Boston, Mass.	I.	Assistant Engineer, B. & A. R. R., and Manufacturing Electrician.
WILLIAM E. BROTHERTON, Cincinnati, O.	V.	Book-keeper, Second National Bank.
*SAMUEL A. FABENS, Jr.	I.	Died March 14, 1875.
SAMUEL M. FELTON, Jr., 21 Cortlandt St., New York, N. Y.	I.	First Vice-President of N. Y., L. E. & W. R. R. Co.
†FREDERICK L. FISHER, Medway, Mass.	I.	Insurance Agent and Broker, 35 Kilby Street, Boston.
FREDERICK GUILD, Jr., Sci. and Lit. Boston, Mass.		With Whittier Machine Company, 1176 Tremont Street.
W. DALE HARRIS, 292 Nelson St., Ottawa, Can.	I.	Chief Engineer, P. P. J. Railway, Consulting Engineer M. & W. Railway, Chief Engineer O. & G. Valley R'y.
†CLAR. L. HOWES, A.B., M.D., Hanover, Mass.	II.	Physician.
*WILLIAM P. JEWETT.	I.	Died January 4, 1884.
†WILLIAM A. KIMBALL, San Bernardino, Cal.	II.	
*WILLIAM C. MAY, FRANK B. MORSE, Murphy's, Cal.	V.	Died March 11, 1878.
CHARLES O. PARSONS, 77 State St., Boston, Mass.	I.	Superintendent, Willard Mining Company.
†GEORGE PHILLIPPS, Marshfield, Mass.	III.	Mining Engineer.
HENRY A. PHILLIPS, Worcester, Mass.	III.	Mining Engineer.
ELLEN H. RICHARDS, A.M., Boston, Mass.	IV.	Superintendent, Worcester Division, Fitchburg R. R.
HENRY L. RIPLEY, Care Horatio Adams, Box 2526, Boston, Mass.	V.	Instructor in Sanitary Chemistry, Mass. Institute of Technology.
	I.	First Lieutenant Third Cavalry, U.S.A., Fort Davis, Texas.

138 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
ROBERT A. SHAILER, 36 Montauk Block, Chicago, Ill.	I.	Of the firm of W. G. Coolidge & Co., Engineers and Contractors.
C. EDWARD STAFFORD, Care Shoenberger & Co., Pittsburg, Penn.	III.	Supt. Bessemer and Open Hearth De- partments, 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 Ob- servatory.
WEBSTER WELLS, Boston, Mass.	I.	Associate Professor of Mathematics, Mass. Institute of Technology.
RANDAL WHITTIER.	I.	(See Record of Class of 1871.)
FRANCIS H. WILLIAMS, M. D., Corner Newbury and Dartmouth Streets, Boston, Mass.	V.	Physician. Assistant Professor of Ma- teria Medica and Therapeutics, Har- vard Medical School.
LOUIS F. WOOD, 34 Oliver Street, Boston, Mass.	V.	Chemical and Color Manufacturer.
<b>1874.</b>		
†HERBERT BARROWS, Reading, Mass.	I.	Real Estate First-Mortgage Loans.
GEORGE H. BARRUS, 95 Milk Street, Boston, Mass.	II.	Expert and Consulting Steam Engineer.
WILLIAM T. BLUNT, Cleveland, O.	I.	Principal Inspector, U. S. Engineer's Office.
GEORGE E. DOANE, Middleboro', Mass.	I.	Of the firm of J. & G. E. Doane, Hardware.
WILLIAM B. DOWSE, 11 Central St., Boston, Mass.	IV.	Of the Metropolitan Rubber Company.
†JOSEPH S. EMERSON, Honolulu, Hawaiian Islands.	I.	Field Assistant, Government Survey.
ELIOT HOLBROOK, 77 4th Ave., Pittsburg, Penn.	I.	Gen. Superintendent, P. & L. E. R. R.
†AECHIRAU HONGMA, Tokio, Japan.	I.	Civil Engineer.
CHARLES P. HOWARD, Hartford, Conn.	I.	Secretary, J. L. Howard & Co., Dealers in Railway and Car Builders' Sup- plies.
†FRANK H. JACKSON, Maple Hill, Kan.	III.	Stock-raising.
*WILLIS H. MYRICK.	II.	Died October 17, 1875.
†HERBERT B. PERKINS, Appleton, Wis.	I.	Professor of Mathematics and Astron- omy, Lawrence University.
FRANK H. POND, 707 Market St., St. Louis, Mo.	II.	Proprietor, Pond Engineering Com- pany.
EDWARD S. SHAW, 5 Pemberton Sq., Boston, Mass.	I.	Consulting Engineer.

GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE. 139

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
FRANCIS H. SILSBEE, Lawrence, Mass.	II.	Superintendent, 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, 64 West Third St., Cincinnati, O.	Sci. and Lit.	Of the firm of Ferris & Wilder, Attorneys-at-Law.

1875.

SAMUEL E. ALLEN, 65 Chauncy St., Boston, Mass.	I.	Agent for the Nashawannuck 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, Honolulu, H. I.	I.	Civil Engineer and Surveyor, Government Survey.
EDGAR S. DORR, 14 Beacon St., Boston, Mass.	I.	Asst. Engineer, Sewer Department.
†WILLIAM C. EDES, 24 Hotel Baldwin, Boston, Mass.	I.	Civil Engineer.
CHARLES W. GOODALE, Butte City, M. T.	III.	Mine Superintendent, Colorado Smelting and Mining Company.
EDWARD A. W. HAMMATT, 5 Pemberton Sq., Boston, Mass.	I.	Civil and Hydraulic Engineer.
†EDWARD A. HANDY, Laredo, Tex.	I.	Engineer, Northern Division, Mexican National Railway.
*JAMES H. HEAD.	II.	Died August 18, 1875.
THOMAS HIBBARD, 232 Beech St., Holyoke, Mass.	II.	Head Draughtsman, Deane Steam Pump Company.
*WILLIAM F. HUNTINGTON.	I.	Died August 7, 1877.
L. P. KINNICUTT, S. D. (Harv.), Worcester, Mass.	V.	Professor of Applied Chemistry at Worcester Polytechnic Institute.
WILFRED LEWIS, 3234 Powelton Ave., Philadelphia, Penn.	II.	Asst. Engineer, with William Sellers & Co., incorporated.
†SAMUEL J. MIXTER, M. D., 180 Marlboro' Street, Boston, Mass.	VIII.	Asst. Demonstrator of Anatomy, Harvard Medical School.



