M.I.T. ANNUAL CATALOGUES AND BULLETINS
1885/86
01 OF 02

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

TWENTY-FIRST

ANNUAL CATALOGUE

OF THE

OFFICERS AND STUDENTS,

WITH A

STATEMENT OF THE COURSES OF INSTRUCTION,

And a List of the Alumni, and of the Members of the Society of Arts.

1885-1886.

BOSTON:
FRANKLIN PRESS: RAND, AVERY, AND COMPANY.
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GENERAL SUMMARY OF STUDENTS.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

STUDENTS.

School of Industrial Science	609
School of Mechanic Arts	60
School of Design	61
Total	730

CALENDAR FOR 1885-86.

School year began	Monday, Sept. 28, 1885.
Second term will begin	Tuesday, Feb. 2, 1886.
Degrees conferred	Tuesday, June 1, 1886.
First Entrance Examinations	Thursday, June 3, 1886. Friday, June 4, 1886.
Second Entrance Examinations	Tuesday, Sept. 21, 1886. Wednesday, Sept. 22, 1886.
Examinations for Advanced Standing	Thursday, Sept. 23, 1886.
School year of 1886–87 will begin	Monday, Sept. 27, 1886.

CALENDAR FOR 1886-87.

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

CONTENTS.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

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

Of the three integral parts of the Institute, the SOCIETY OF ARTS was first organized, and has continued ever since to hold semi-monthly meetings from October to May of each year. A more detailed account of this society, with lists of its officers and members, will be found on pages 125 to 132.

THE SCHOOL OF INDUSTRIAL SCIENCE was opened in February, 1865, in temporary rooms in Mercantile Building, Summer Street, Boston, with twenty-seven pupils, of whom fourteen graduated with the diploma of the Institute of Technology in 1868. The growth of this school since its opening is shown in the lists of its graduates. Its present organization and condition, with an account of its courses of study and research, and with registers of its officers and students, will be found on pages 11 to 103. 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 lists of graduates and present students, will be found on pages 120 to 124; the other, the School of Mechanic Arts, a full account of which will be found on pages 111 to 120.

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

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

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

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

Chapter 183, *Acts and Resolves of* 1861

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

Chapter 186, *Acts and Resolves of* 1863.

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

Chapter 247, *Acts and Resolves of* 1868.

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On the Part of the Commonwealth.

HIS EXCELLENCY, GOV. GEORGE D. ROBINSON.
HON. MARCUS MORTON, *Chief Justice of the Supreme Court.*
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SCHOOL OF INDUSTRIAL SCIENCE.

SCHOOL OF INDUSTRIAL SCIENCE.

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HENRY MARTIN, S.B.,
Assistant in Chemical Analysis.

FRANK A. PICKERNELL, S.B.,
Assistant in Mechanical Engineering.

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C. HOWARD WALKER,
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WILLIAM T. SEDGWICK.
SILAS W. HOLMAN.
WEBSTER WELLS.
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COURSES OF INSTRUCTION.

The SCHOOL OF INDUSTRIAL SCIENCE of the Massachusetts Institute of Technology provides an extended series of scientific and literary studies, and of practical exercises. The courses of study include the Physical, Chemical, and Natural Sciences and their applications; Pure and Applied Mathematics; Drawing; the English, French, German, and other Modern Languages; History; Political Economy; and International and Business Law. These studies and exercises are so arranged as to offer a liberal and practical education in preparation for active pursuits, as well as a thorough training for most of the scientific professions. The positions and the character of the work for which the several courses fit their graduates are best indicated by an inspection of the record of the present occupations of graduates given on pages 132 to 152.

The following regular courses of study, each four years in 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. Details of the courses are given on pages 23 to 33.

I.	CIVIL AND TOPOGRAPHICAL ENGINEERING.
II.	MECHANICAL ENGINEERING.
III.	MINING ENGINEERING.
IV.	ARCHITECTURE.
V.	CHEMISTRY.
VI.	ELECTRICAL ENGINEERING.
VII,A.	NATURAL HISTORY.
VII,B.	BIOLOGY, — Preparatory to Medical Studies.
VIII.	PHYSICS.
IX.	GENERAL COURSE.

Courses I. to VI. are distinctly professional, the character of the chief work of each course being indicated by its title. Schedules showing the distribution of the topics of instruction included in the courses, and statements of the methods of instruction used, will be found for Course I. on pp. 23 and 46; Course II. on pp. 24 and 49; Course III. on pp. 25 and 53; Course IV. on pp. 26 and 61; Course V. on pp. 27 and 38.