140 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
BENJAMIN A. OXNARD, Brooklyn, N. Y.	III.	Superintendent of Fulton Sugar Refinery.
†THOMAS D. PLIMPTON, Hyde Park, Mass.	II.	Employed in the manufacture of Woolen Goods.
†WILLIAM A. PRENTISS, Sci. and Lit. Holyoke, Mass.		Of the firm of Geo. W. Prentiss & Co., Manufacturers of Iron Wire.
FRANCIS T. SARGENT, 335 Broadway, 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.	Civil Engineer and Bridge Inspector.

1876.

†CHARLES F. ALLEN, Occidental Hotel, San Francisco, Cal.	III.	Mining Engineer and Metallurgist.
THOMAS ASPINWALL, 12 Pearl Street, Boston, Mass.	I.	Civil Engineer.
WILLIAM P. ATWOOD, 81 Appleton St., Lowell, Mass.	V.	Chemist at the Hamilton Print Works.
THOMAS W. BALDWIN, A. B., Room 1, Exchange Block, Bangor, Me.	I.	Civil Engineer.
WALTER B. BARROWS, Washington, D. C.	VII.	First Asst. Ornithologist, U. S. Dept. of Agriculture.
AARON D. BLODGETT, 63 Kilby St., Boston, Mass.	II.	Expert and Manufacturing Electrician.
†JOSHUA B. F. BREED, 1026 Fourth Av., Louisville, Ky.	I.	Assistant City Engineer, in charge of Sewers, Western District.
HARRY T. BUTTOLPH, Buffalo, N. Y.	I.	Assistant City Engineer, in charge of Paving.
FREDERICK K. COPELAND, 22 W. Lake St., Chicago, Ill.	I.	Vice-President and Treasurer, Diamond Prospecting Company.
WILLIAM O. CROSBY, Boston, Mass.	VII.	Asst. Prof. of Mineralogy and Lithology, Mass. Inst. of Technology.
WILLIS E. DAVIS, Sci. and Lit. 211 Drumm St., San Francisco, Cal.		Employed by Davis & Cowell, Manufacturers of Santa Cruz Lime.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 141

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
*CLARENCE L. DENNETT.	II.	Died June 5, 1878.
CHARLES R. FLETCHER, 88 Equitable Building, Boston, Mass.	V.	Consulting Chemist and Metallurgist.
JOHN R. FREEMAN, 31 Milk St., Boston, Mass.	I.	Inspector and Hydraulic Engineer, Associated Factory Mutual Insur- ance Cos.
FRANCIS E. GALLOUPE, 30 Kilby St., Boston, Mass.	II.	Mechanical Engineer.
*ROBERT H. GOULD.	Metallurgy.	Died November 19, 1878.
JOHN B. HENCK, Jr., Longwood, Fla.	VIII.	Editor, Florida Republican.
FRANK W. HODGDON, Arlington, Mass.	I.	Asst. Eng'r with the Harbor and Land Com. of Mass., Boston.
SUMNER HOLLINGSWORTH, South Braintree, Mass.	II.	President, Hollingsworth & Whitney Paper Company.
SILAS W. HOLMAN, Boston, Mass.	VIII.	Associate Professor of Physics, Mass. Institute of Technology.
ALFRED E. HUNT, 95 & 97 Fifth Ave., Pittsburg, Penn.	III.	Of the firm of Hunt & Clapp, Chemists and Metallurgical Engineers, Pitts- burg Testing Laboratory.
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, Jr., Rico, Colo.	III.	Metallurgist, Pasadena Reduction Company.
ALFRED C. KILHAM, North Springfield, Mo.	II.	Employed in Motive Power Dept., St. Louis & 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, P. O. Box 2395, Denver, Colo.	V.	Chemist.
CHARLES T. MAIN, Lawrence, Mass.	II.	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. & K. C. R. R.
†WILLIAM E. NICKERSON, 351 Broadway, N. Somerville, Mass.	V.	Chemist.
DAVID W. PHIPPS, Seattle, Washington Ter.	Phil.	Attorney-at-Law.
CHARLES F. PRICHARD, Lynn, Mass.	II.	Superintendent of the Lynn Gas-Light Company.
HENRY RAEDER, 218 La Salle St., Chicago, Ill.	I.	Henry Raeder & Co., Architects and Engineers.

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NAME AND RESIDENCE.	COURSE.	OCCUPATION.
CHARLES L. RICH, East Jaffrey, N. H.	I.	Cashier, Monadnock National Bank.
*THOMAS W. ROBINSON.	III.	Died November 3, 1880.
CHARLES A. SAWYER, Sci. and Lit. Room 5, 125 Dearborn St., Chicago, Ill.	Attorney-at-Law.	
THEODORE E. SCHWARZ, Red Mt., Ouray Co., Colo.	III.	Superintendent, Yankee Girl Mining Company.
†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 Street, 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, 14 Beacon Street, Boston.	I.	Assistant Engineer, Sewer Department.

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, Mason Building, Boston, Mass.	IV.	Architect.
WILLIAM H. BEECHING, 61 Blackstone St., Boston, Mass.	II.	Cork Manufacturer.
G. WALTER CAPEN, Canton, Mass.	IV.	Architect.
HENRY H. CARTER, 14 Beacon St., Boston, Mass.	I.	Chief Engineer, Boston Sewer Dept.
WILLIAM E. CHAMBERLIN, 6 Beacon St., Boston, Mass.	IV.	Of the firm of Chamberlin & Whidden, Architects.
*GEORGE H. CHAPMAN.	II.	Died January 21, 1879.
LINUS FAUNCE, Boston, Mass.	II.	Assistant Professor of Drawing, Mass. Institute 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.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 143

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
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 St., Lowell, Mass.	I.	Assistant Engineer in office of Propri- etors of Locks and Canals on Merrimack River.
†EDMUND GROVER, Zanesville, O.	I.	Assistant Engineer, C., B. & Q. R. R.
RICHARD A. HALE, Lawrence, Mass.	I.	Principal Assistant 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.
HENRY D. HIBBARD, Pittsburg, Penn.	III.	Supt. Steel Dept., Linden Steel Co.
WALTER JENNEY, 55 G St., South Boston, Mass.	III.	Superintendent, Petroleum Refinery, Jenney Manufacturing Company.
*JOSEPH KIRK.	II.	Died July, 1886.
GEORGE W. KITTREDGE, Corner Fourteenth and Main Sts., Louisville, Ky.	I.	Engineer, Maintenance of Way, J., M. & I. R. R., and Engr. Louisville Bridge Co.
CHARLES F. LAWTON, Cañon City, Colo.	I.	Engineering Department, A., T. & S. Fé R. R.
BENJAMIN C. MUDGE, 70 Kilby St., Boston, Mass.	I.	N. E. Sales Agent for H. R. Worth- ington's Hydraulic Works, etc.
CECIL H. PEABODY, Boston, Mass.	II.	Assistant Prof. of Steam Engineering, Mass. Institute of Technology.
ARTHUR L. PLIMPTON, 7 Hawthorn St., Roxbury, Mass.	I.	Street Railway Surveyor and Engineer, 16 Kilby Street.
HARRY C. SOUTHWORTH, Hancock, Lake Superior, Mich.	III.	Mining and Civil Engineering, Explor- ing, etc.
*CHARLES E. STEWART.	I.	Died October 7, 1877.
THOMAS F. STIMPSON, Providence, R. I.	III.	Overseer, Printing Dept., Silver Spring Bleaching and Dyeing Co.
GEORGE F. SWAIN, Boston, Mass.	I.	Professor of Civil Engineering, Mass. Institute of Technology.
†FRANK E. WIGGIN, Santa Fé, Argentine Republic.	I.	Engineer, <i>Ferro Carril de Sta Fé a las Colonias.</i>
†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.



144 GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
†TAKUMA DAN, Chikugo, Japan.	III.	General Supt., Mieke Imperial Coal Mines.
CHARLES S. EATON, 219 Washington St., Boston, Mass.	IV.	In business.
ALFRED S. HIGGINS, 35 Howard St., Boston, Mass.	IV.	With R. R. Higgins & Co.
JULIAN A. KEBLER, 1657 Larimer St., Denver, Colo.	I.	General Superintendent, Colorado Fuel Co.
FRANK H. MORGAN, 142 Cascadilla Pl., Ithaca, N. Y.	V.	Instructor in Chemistry, Cornell University.
EVERELL J. NICHOLS, Burlington, Io.	I.	Engineer Corps, Chicago, Burlington & Quincy Railroad.
FREDERICK H. PRENTISS, 22 Cortlandt St., New York, N. Y.	II.	With N. Y. Steam Co.
JAMES RITCHIE, 44 Euclid Ave., Cleveland, O.	I.	Civil Engineer.
†JAMES W. ROLLINS, Jr., Hicksford, Va.	I.	Chief Engineer, Atlantic & Danville Railroad.
C. D. SAWIN, M. D., 349 Main St., Charlestown, Mass.	Sci. and Lit.	Physician and Surgeon to Massachusetts State Prison.
PETER SCHWAMB, Boston, Mass.	II.	Assistant Prof. of Mechanism, Mass. Institute of Technology.
FREDERIC P. SPALDING, 444 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.
EMILE F. WILLIAMS, 230 Washington Street, Boston, Mass.	I.	Loans on Mortgages of Real and Personal Property.
JAMES G. WOOLWORTH, Norwich, Ct.	V.	With Norwich Dyeing 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.

GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE. 145

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
FRED. S. COFFIN, 152 Congress St., Boston, Mass.	III.	Manager, Wool Department, Stoddard, Lovering & Co.
W. OTIS DUNBAR, Altoona, Penn.	II.	In charge of Pennsylvania R. R. Test Room.
†GEORGE W. FABENS, Chariton, Io.	I.	Division Roadmaster, Chicago, Bur- lington & Quincy R. R.
CHARLES S. GOODING, 28 School St., Boston, Mass.	II.	Mechanical Engineer and Draughts- man.
ERNEST G. HARTWELL, 68 Devonshire St., Boston, Mass.	IV.	With Hartwell & Richardson, Archi- tects.
†RAPHAEL M. HOSEA, Swan, Marion Co., Io.	I.	Mine Superintendent, Whitebreast Coal and Mining Company.
HORACE J. HOWE, Elmira, N. Y.	I.	Engineer, N. Y., L. E. & W. R. R.
FREDERICK B. KNAPP, Duxbury, Mass.	I.	Principal, Scientific Preparatory School.
FRED. H. LANE, Room 101, 26 Broadway, New York, N. Y.	II.	With Standard Oil Company.
†FRED. R. LORING, 8 Greenwich Park, Boston, Mass.	VII.	Studying in Germany.
WILLIAM W. MACFARLANE, 110 Oxford St., Philadelphia, Penn.	V.	Assistant Superintendent, Quaker City Dye Works.
ARTHUR H. METCALF, Pawtucket, R. I.	II.	Mechanical Engineer.
EDWIN C. MILLER, Wakefield, Mass.	II.	Assistant Superintendent, Henry F. Miller & Sons' Piano Company.
EDWARD H. OWEN, Jr., 150 Crescent Street, Waltham, Mass.	II.	Unemployed. Out of health.
WILLIAM H. PICKERING, Cambridge, Mass.	VIII.	Assistant in charge of Boyden Dept., Harvard College Observatory.
GEORGE F. RIGGS, Enterprise, Kan.	I.	Division Engineer, C. K. & N. Railway.
FRANK G. STANTIAL, Melrose, Mass.	V.	In charge of Cochrane Chemical Com- pany's Ammonia Works, East Cam- bridge.
WILLIAM S. STEARNS, Wyoming, O.	I.	Superintendent, Stearns & Foster Co.'s Cotton Factory, Cincinnati, O.
ARTHUR M. WAITT, 41 Dwight St., Boston, Mass.	II.	General Foreman, Car Dept., Boston & Maine R. R., Salem, Mass.