Course III., Mining. This course is planned to prepare students for Mining, Geology, and Metallurgy, in accordance with the present demand for men. It is therefore laid out with three options. In the first, a considerable amount of time is devoted to surveying, mathematics, and drawing, — subjects of importance to the Mine Surveyor and Engineer. The second emphasizes the geological subjects, and leads towards the surveying of geological deposits with special reference to their economical value. The third is devoted to the metallurgical and chemical sides of the profession. It will be necessary, therefore, for the student, on reaching the middle of the second year, to choose one of these branches of the profession, and subsequently to follow the options corresponding to this choice.

Course VI., Electrical Engineering. This course was established in 1882, 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. The instruction given includes the study of theoretical and applied electricity in its various branches; so that one completing the course may acquire a knowledge of the technical application of electricity to land and sub-marine telegraphy, telephony, electric lighting, and the electrical transmission of power. Those portions of Mechanical Engineering which are especially important in connection with dynamo-electric machinery are pursued at length. The schedule is on p. 28, and further details on p. 41.

Course VII,A., Natural History, affords an appropriate general training for those whose ulterior object is the special

pursuit of Geology, Mineralogy, Botany, or Zoölogy, or who desire to become teachers of Natural History. The schedule of this course is given on p. 29.

Course VII, B., Biology, Preparatory to Medical Studies. The recent remarkable development of the biological sciences, and especially the applications of physics and chemistry to physiology, have led to the establishment of a course of study in which biology is a prominent feature. Moreover, the intimate relations now existing between the study of life and living things (biology) and medicine, in its more modern and scientific form, make this subject, especially when combined with a due proportion of physics, chemistry, drawing, French, and German, peculiarly adapted to one who intends eventually to study medicine. The course of study outlined on p. 30 has accordingly been so arranged as to furnish a good knowledge of biology, such, for example, as a prospective teacher of this subject might require; at the same time giving perhaps the best preparation possible at present for the professional study of medicine.

Aside from the subjects pertaining to a general scientific education, and shared with other courses of the school, the biological student becomes familiar with the anatomy and physiology of normal living things, — a familiarity which is of inestimable value in the study of disease. Equally important is that education of the hand and the eye, and that mental habit which comes only from constant use of the microscope, the scalpel, and instruments of precision. At first, therefore, are studied such forms as yeast, amœba, moulds, bacteria, the fern, the seed-plant, hydra, the earthworm, lobster, dog-fish, frog, pigeon, and rabbit; while in the later years higher biology (introducing topics like natural selection, mimicry, the germ theory of disease and evolution) is carried on contemporaneously with experimental animal physiology and histology. To this end a large biological laboratory is provided, a description of which, with an enumeration of the apparatus at command, will be found on page 58.

Course VIII., Physics, is based on the physical and mathematical sciences, and offers suitable training for persons who desire to pursue the study of physical science, and for those who intend to teach Physics, or to enter upon its various practical applications. See pp. 31 and 41.

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

In providing that body of scientific, as distinguished from philosophical, study which it is intended shall give to the instruction in Course IX. its predominant character, extensive options within certain fields are allowed. Thus, in the first term of the second year the student may choose between Theoretical Chemistry and Advanced Algebra; the latter leading up to further options in pure Mathematics, the former to three other lines of options in which the prominent subjects are respectively Biology, Geology including either Zoölogy or Mineralogy, and Chemistry pure and applied. (See p. 32.)

Options. To enable a student to devote himself more closely to some one or more branches of the professional or scientific course of study which he has undertaken, and to give him a choice as to which branch he shall pursue, a further introduction of optional lines of study has been made in some of the courses. An inspection of the schedules, pp. 25 to 33, will show, that, in the second and later years of courses III., V., VII,A., VII,B., VIII., and IX., choice is offered between several more or less distinct lines of study. The choice among these options in the later years is necessarily to some extent restricted by the decision made in the first instance, owing to the requirement of certain of the earlier subjects as preparation for the corresponding later ones. While in some cases the later options are positively determined by the earlier ones, in other cases 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. 68 to 82. In some instances the options of the course schedules are so numbered as to indicate their sequence. In Course V., p. 27, the selection of options is less limited than in other instances; and the necessary order of pursuing the options can be learned by reference to the Schedule of Topics, pp. 68 to 82. The options of Courses III. and IX. are stated on pp. 17 and 20. In Course VII.A., option is offered between geological, zoölogical, and physiological lines of special study. In course VII.B.,

the option lies mainly between a course tending to the study of pure Mathematics and its applications to Physics, and one giving more attention to Chemistry.

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

Advanced courses of study may be pursued either with or without reference to the advanced degrees authorized by the corporation. See p. 34.

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. 108.

Schedules of the Courses. The following pages contain the schedules of the distribution of studies throughout the whole of the various courses given in the School of Industrial Science.

The first year for all courses is the same, 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.

A clear 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 ten 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. 35 to 62; and by referring, at the same time, to the "Schedule of Topics," given on pp. 67 to 82.

Methods and Apparatus of Instruction. The statements given on pp. 35 to 62 supply a general outline of the character of instruction given, of the methods by which it is 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 applicant for special courses, or to the special student, in affording him the means of ascertaining precisely what instruction is given in any topic which he may desire to pursue, when, at what length, and by whom it is treated, and exactly what preparation will be demanded of every applicant for the topic considered. By careful consultation of this schedule, the special course may be so planned that the earlier studies shall afford suitable preparation for those more advanced towards which the course is directed. See p. 67.

REGULAR COURSES.

SCHEDULES OF PRESCRIBED AND OPTIONAL STUDIES.

I.—CIVIL ENGINEERING.

FIRST YEAR.	
FIRST TERM.	SECOND TERM.
Algebra. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical and Freehand Drawing. Military Drill.	Solid Geometry. Plane Trigonometry. General Chemistry. Chemical Laboratory. Modern History. English Literature. French. Mechanical Drawing. Military Drill.
SECOND YEAR.	
FIRST TERM.	SECOND TERM.
Surveying: Compass and Transit. Plotting from Notes. Analytic Geometry. Advanced Geometrical Drawing. Physics. Modern History. German. Spherical Trigonometry.	Levelling: Profiles. Elements of Topography. Differential Calculus. Physics. Physical Geography. Modern History. German.
THIRD YEAR.	
FIRST TERM.	SECOND TERM.
Railroad Engineering. Advanced Field Work. Topographical Drawing. Integral Calculus. General Statics. Physics: Lectures and Laboratory. Structural Geology. Constitutional History. German.	Railroad Engineering. Topography and Map Work. Kinematics and Dynamics. Strength of Materials. Physics: Laboratory Work. Historical Geology. Political Economy. German.
FOURTH YEAR.	
FIRST TERM.	SECOND TERM.
Bridges and Roofs. Railroad Management. Hydraulic Engineering. Sanitary Engineering. Strength of Materials. Topography and Geodesy.	Bridges and Roofs. Hydraulic Engineering. Sanitary Engineering. Specifications and Contracts. Applied Mechanics. Thesis Work.

II.—MECHANICAL ENGINEERING.

First Year.

First Term.	Second Term.
Algebra. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical and Freehand Drawing. Military Drill.	Solid Geometry. Plane Trigonometry. General Chemistry. Chemical Laboratory. Modern History. English Literature. French. Mechanical Drawing. Military Drill.

Second Year.

First Term.	Second Term.
Principles of Mechanism. Construction of Gear Teeth. Drawing. Carpentry and Wood Turning (shopwork). Analytic Geometry. Descriptive Geometry. Physics. Modern History. German.	Mechanism of Mill Machinery. Mechanism of Shop Machinery. Drawing. Pattern Work (shopwork). Differential Calculus. Physics. Modern History. 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. Political Economy. German.

Fourth Year.

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

III. — MINING ENGINEERING.

First Year.

First Term.	Second Term.
Algebra. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical and Freehand Drawing. Military Drill.	Solid Geometry. Plane Trigonometry. General Chemistry. Chemical Laboratory. Modern History. English Literature. French. Mechanical Drawing. Military Drill.

Second Year.

First Term.	Second Term.
Chemical Analysis. Physics. German. Analytic Geometry. Surveying. Drawing.	Chemical Analysis. Physics. German. Mineralogy and Blowpipe Analysis. *Options.* 1. Surveying; Diff. Calculus. 2. Phys. Geog.; Gen. Biology and Botany; Zoöl. and Palæontology; Chemistry. 3. Surveying; Phys. Geog.; Chemistry.

Third Year.

First Term.	Second Term.
Chemical Analysis. Geology. German. Mining. *Options.* 1. Chemistry; Int. Calculus and App. Mech.; Physics. 2. Chemistry; Const. History; Physics; Zoöl. and Palæontology. 3. Const. History; Sp. Methods; Physics; Theoret. Chem.	Chemical Analysis and Assaying. German. Mining. Geology. Political Economy. *Options.* 1. Applied Mechanics. 2. Chemistry; Physical Laboratory. 3. Chemistry; Physical Laboratory.

Fourth Year.