## 1880.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
GEORGE H. BARTON, Boston, Mass.	III.	Instructor in Determinative Mineralogy, Mass. Institute of Technology.
CHARLES H. BROWN, 688 Shawmut Avenue, Boston, Mass.	I.	
EDWIN E. CHASE, Central City, Colo.	I.	United States Deputy Surveyor and Mining Engineer.
FREDERICK W. CLARK, Boston, Mass.	III.	Assistant Professor of Mining and Met- allurgy, Mass. Institute of Tech.
GEORGE W. HAMILTON, 14 Beacon Street, Boston, Mass.	I.	With the Sewer Department.
LORING R. MILLEN, Savannah, Ga.	III.	Wholesale Lumber Dealer, Stillwell, Pike & Millen.
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.	Assistant Metallurgist, Kansas City Smelting and Refining Co.
*JAMES S. ATKINSON.	II.	Died December 17, 1883.
AMOS BINNEY, A.B., Walpole, Mass.	V.	Chemist, Walpole Dye and Chemical Works.
†DAVID S. BISSELL, Pittsburgh, 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, Altoona, Penn.	III.	Employee, Pennsylvania R. R.
BENJAMIN G. COLLINS, Edgartown, Mass.	II.	
HARRY H. CUTLER, Newton, Mass.	II.	Superintendent, Newton Electric Light and Power Co.
F. GRAEF DARLINGTON, Moxahala Ave., Zanesville, O.	IX.	Superintendent and Secretary, Cincin- nati & Muskingum Valley Railway Co.
JOHN DUFF, 14 Sheafe St., Charlestown, Mass.	V.	
DAVID S. GODDARD, Lowell, Mass.	III.	With Coburn Shuttle Co.
*MARIE G. HOLMAN, A.M.	V.	Died May 5, 1885.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
†WALTER J. KOEHLER, Parral, Chihuahua, Mexico.	V.	Metallurgist.
EDWIN J. LEWIS, Jr., 9 Park St., Boston, Mass.	IV.	Architect.
WILLIAM B. LINDSAY, A.B., Carlisle, Penn.	V.	Professor of Chemistry, Dickinson College.
JAMES LUND, 22 James St., Malden, Mass.	V.	Superintendent, Indigo Works, Cochran Chemical Co.
GEORGE A. MOWER, 75 Queen Victoria St., London, Eng.	II.	Manager, English Branch Crosby Steam Gage and Valve Co.
WEBSTER NORRIS, Melrose, Mass.	III.	Chemist, Boston Rubber Shoe Co.
EVELYN W. ORDWAY, New Orleans, La.	V.	Professor of Chemistry and Physics, Newcomb College, Tulane Univ.
THEODORE PARKER, Burlington, Io.	I.	Assistant Engineer, C., B. & Q. R. R.
NATHANIEL W. SHED, Nashua, N. H.	V.	Chemist, with the Nashua Iron and Steel Co.
WILLIAM R. SNEAD, 318 W. Chestnut St., Louis- ville, Ky.	IV.	Superintendent, The Snead Co. Iron Works.
HAROLD E. STEARNS, Montreal, P. Q.	II.	Treasurer, Dominion Wadding Co.
EDWARD R. WARREN, Crested Butte, Colo.	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, 119, 121, and 123 Third Street, Des Moines, Io.	II.	Wholesale Implement business.
EDWARD F. ELY, A.B., 6 Beacon St., Boston, Mass.	IV.	With Andrews & Jaques, Architects.
GEORGE FAUNCE, A.B., Mansfield Valley, Allegheny Co., Penn.	III.	Assistant Superintendent of Pennsylvania Lead Company's Works.
*HARRY A. FOSS.	II.	Died August 19, 1885.
CHARLES A. FRENCH, Boston, Mass.	III.	Instructor in Mathematics, Massachusetts Institute of Technology.



148 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
HOWARD V. FROST, Care of Klettig u. Reibstein, Bankers, Göttingen, Germany.	V.	Student at the University.
EDW. G. GARDINER, Ph.D., Boston, Mass.	VII.	Instructor in Biology, Massachusetts Institute of Technology.
†FRANCIS P. HALL, Columbia St., Dorchester, Mass.	V.	Assayer.
†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, Watertown, N. Y.	II.	Chief Draughtsman, Eames Vacuum Brake Co.
GEORGE W. MANSFIELD, Cleveland, O.	III.	Electrical Engineer.
†FRANK C. MORRISON, 89 Court St., Boston, Mass.	I.	Engineer and Draughtsman.
JAMES P. MUNROE, 10 Batavia St., Boston, Mass.	III.	Secretary, Massachusetts Institute of Technology.
CARRIE L. RICE, 2818 Arapahoe St., Denver, Colo.	V.	Teacher of Chemistry and Algebra, Denver High School.
WILLIAM T. RIPLEY, Center Rutland, Vt.	II.	Superintendent, Ripley Sons' Wholesale Marble Works.
HENRY F. ROSS, Jamaica Plain, Mass.	III.	With Boston Thread and Twine Co.
JOHN H. ROSS, Jamaica Plain, Mass.	Elective.	Superintendent, Boston Thread and Twine Co.
GRENVILLE T. SNELLING, 15 Rue de Buci, Paris, Fr.	IV.	Student of Architecture, <i>Ecole Nationale et Speciale des Beaux Arts</i> .
WALTER B. SNOW, Watertown, Mass.	II.	With B. F. Sturtevant, Jamaica Plain.
ANTHONY C. WHITE, 141 Pearl St., Boston, Mass.	VIII.	With American Bell Telephone Co.

1883.

HERBERT T. BARDWELL, Box 1265, Springfield, Mass.	I.	With Aerated Fuel Co.
GEORGE H. BRYANT, Auburn, Ala.	II.	Professor of Mechanic Arts, Alabama Polytechnic Institute.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 149

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
HARVEY S. CHASE, Great Falls, N. H.	II.	Supt., Gas Light Co. and Great Falls Manufacturing Co.'s Water Works.
†FRANK E. DAVIS, Boston, Mass.	II.	In business.
JOHN G. EPPENDORFF, Buffalo, N. Y.	IV.	Interior Decorator and Designer.
†GEORGE J. FORAN, 95 Liberty St., New York, N. Y.	II.	With Geo. F. Blake Manufacturing Co.
WILLIAM B. FULLER, 5 Banning Block, Duluth, Minn.	I.	City Engineer.
HORACE B. GALE, 2645 Washington Ave., St. Louis, Mo.	II.	Professor of Dynamic Engineering, Washington University.
GEORGE H. GUSTIN, Beaufort, S. C.	III.	Chemist, Sea Island Chemical Co.
FREDERIC O. HARRIMAN, Jaltipan, Mex.	I.	Civil Engineer and Contractor.
†JAMES H. HUTCHINGS, 1672 Washington St., Boston, Mass.	II.	
HARVEY M. MANSFIELD, Fairfield, Me.	III.	Supt., Somerset Fiber Company.
ROBERT W. SCOTT, 44 N. Fourth St., Philadelphia, Penn.	II.	Mechanical Engineer and Draughtsman.
GEORGE A. SMITH, Arlington, Mass.	V.	Of the firm of Thos. Strahan & Co., Manufacturers of Wall Paper, Chelsea, Mass.
†FRANK TENNEY, Steeltown, Dauphin Co., Penn.	III.	Asst. Superintendent, Blast Furnace Department, Penn. Steel Company.
CHARLES H. TOMPKINS, Jr., 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., corner Blackwell, Chicago, Ill.	V.	Chemist, with N. K. Fairbank & Co.
1884.		
CHARLES B. APPLETON, Hotel Oxford, Boston.	II.	In Draughting Office of E. D. Leavitt, Jr., Mech. Engineer, Cambridgeport.
†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, Spokane Falls, Wash. Ter.	III.	Asst. Engineer, Northern Pacific R. R.

150 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
HENRY A. BOARDMAN, Providence, R. I.	V.	With the Silver Spring Bleaching and Dyeing Company.
CHARLES C. BOTHFELD, Pittsburg, Penn.	I.	With Pittsburg Testing Laboratory.
†W. FRANK CARR, B. S., Minneapolis, Minn.	I.	Of the firm of Spalding & Carr.
CHRISTOPHER J. CARVEN, 1604 Dorchester Ave., Dorchester, Mass.	I.	City Engineer's Office, Boston.
ROSCOE L. CHASE, 110 Oxford St., Philadelphia, Penn.	V.	Chemist, Quaker City Dye Works.
ALFRED O. DOANE, Skowhegan, Me.	III.	Chemist of Fiberite M'fg Co.
ALFRED L. FITCH, 85 Seeley Ave., Chicago, Ill.	II.	
GEORGE L. R. FRENCH, Lincoln, Neb.	I.	Resident Engineer, Burlington & Missouri River Railroad.
AUG. H. GILL, Mass. Inst. of Technology, Boston, Mass.	V.	Water Analyst, State Board of Health.
†FRED M. HAINES, Boston, Mass.	III.	Assistant Engineer, Northern Pacific R. R.
GEORGE H. HEYWOOD, Gardner, Mass.	III.	With Heywood Brothers, Chair Manufacturers.
JAMES G. HOLDER, 73 Broad St., Lynn, Mass.	V.	Apothecary.
GEORGE F. KNAPP, P. O. Box 25, Steelton, Penn.	V.	Supt., Blast Furnaces, Penn. Steel Co.
AMY STANTIAL LUND, 22 James St., 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 and Milling Company.
†CHARLES O. PRESCOTT, Plymouth, Mass.	V.	Teacher of Chemistry.
WILLIAM L. PUFFER, Boston, Mass.	III.	Instructor in Physics, Mass. Institute of Technology.
ARTHUR J. PURINTON, Boston, Mass.	II.	Instructor in Mechanical Engineering, Mass. Institute of Technology.
WILLIAM J. RICH, Lowell, Mass.	III.	Office, Proprietors of Locks and Canals on Merrimack River.
FRANKLIN B. RICHARDS, Box 6, Youngstown, O.	III.	Manager of Himrod Furnaces.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 151

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
C. SNELLING ROBINSON, Fourth Avenue West, Duluth, Minn.	III.	Analytical Consulting Chemist and Assayer.
THEODORE W. ROBINSON, Fourth Avenue West, Duluth, Minn.	III.	Analytical Consulting Chemist and Assayer.
A. LAWRENCE ROTCH, 3 Commonwealth Avenue, Boston, Mass.	II.	Proprietor, Blue Hill Meteorological Observatory, Readville, Mass.
JOSIAH P. RYDER, East Boston, Mass.	V.	Teacher, Dorchester High School.
ALFRED STEBBINS, Jr., 187 West St., N. Y. City.	III.	Office of Engineer of Buildings and Bridges, N. Y., L. E. & W. R. R.
ELLIOT T. STURGIS, Cheyenne, Wyoming.	III.	With the Union Cattle Company.
ALICE BROWN TYLER, Göttingen, Germany.	V.	
HARRY W. TYLER, Obere Karspile, 20 D, Göttingen, Germany.	V.	Student at the University.
NAHUM WARD, Mt. Seaver Ave., Roxbury, Mass.	V.	Chemist, with N. Ward Co.
WILLIAM M. WHITNEY, Winchendon, Mass.	II.	With Baxter D. Whitney, Manufacturer Wood-working Machinery.
FRANCIS C. WILLIAMS, Jr., Lincoln, Neb.	I.	Draughtsman, 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.	Supt. Blast Furnace Dept., Pennsylvania Steel Company.
EDWARD R. BENTON, Ph.D., Newton Centre, Mass.	IV.	Draughtsman, with McKim, Mead & White.
HEYWOOD COCHRAN, Louisville, Ky.	II.	Draughtsman, with Louisville Bridge and Iron Company.
†EDWARD H. DEWSON, Jr., Quincy, Mass.	II.	Employed in shops of the Old Colony R. R., Boston, Mass.
FREDERICK FOX, Jr., 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.



152 GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
WALTER K. HARRINGTON, Green Bay, Wis.	I.	Supt. of Green Bay & Fort Howard Water Works Company.
ELEAZER B. HOMER, Boston, Mass.	IV.	Instructor in Architecture, Mass. Insti- tute of Technology.
FRANK H. LORD, 65 Oliver St., Boston, Mass.	II.	With the Wainwright Manufacturing Company.
TRACY LYON, Tonawanda, N. Y.	II.	With Armitage, Herschel & Co., Tonawanda Eng. and Boiler Works.
HUGH MACRAE, Wilmington, N. C.	III.	Mining Engineer.
HENRY MARTIN, Mass. Institute of Technology, Boston, Mass.	V.	Water Analyst, State Board of Health.
ALLYNE L. MERRILL, Cambridge, Mass.	II.	Instructor in Mechanical Engineering, Mass. Institute of Technology.
*EBEN G. MERRILL.	I.	Died October 12, 1887.
EVERETT MORSS, 323 Marlboro' St., Boston, Mass.	III.	With Morss & Whyte, Wire Workers.
FREDERICK H. NEWELL, Boston, Mass.	III.	Graduate Student, Mass. Institute of Technology.
†JOSEPH E. NUTE, 813 South Nineteenth Street, Omaha, Neb.	I.	With United Gas Improvement Com- pany of Philadelphia, Penn.
†MARCELLA I. O'GRADY, Baltimore, Md.	IX.	Science Teacher in Bryn Mawr School.
FRANK A. PICKERNELL, New York, N. Y.	VI.	With American Telephone and Tele- graph Company.
RICHARD H. PIERCE, A. B., 185 Dearborn St., Chicago, Ill.	VI.	Electrician, with Leonard & Izard.
NEWBERT M. RANDALL, Steelton, Penn.	III.	Assistant Chemist, Pennsylvania Steel Company.
OTIS T. STANTIAL, 50 Waubausia Avenue, Chicago, Ill.	III.	Chemist, North Chicago Rolling Mill Company.
HENRY P. TALBOT, Holliston, Mass.	V.	Instructor in Chemical Analysis, Mass. Institute of Technology.
GEORGE P. VANIER, Steelton, Penn.	III.	Chemist, Pennsylvania Steel Co.
ERASTUS WORTHINGTON, Jr., Dedham, Mass.	I.	Civil Engineer, Water Works and Sewerage Construction.
1886.		
GEORGE P. ABORN, Warren, Mass.	II.	With the Knowles Pump Works.
ARTHUR C. ANTHONY, 33 Nassau St., N. Y. City.	III.	Inspector for the Commonwealth Ins. Company.