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

IV. — ARCHITECTURE.

First Year.	
FIRST TERM.	SECOND TERM.
Algebra.	Solid Geometry.
General Chemistry.	Plane Trigonometry.
Chemical Laboratory.	General Chemistry.
Rhetoric.	Chemical Laboratory.
English Composition.	Modern History.
French.	English Literature.
Mechanical and Freehand Drawing.	French.
Military Drill.	Mechanical Drawing.
	Military Drill.
Second Year.	
FIRST TERM.	SECOND TERM.
Materials.	Original Design.
Greek and Roman Architectural History.	Common Constructions.
The Orders.	Mediæval and Modern Architectural History.
Analytic Geometry.	Shades, Shadows, and Perspective.
Physics.	Drawing.
Descriptive Geometry.	Differential Calculus.
Modern History.	Physics.
German.	Modern History.
	German.
Third Year.	
FIRST TERM.	SECOND TERM.
Original Design.	Original Design.
Sketching and Water Color.	Sketching and Water Color.
Lectures on Fine Arts.	Surveying.
Working-Drawings and Framing.	Iron Construction.
Integral Calculus.	Kinematics and Dynamics.
General Statics.	Strength of Materials.
Structural Geology.	Stereotomy.
Physics: Lectures and Laboratory Work.	Political Economy.
German.	German.
	Acoustics.
Fourth Year.	
FIRST TERM.	SECOND TERM.
Advanced Original Design.	Advanced Original Design.
History of Ornament.	Sketching and Water Color.
Sketching and Water Color.	Planning.
Problems in Construction.	Schools, Theatres, and Churches.
Specifications.	Problems in Construction.
Strength of Materials.	Specifications and Contracts.
Lectures on Fine Arts.	Constitutional History.
Ventilation and Heating.	Advanced French.
Language.	Thesis Work.

V. — CHEMISTRY.

FIRST TERM.	SECOND TERM.
First Year.	
Algebra.	Solid Geometry.
General Chemistry.	Plane Trigonometry.
Chemical Laboratory.	General Chemistry.
Rhetoric.	Chemical Laboratory.
English Composition.	Modern History.
French.	English Literature.
Mechanical and Freehand Drawing.	French.
Military Drill.	Mechanical Drawing.
	Military Drill.
Second Year.	
Chemical Analysis.	Chemical Analysis.
Theoretical Chemistry.	Mineralogy and Blowpipe Analysis.
Physics.	Physics.
German.	German.
Modern History.	Modern History.
Analytic Geometry.	*Options.*
	Differential Calculus.
	{ Physical Geography.
	{ Gen. Biology and Botany.
Third Year.	
Chemical Analysis.	Chemical Analysis.
Special Methods.	Theoretical Chemistry.
Industrial Chemistry.	Industrial Chemistry.
Physics: Lectures and Laboratory.	Physical Laboratory.
German.	German.
Constitutional History.	Political Economy.
Options.	*Options.*
Integral Calculus.	Physics.
Geology.	Geology.
Chemical Analysis.	Sanitary Chemistry.
General Physics (Electricity).	Industrial Chemistry.
Fourth Year.	
Chemical Analysis.	Organic Chemistry.
Organic Chemistry.	Thesis Work.
Physics.	
Metallurgy.	
Abstracts.	
Options.	
Physics.	
Language.	
Sanitary Chemistry.	
Laboratory Options.	
Analytical Laboratory.	
Organic Laboratory.	
Metallurgical Laboratory.	
Industrial Laboratory.	

VI. — ELECTRICAL ENGINEERING.

First Year.	
FIRST TERM.	SECOND TERM.
Algebra.	Solid Geometry.
General Chemistry.	Plane Trigonometry.
Chemical Laboratory.	General Chemistry.
Rhetoric.	Chemical Laboratory.
English Composition.	Modern History.
French.	English Literature.
Mechanical and Freehand Drawing.	French.
Military Drill.	Mechanical Drawing.
	Military Drill.
Second Year.	
FIRST TERM.	SECOND TERM.
Physics: Lectures.	Physics: Lectures.
Mechanics and Acoustics.	Physical Laboratory.
Analytic Geometry.	Acoustics and Electricity.
Descriptive Geometry.	Differential Calculus.
Mechanism.	Mechanism.
Carpentry and Wood-turning.	Drawing.
Modern History.	Metal Turning.
German.	Modern History.
	German.
Third Year.	
FIRST TERM.	SECOND TERM.
Physics: Lectures and Laboratory.	Physical Lab.: Electricity, Heat.
Electricity: Readings.	Electricity: Readings.
Integral Calculus.	Kinematics and Dynamics.
General Statics.	Strength of Materials.
Mechanical Engineering.	Mechanical Engineering.
Drawing.	Mech. Engineering Laboratory.
Constitutional History.	Drawing.
German.	Political Economy.
	German.
Fourth Year.	
FIRST TERM.	SECOND TERM.
Technical Applications of electricity to Telegraph, Telephone, Electric Lighting, etc.: Lectures.	Technical Applications of Electricity.
Phys. Lab.: Electrical Testing & Construction of Instruments.	Advanced Physics, Memoirs, etc.
Testing of Telegraph Lines, Dynamo Machines, etc.	Physical Research.
Advanced Physics: Memoirs, etc.	Differential Equations.
Photometry.	Calculus of Variations.
Method of Least Squares.	Mechanical Engineering.
Discussion of the Precision of Measurements.	Mech. Engineering Laboratory.
Mechanical Engineering.	
Mech. Engineering Laboratory.	
Applied Mechanics, Thermodynamics, Hydraulics, etc.	