GRADUATES : SCHOOL OF INDUSTRIAL SCIENCE. 153

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
DANA P. BARTLETT, Boston, Mass.	VI.	Assistant in Mathematics, Mass. Inst. of Technology.
BIRNEY C. BATCHELLER, Fort Hamilton, N. Y. Harbor.	II.	With the Pneumatic Dynamite Gun Company.
WILLIAM L. BRAINERD, 68 Devonshire St., Boston, Mass.	IV.	Draughtsman, with Hartwell & Richardson, Architects.
JOHN K. BURGESS, Dedham, Mass.	II.	Farming.
CHARLES L. BURLINGHAM, 2207 Calumet Ave., Chicago, Ill.	III.	Supt.'s Asst., Chicago and Aurora Smelting and Refining Company.
WM. H. CHADBOURN, Jr., Chadbourne, N. C.	III.	Chief Engineer and Supt. Construction, Wilmington, Chadbourne & Conway Railroad.
WILLIAM L. CHURCH, 80 Ferry Street, Malden, Mass.	VI.	
HARRY E. H. CLIFFORD, Boston, Mass.	VI.	Assistant in Physics, Mass. Inst. 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.	Aid, Boston Sewer Department.
CHARLES C. DOE, 224 Commonwealth Ave., Boston, Mass.	VII.	Student at Harvard Medical School.
ORRIN S. DOOLITTLE, Altoona, Penn.	V.	Assistant in Laboratory of the Pennsylvania Railroad.
JAMES C. DUFF, Milwaukee, Wis.	V.	Chemist, C. M. & St. P. Railway.
GEORGE W. FARMER, Topeka, Kan.	II.	In the shops of the Atchison, Topeka & Santa Fé Railroad.
EDWARD S. FOSS, Boston, Mass.	V.	Assistant in General Chemistry, Mass. Institute of Technology.
FRED. E. FOSS, A.B., Galena, Ill.	I.	Resident Engineer, Minn. & Northwestern Railroad Tunnel.
THEODORE R. FOSTER, Aurora, Ill.	II.	Office of Mechanical Engineer, C., B. & Q. R. R.
ALEX. S. GARFIELD, Lexington, Mass.	II.	Graduate Student, Mass. Institute of Technology.
D. LEWIS K. HATHAWAY, Warren, Mass.	II.	Draughtsman at Knowles Pump Works.
EDWARD E. HIGGINS, St. Johnsbury, Vt.	VI.	Asst. Electrician, Standard Electric Company of Vermont.
†WILLIAM J. HOPKINS, Stanhope St., Boston, Mass.	VI.	With N. E. Weston Electric Light Company.

154 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
†WALTER R. INGALLS, 115 Ocean St., Lynn, Mass.	III.	Mining Engineer, Leadville, Colo.
†WILLIAM F. JORDAN, Lincoln, Neb.	I.	Engineering Department of the Burlington & Mo. River Railway.
C. BELLE KENNEY, 111 Saratoga Street, East Boston, Mass.	V.	Science Teacher, Bryn Mawr School, Baltimore, Md.
JOHN A. McC. LAWRENCE, 1364 South Thirteenth St., Denver, Colo.	II.	Machinist in shops of the Denver & Rio Grande R. R.
ALBERT E. LEACH, 87 Milk St., Boston, Mass.	II.	Solicitor of Patents, with W. B. H. Dowse, Counselor-at-Law.
FRANK L. LOCKE, 7 Eaton St., Boston, Mass.	I.	In City Engineer's Office, Boston, Mass.
WILSON H. LOW, Eighteenth and Blackwell Sts., Chicago, Ill.	V.	Chemist, with N. K. Fairbank & Co.
ELGOOD C. LUFKIN, Lockport, N. Y.	II.	With Holly Manufacturing Company.
JAMES P. LYNDE, 37 & 39 Main St., Palmer, Mass.	IX.	Druggist.
ALEX. R. MCKIM, Care Mendelssohn & Cie., Berlin, Germany.	I.	Student, <i>Königliche Technische Hoch- schule.</i>
HARRY B. MERRIAM, Room N, Union Depot, Denver, Colo.	I.	Assistant to Division Engineer, Union Pacific Railway.
HENRY P. MERRIAM, Fort Hamilton, N. Y.	VI.	With Pneumatic Dynamite Gun Com- pany.
EDWARD F. MILLER, Boston, Mass.	II.	Assistant in Mechanical Engineering, Mass. Institute of Technology.
EDGAR H. MUMFORD, Omaha, Neb.	II.	In shops of the Union Pacific R'y.
ARTHUR A. NOYES, S.M., Boston, Mass.	V.	Asst. in Analytical Chemistry, Mass. Institute of Technology.
EDWARD L. PIERCE, Jr., 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, Cam- bridge, Mass.	II.	Student at Harvard Law School.
ARTHUR G. ROBBINS, Boston, Mass.	I.	Assistant in Civil Engineering, Mass. Institute of Technology.
L. KIMBALL RUSSELL, So. Chicago, Ill.	V.	Assistant Chemist, North Chicago Rolling Mill Company.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
†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 & Co.
†THEODORE STEBBINS, 185 Dearborn Street, Chicago, Ill	VI.	Electrician, with Western Edison Light Company.
AUGUSTUS B. STOUGHTON, 411 Walnut St., Philadelphia, Penn.	II.	With Morgan & Lewis, Attorneys-at-Law.
WILLIAM M. TAYLOR, Indianapolis, Ind.	II.	With Chandler & Taylor, Phoenix Machine Works. *
CHARLES D. TURNBULL, Boston, Mass.	II.	With Hecht Brothers & Co., Wool Dealers.
DAVID VAN ALSTINE, 710 Fourteenth St. ville, Ky.	II.	With Snead & Bibb, Architectural Iron Works.
MAURICE A. VIELÉ, B.S., New York, N. Y.	II.	Engineer Corps, New Croton Aqueduct Commission.
†C. MORRIS WILDER, Cincinnati, O.	VI.	
ELWOOD J. WILSON, Salt Lake City, Utah Ter.	III.	Chemist, Germania Lead Works.
†CHARLES WOOD, Pittsburg, Penn.	I.	With Keystone Bridge Company.
CHARLES H. WOODBURY, 22 School St., Boston, Mass.	II.	Artist.
VERNOR F. WORCESTER, 14 Park St., Rutland, Vt.	II.	In Draughting Dept. of the Howe Scale Company.
FRED. R. YOUNG, Steelton, Penn.	III.	In Bessmer Department of the Pennsylvania Steel Company.