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

VII.A.—NATURAL HISTORY.

First Year.

FIRST TERM.	SECOND TERM.
Algebra. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical and Freehand Drawing. Military Drill.	Solid Geometry. Plane Trigonometry. General Chemistry. Chemical Laboratory. Modern History. English Literature. French. Mechanical Drawing. Military Drill.

Second Year.

FIRST TERM.	SECOND TERM.
Physics. Chemical Analysis. Theoretical Chemistry. Analytic Geometry. Modern History. German.	Chemical Analysis. Mineralogy and Blowpipe Analysis. General Biology and Botany. Physical Geography. Physics. Modern History. German.

Third Year.

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

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

Fourth Year.

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

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

First Year.	
FIRST TERM.	SECOND TERM.
Algebra. General Chemistry. Chemical Laboratory. Rhetoric. English Composition. French. Mechanical and Freehand Drawing. Military Drill.	Solid Geometry. Plane Trigonometry. General Chemistry. Chemical Laboratory. Modern History. English Literature. French. Mechanical Drawing. Military Drill.
Second Year.	
FIRST TERM.	SECOND TERM.
Physics. Chemical Analysis. Analytic Geometry. Theoretical Chemistry. Modern History. German.	General Biology and Botany. Chemical Analysis. Physics. Physical Geography. Modern History. German.
Third Year.	
FIRST TERM.	SECOND TERM.
Sanitary Chemistry. General Biology; continued. Physics: Lectures and Laboratory. Structural Geology. Zoölogy and Palæontology. Constitutional History. German. *Options.* 1. Physics. 2. Chemistry. 3. Biology.	Comparative Anatomy and Embryology. Zoölogy and Palæontology. Physical Laboratory. Historical Geology. Political Economy. German. *Options.* 1. Physics. 2. Chemistry. 3. Biology.
Fourth Year.	
FIRST TERM.	SECOND TERM.
Animal Physiology and Histology. Ventilation and Heating. Bibliography: Abstracts. Higher Biology: Lectures. *Options.* 1. Physics. 2. Chemistry. 3. Biology.	Physiology and Histology. Heredity: Lectures. Higher Biology: Lectures. Climatology. Water Supply and Drainage. History of the Biological Sciences. Thesis Work.

VIII. — PHYSICS.

First Year.

First Term.	Second Term.
Algebra.	Solid Geometry.
General Chemistry.	Plane Trigonometry.
Chemical Laboratory.	General Chemistry.
Rhetoric.	Chemical Laboratory.
English Composition.	Modern History.
French.	English Literature.
Mechanical and Freehand Drawing.	French.
Military Drill.	Mechanical Drawing.
	Military Drill.

Second Year.

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

Third Year.

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

Fourth Year.

First Term.	Second Term.
Physical Laboratory.	Physical Research.
General Physics.	General Physics.
Advanced Physics: Memoirs, etc.	Advanced Physics: Memoirs, etc.
Principles of Sci. Investigation.	Calculus of Variations.
Photography.	Differential Equations.
Applied Mechanics: Thermodynamics, Hydraulics.	*Options.*
Method of Least Squares.	Physiological Measurements.
Options.	Physical Laboratory.
1. Chemistry. 2. Defin. Integrals.	Quaternions.

IX.—GENERAL COURSE.

First Year.

First Term.	Second Term.
Algebra.	Solid Geometry.
General Chemistry.	Plane Trigonometry.
Chemical Laboratory.	General Chemistry.
Rhetoric.	Chemical Laboratory.
English Composition.	Modern History.
French.	English Literature.
Mechanical and Freehand Drawing.	French.
Military Drill.	Mechanical Drawing.
	Military Drill.

Second Year.

First Term.	Second Term.
Physics: Lectures.	Physics: Lectures.
Modern History.	Modern History.
German.	English Literature.
Advanced French.	German.
Analytical Geometry.	Advanced French.
	Physical Geography.
Options.	
1. }	*Options.*
2. } Theoretical Chemistry.	1. General Biology and Botany; Zoölogy and Palæontology.
3. }	2. Phys. Geog.; Zoöl. and Palæontology; Special Work in either subject.
4. }	3. Mineralogy.
5. Advanced Spherical Trigonometry.	4. Chemical Analysis.
	5. Differential Calculus.

Third Year.

First Term.	Second Term.
Physics: Lectures and Laboratory.	Physical Laboratory.
Constitutional History.	English Literature.
Modern History.	Political Economy.
English History and Literature.	International Law.
German.	German.
Language.	Language.
Carpentry and Wood Turning.	Historical Geology.
	Filing and Machine Tool Work.
Options.	*Options.*
1. Physiology and Histology; Zoölogy and Palæontology.	1. Biology; Embryology; Physiology.
2, 3. Structural Geology; Special Geological Work or Zoölogy and Palæontology.	2, 3. Historical Geology; Special Geological Work.
4. Ind. Chem.; Chem. Analysis.	4. Ind. Chem.; Theoret. Chem.
5. Integral Calculus.	5. Gen. Theory of Equations; Determinants.

Fourth Year.

This year will, for the present, be arranged to meet individual requirements.

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. (See pp. 22 and 65.) Opportunity will be given in the laboratories and lecture-rooms for the pursuit of special courses by teachers, and by persons of mature years engaged in technical pursuits. All special students in Architecture are required to take in full, as a minimum, the following course of two years' duration: —

SCHEDULE OF PARTIAL COURSE IN ARCHITECTURE.

FIRST YEAR.

FIRST TERM.	SECOND TERM.
The Five Orders.	Original Design.
Sketching and Water-Color.	Sketching and Water-Color.
Mechanical and Freehand Drawing.	Common Constructions.
Materials.	Projections.
Ancient Architectural History.	Shades, Shadows, and Perspective.
Elementary Mechanics.	Mediæval and Mod. Arch. History.
	Graphical Statics.

SECOND YEAR.

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

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

ADVANCED COURSES.

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

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

The particular course of study which candidates for these degrees wish to pursue must be submitted in writing to the Faculty, and must meet with approval. Occasional short absences, when the time is spent upon professional work by advice of the Faculty, will not be considered as interruptions of the student's residence.

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

METHODS AND APPARATUS OF INSTRUCTION.

Ordinary Exercises. — Instruction is given by lectures and recitations, and by practical exercises in the field, the laboratories, and the drawing-rooms. Text-books are used in many, but not in all, subjects. In many subjects, 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. 69.)

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

1. Advanced Algebra, including the Theory of Logarithms and the use of Logarithmic Tables.
2. Solid and Spherical Geometry.
3. Plane Trigonometry, with practical applications to the computation of triangles and the solution of such problems as occur in surveying.
4. Plane Analytical Geometry, including the equations and

properties of the point, right line, and circle, and of the parabola, ellipse, and hyperbola.

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

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

1. Differential Equations, with applications to problems in Geometry.

2. The Theory of Probability and Method of Least Squares, including the adjustment of observations and the computation of probable errors.

3. Determinants.

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

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

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

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

4. Advanced 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. 64) is continued through one year, and German through two years, for all regular students. In certain departments, there is an advanced course in each. Instruction in the elements of Italian and Spanish is also offered.

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

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. During the second term of the present year, a course of lectures on Business Law will be delivered by John C. Gray, Esq., of Boston. Students in the General Course receive more extended instruction in History and Political Science.

The Instruction in Chemistry. — All students who are candidates for a degree attend a course of lectures on Inorganic Chemistry, illustrated by experiments, and perform actual experimental work in the laboratory for general chemistry. The lectures are intended to prepare the student for his work in the laboratory, and to emphasize the facts which he there learns. In the laboratory, the student receives instruction in chemical manipulation, and performs a series of experiments designed to illustrate the properties of the more important elements, and the laws of chemical action. In connection with the lectures in Inorganic Chemistry, the elements of theoretical chemistry are taught; and the student has practice in the solution of stochiometrical and other chemical problems. The study of the theory of the subject is continued by a more advanced course of lectures and recitations, in which are presented the prevailing theoretical views as to chemical action, the constitution and classification of chemical compounds, as well as certain portions of molecular physics which bear directly upon chemical theories, especially in the matter of thermo-chemistry.

The instruction in Analytical Chemistry extends through two or more years. In the analytical laboratory the system of instruction in classes is not employed. Each student is given a desk in the laboratory, which is open to him at all times, and he receives personal instruction. His progress depends largely upon the amount of time spent.

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. Special students are permitted to select such work as they desire, and for which they are qualified.