## 1887.

GEORGE A. ARMINGTON, 1884 Euclid Ave., Cleve- land, O.	II.	Instructor in Mech. Engineering, Case School of App. Science.
†SIDNEY R. BARTLETT.	VII.	
CHARLES A. BARTON, Waltham, Mass.	II.	With Boston Manufacturing Company, Bleaching and Dyeing Dept.
WILLIAM B. BLAKE, Louisville, Ky.	I.	In Engineer Dept., J., M. & I. R. R.
WALTER C. BRACE, P. O. Box 752, Pueblo, Colo.	III.	Assayer, Pueblo Smelting and Refining Company.



156 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
†HENRY B. BRAINERD, 113 Drummond St., Montreal, P. Q.	IX.	
†DWIGHT BRAINERD, 113 Drummond St., Montreal, P. Q.	IX.	
HENRY F. BRYANT, Room 2, Town Hall, Brookline, Mass.	I.	With A. H. French, Civil Engineer.
FRANK G. BURGESS, 807 Bush St., San Francisco, Cal.	I.	With Southern Pacific R. R. Co.
JULIAN A. CAMERON, Graniteville, Mass.	II.	With Abbot Worsted Mills.
FRANK D. CARNEY, Steelton, Penn.	III.	With Pennsylvania Steel Company.
WINTHROP COLE, West Wareham, Mass.	II.	With Tremont Nail Company.
HENRY J. CONANT, West Lynn, Mass.	II.	With Thomson-Houston Electric Light- ing Company.
HELEN COOLEY, Lawrence, Mass.	V.	Asst. Chemist, Pacific Mills.
RALPH E. CURTIS, Newburyport, Mass.	II.	Assistant in Mechanical Engineering, Mass. Institute of Technology.
WILLIAM C. CUSHING, A.B., Fourteenth and Main Sts., Louisville, Ky.	I.	On Engineer Corps, J. M. & I. R. R.
SARAH L. DAY, A.B., 280 Newbury St., Boston, Mass.	V.	
WALTER C. FISH, 7 Park St., Lynn, Mass.	VI.	With Thomson Electric Welding Co.
JOHN M. FOX, Boston, Mass.	VI.	Asst. in Drawing, Mass. Institute of Technology.
JOSEPH B. GAY, 220 Devonshire St., Boston, Mass.	IV.	With Allen & Kenway, Architects.
WALTER H. GLEASON, 12 Faneuil Hall Market, Boston, Mass.	V.	With W. Gleason & Co., Fruit Com- missioners.
WILLIAM S. HADAWAY, Jr., 7 Park St., Lynn, Mass.	VIII.	With Thomson-Houston Electric Co.
WILLIAM O. HILDRETH, Boston, Mass.	II.	Asst. in Mechanical Engineering, Mass. Institute of Technology.
JAMES C. HOBART, 56 Plum St., Cincinnati, O.	II.	With the James L. Haven Co.
OREN S. HUSSEY, Lowell, Mass.	II.	With Wamesit Water Power Co.

GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE. 157

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
EDWARD A. JONES, 7 East St., Pittsfield, Mass.	II.	With E. D. Jones, Millwright and Mfr. of Paper Machinery.
CHARLES B. KENDALL, Boston, Mass.	V.	Asst. in General Chemistry, Mass. Institute of Technology.
WILLIAM D. LIVERMORE, 133 Orms St., Providence, R. I.	V.	Second hand in Dyehouse of Silver Springs Bleaching and Dyeing Co.
PHILIP A. MOSMAN, 212 N. Hickory St., Joliet, Ill.	III.	Asst. in Laboratory of Joliet Steel Co.
SAMUEL P. MULLIKEN, McMicken Ave., Cincinnati, O.	V.	Assistant in Chemistry, University of Cincinnati.
GEORGE L. NORRIS, Chicago, Ill.	III.	Asst. Chemist, North Chicago Rolling Mill Company.
GEO. W. PATTERSON, Jr., A.B., 1 Oxford Terrace, Boston, Mass.	VI.	Assistant in Mathematics, Mass. Inst. of Technology.
QUINTARD PETERS, 488 Peachtree Street, Atlanta, Ga.	IX.	
HERBERT A. RICHARDSON, Mass. Inst. of Technology, Boston, Mass.	V.	Water Analyst, State Board of Health.
FRANZ H. SCHWARZ, Lawrence, Mass.	II.	Draughtsman at Lower Pacific Mills.
HENRY D. SEARS, Lynn, Mass.	VI.	With Thomson-Houston Electric Co.
FRANK E. SHEPARD, 15 Ashland Street, Dorchester, Mass.	II.	In Boston & Albany Locomotive Works.
CHARLES P. SMITH, Norwich, Conn.	II.	With C. B. Rogers & Co., Manufacturers of Wood-working Machinery.
HARRY E. SMITH, Mass. Inst. of Technology, Boston, Mass.	V.	Private Asst. to Prof. L. M. Norton.
J. WALDO SMITH, Holyoke, Mass.	I.	Asst. Eng'r in Hydraulic Dept. of Holyoke Water Power Company.
HENRY SOUTHER, Jr., Germany.	III.	Student.
HOLLON C. SPAULDING, 70 Kilby St., Boston, Mass.	II.	With Henry R. Worthington.
TIMOTHY W. SPRAGUE, Boston, Mass.	III.	Asst. in Mining, Mass. Institute of Technology.
JAMES H. STANWOOD, Pottstown, Penn.	I.	With Philadelphia Bridge Works.
HENRY F. STODDARD, Fort Hamilton, N. Y.	II.	With Pneumatic Dynamite Gun Co.
GILES TAINTOR, 44 Broadway, N. Y. City.	VI.	With the Electrical Accumulator Co.

158 GRADUATES: SCHOOL OF INDUSTRIAL SCIENCE.

NAME AND RESIDENCE.	COURSE.	OCCUPATION.
EDWARD G. THOMAS, Chicopee, Mass.	II.	Draughtsman, with the Ames Manufacturing Co.
FREDERICK THOMPSON, Pittsburg, Penn.	I.	Designing Dept., Keystone Bridge Co.
WALTER S. THOMPSON, Lincoln, Neb.	I.	Draughtsman, Burlington & Missouri River R. R.
GREENLEAF R. TUCKER, City Hospital, Boston, Mass.	V.	Chemist and Apothecary.
H. JUDSON TUCKER, Schenectady, N. Y.	VI.	With Sprague Electric Motor Co.
ALEXANDER H. TWOMBLY, Quincy Point, Mass.	II.	With Safety Seam Boiler Co.
RALPH VOSE, 292 Ave. B, New York, N. Y.	VI.	Asst. Electrician, with Bergmann & Co.
WALTER G. WHITMORE, Plymouth, Mass.	VI.	
GRANGER WHITNEY, Box 34, Steelton, Penn.	III.	With Pennsylvania Steel Co.
WILLIAM A. WHITNEY, Skowhegan, Me.	I.	Manager, Coburn Water Power Co.
HERBERT A. WILCOX, 212 N. Hickory Street, Joliet, Ill.	III.	Asst., in Laboratory of Joliet Steel Co.
SIDNEY WILLIAMS, 15 Arlington, St., Boston, Mass.	I.	