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

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

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

The instruction in Sanitary Chemistry consists mainly of laboratory work, and a special laboratory has been equipped for the purpose. For all who choose to pursue the subject, a minimum amount of work is laid out, consisting of a study of the methods in common use for the chemical examination of air and water, of milk and of butter. Subsequently opportunity is afforded for the critical study of other methods of analysis, for the examination of other articles of food, and for the investigation of a variety of sanitary problems in which chemical questions are involved.

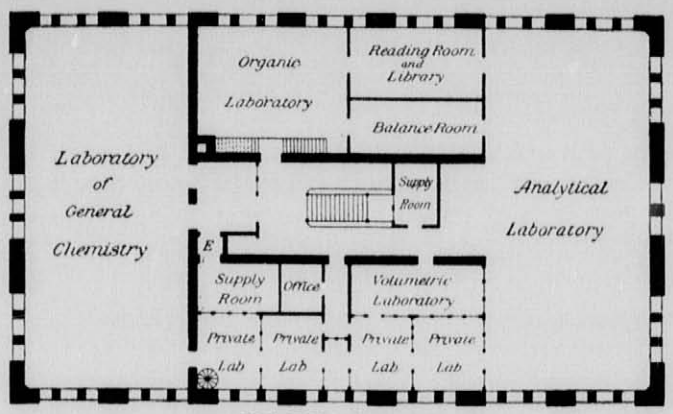
Industrial Chemistry is taught by a course of lectures, and by work in the laboratory of industrial chemistry. A full description of the most important technical applications of chemistry is given in the lectures. A part of the lectures will be given by persons actively employed in carrying out the processes which they will describe. The department possesses a very valuable collection of charts illustrating chemical industries, presented by the late Prof. Robert E. Rogers. In the industrial laboratory, the students prepare chemical products from raw materials. They also undertake the preparation of pure chemicals. They are taught fractionation and distillation. Particular attention is paid to the preparation of dyes and mordants. A full course of instruction in bleaching and dyeing is given. It includes scouring, bleaching of cotton and wool, and the dyeing of yarn and

cloth. The students are taught how to make comparative tests of dye-stuffs, and qualitative tests to determine the dyes present upon fibres. The students also become familiar with many of the most useful methods of commercial analysis. The laboratory instruction is supplemented by excursions to manufacturing establishments where the practical working of chemical industries can be examined.

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

The instruction in Chemistry is designed primarily for those who are candidates for the several degrees of the Institute, and for such special students as are looking to chemistry as a profession, and are following, in the main, the courses laid out for the regular students. Such special students are required to study French and German as a part of their course, and are held to the same examinations in the subjects which they pursue as are the regular students. In addition, the Institute desires to make available all the facilities of the lecture-rooms and laboratories to teachers who wish to perfect themselves in chemistry, and to persons of maturer years who are engaged in technical pursuits, and who wish to acquire an accurate knowledge of the science. Such persons may be admitted without formal examinations, on satisfying the professors in the department that they are competent to pursue to advantage the subjects chosen.

The Kidder Laboratories of Chemistry afford accommodations for five hundred students. The chemical department occupies thirteen laboratories, two lecture-rooms, a reading-room, balance-room, offices, and supply-rooms: in all, twenty-two rooms. The laboratory for general chemistry has places for two hundred and eighty-eight students, and is very completely equipped for instruction in elementary chemistry.



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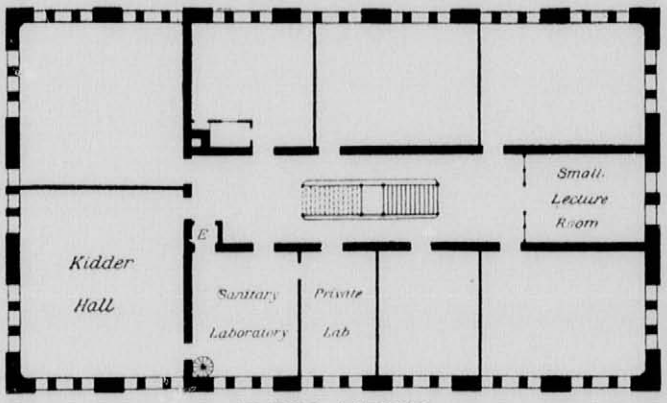

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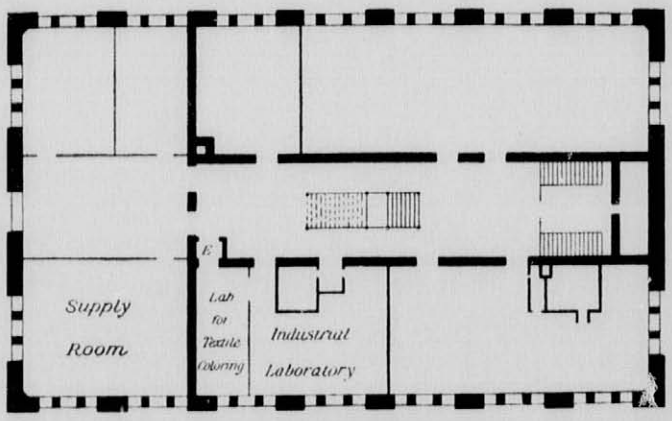


BASEMENT.