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	" " 1887 . . . . .	58
Total . . . . .	504		
Deduct names counted twice . . . . .	2		
			502

## TITLES OF THESES

OF SUCCESSFUL CANDIDATES FOR THE DEGREE OF  
BACHELOR OF SCIENCE, JUNE, 1887.

---

- GEORGE ARTHUR ARMINGTON,  
An Investigation of the Radial Valve Gears.
- SIDNEY ROLAND BARTLETT,  
A Biological Examination of the Water Supply of Newton, Mass.
- CHARLES ARTHUR BARTON,  
An Experimental Study of the Surface Condenser.
- WILLIAM BISBEE BLAKE,  
A Review of the N. Y. City Water Supply and of the Quaker Bridge Dam.
- WALTER CLAUDIUS BRACE,  
Ama'lgamation, Concentration, and Smelting of a Central City (Colo.) Gold Ore.
- HENRY BOIES BRAINERD,  
An Analysis of the Expenditures of the City of Boston, between the Years 1866 and 1886.
- DWIGHT BRAINERD,  
The Law of Suicides.
- HENRY FLETCHER BRYANT,  
A Design for a Sewerage System for Brockton, Mass.
- FRANK GELETT BURGESS,  
Location and Estimates for a Narrow-Gauge Railway from Davis Mine to Charlemont, Mass. (*With F. Thompson.*)
- JULIAN ABBOT CAMERON,  
A Design for the Arrangement of the Machinery in a Worsted Mill.
- FRANK DELBERT CARNEY,  
The Treatment of a Pyritous Copper Ore from the Davis Mine, Mass.
- WINTHROP COLE,  
An Experimental Investigation of the Flow of Steam through a Tube.
- HENRY JOHN CONANT,  
The Steam Engine Indicator. A Theoretical and Experimental Study of some of its Errors.



- HELEN COOLEY,  
A Comparison of the Methods of Testing Indigo.
- RALPH EDGAR CURTIS,  
The Results of some Experiments on Pumping Engines, with reference to  
Cylinder Condensation. (*With W. O. Hildreth.*)
- WILLIAM CHANNING CUSHING (*M.A., Univ. of New Brunswick*),  
The Tensile Strength of Cement as Affected by the Fineness of Grinding;  
and the Change of Dimension of Cement during Induration. (*With  
W. S. Thompson.*)
- SARAH LOUISE DAY (*A.B., Vassar College*),  
The Composition of Cotton-Seed Oil.
- WALTER CLARK FISH,  
A Commercial Efficiency Test of a Thomson-Houston Dynamo.
- JOHN MANASSEH FOX,  
The Inverse Electromotive Force of the Voltaic Arc.
- JOSEPH BATES GAY,  
A Design for a College.
- WALTER HOWARD GLEASON,  
The Boiling Points of Naphthaline, Benzophenone, and Benzol under Con-  
trolled Exhaustions, with reference to Thermometry.
- WILLIAM SEYMOUR HADAWAY, JR.,  
A Study of the Deviations between the Mercurial and the Air Thermometer.
- WILLIAM OSGOOD HILDRETH,  
The Results of some Experiments on Pumping Engines, with reference to  
Cylinder Condensation. (*With R. E. Curtis.*)
- JAMES CALVIN HOBART,  
Transmission of Power by Rope Gearing,
- OREN SHAW HUSSEY,  
An Experimental Determination of the Pressure on Lathe Tools. (*With  
E. A. Jones.*)
- EDWARD ARCHIE JONES,  
An Experimental Determination of the Pressure on Lathe Tools. (*With  
O. S. Hussey.*)
- CHARLES BENJAMIN KENDALL,  
The Action of Alizarine Assistant in Turkey Red Dyeing.
- WILLIAM DOWNING LIVERMORE,  
The Action of Dilute Nitric Acid on Substituted Aromatic Amido Com-  
pounds.
- PHILIP ALONZO MOSMAN,  
Smelting of Calumet and Hecla "Black Jack" for Black Copper.
- SAMUEL PARSONS MULLIKEN,  
The Action of Nitrosulphuric Acid on certain Toluol Derivatives.
- GEORGE LINCOLN NORRIS,  
The Smelting of Fine Lead Ores.

- GEORGE WASHINGTON PATTERSON, JR. (*A. B., Yale University*),  
Experiments on the Blake Transmitter. (*With H. J. Tucker.*)
- QUINTARD PETERS,  
A History of the Iron and Steel Tariffs from the Adoption of the Constitution to the Civil War, 1789-1860.
- HERBERT APPLETON RICHARDSON,  
Linoleic Acid.
- FRANZ HERMAN SCHWARZ,  
A Design for a Mine Hoisting Plant.
- HENRY DARRAH SEARS,  
Researches Relating to the Melting Platinum Standard of Light. (*With G. Taintor.*)
- FRANK EDWARD SHEPARD,  
Experiments on the Steam Injector and Apparatus for the Determination of the Velocity of the delivered Water. (*With E. G. Thomas.*)
- CHARLES PORTER SMITH,  
Water Meters. (*With A. H. Twombly.*)
- HARRY ERNEST SMITH,  
The Oxidation of Ricinoleic Acid.
- JONAS WALDO SMITH,  
A Discussion of the Flow of Water over Submerged Weirs.
- HENRY SOUTHER, JR.,  
A Method of Treatment of a rich Gold and Silver Ore.
- HOLLON CURTIS SPAULDING,  
A Design for an Oscillating Cylinder Marine Engine, with Original Valve Motion.
- TIMOTHY WILSON SPRAGUE,  
Treatment of a Leadville Carbonate Ore.
- JAMES HUGH STANWOOD,  
An Examination into the Economical Arrangement of the Kinzua Viaduct, together with a Design for a Bridge with Separate Piers. (*With W. A. Whitney.*)
- HENRY FARRIS STODDARD,  
An Experimental Investigation of the Strength and Elasticity of Shafting subjected to combined Twisting and Bending.
- GILES TAINTOR,  
Researches relating to the Melting Platinum Standard of Light. (*With H. D. Sears.*)
- EDWARD GALBRAITH THOMAS,  
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