PLANS,

Showing the rooms on the several floors of the
New Building of the Mass. Institute of Technology
occupied by the
KIDDER CHEMICAL LABORATORY.

The analytical laboratory can accommodate one hundred and fifty students, and possesses every convenience for accurate and rapid analytical work. The organic laboratory has places for thirty students. Conveniences are afforded for conducting offensive and dangerous operations in the open air, or in a separate room. The sanitary laboratory contains places for sixteen students. It possesses a very complete outfit for the analysis of air and water, and for the investigation of sanitary problems. The laboratory for industrial chemistry accommodates sixteen students. It contains jacketed kettles, a centrifugal drier, drying-chambers, stills, presses, and numerous other pieces of apparatus needed to perform chemical operations upon a considerable scale. In connection with this laboratory is a room devoted to textile coloring, furnished with kettles, water-baths, drying-room, and various working-models of machines used in this branch of applied chemistry. Kidder Hall has a seating-capacity of one hundred and eighty, and is arranged with special reference to the delivery of experimental lectures. In addition, there is a small lecture-room, seating thirty. The lecture-rooms contain valuable cabinets of specimens for purposes of illustration. The balance-room is supplied with twenty-two balances. The chemical library, which is kept in the reading-room of the department, numbers over one thousand volumes. The reading-room also contains files of the more important chemical periodicals.

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

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

In addition to the courses of general lecture-room and laboratory exercises in Physics, which are required of all regular students, various special courses of lectures, readings, and laboratory exercises in Optics, Heat, Acoustics, 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 has been very considerably extended.

As many of the students taking the course in Physics intend to make teaching their profession, a special course called Advanced Physics is arranged with this object in view, in which each student in turn investigates the present condition of our knowledge of some particular phenomenon or law, and presents the result, which frequently embodies the outcome of his own researches as well as of the researches of others, in the form of a scientific memoir or lecture.

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

The library of the department contains the standard works upon various branches of Physics. It is especially full in those relating to electricity, and all new works of value on that subject are added as they appear. Most of the leading scientific and technical periodicals devoted to Physics are regularly received, and are accessible to students. The valuable gift of a complete set of the *Fortschritte der Physik* has been recently received.

The Instruction in Electrical Engineering. — As a foundation for subsequent work, thorough instruction is given in the theory of electricity. Also 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 in the electrical testing of telegraph lines, is provided. The subjects of construction, specifications, and contracts also receive attention.

Besides the work done by the regular staff of instruction of the Institute, special teaching will be given by gentlemen who are professionally engaged in various departments of Electrical Engineering, or especially conversant with certain branches of applied electricity. During the past year such instruction has been given by the following gentlemen: —

Mr. George W. Blodgett, Electrician of the Boston and Albany Railroad, on the Application of Electricity to Railway Signalling; Mr. J. Rayner Edmands, of the Harvard College Observatory, on the Establishment and Distribution of Time; Mr. C. J. H. Woodbury, of the Manufacturers' Mutual Fire Insurance Company, on Electric Lighting in its Relation to Fires and Fire Insurance; Prof. Elihu Thomson, Electrician of the Thomson and Houston Electric Lighting Company, on their System of Lighting; Messrs. A. C. White and H. B. Gale, of the New England Weston Electric Light Company, on Electric Light Installations. It is expected that these courses will be still further extended during the current year.

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

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 determi-

nation 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, Hydraulics, and special study of Dynamics.

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

The Laboratory of Applied Mechanics. — The object of this laboratory is to give to the students, as far as possible, the opportunity of becoming familiar, by actual test, with the strength and elastic properties of the materials used in construction. A plan of it will be found between pp. 50 and 51.

It is furnished with the following apparatus: —

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

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

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

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

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

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

The classes are divided into small sections when making tests with 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 22 engine-lathes, and 15 hand-lathes of recent approved patterns, a machine-drill, 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. The use of the various instruments employed in surveying is taught mainly by actual work in the field. The student is thus made familiar in a practical way with the several operations involved in Railroad, Hydraulic, and Sanitary Engineering. The work in the drawing-room

consists in representing upon paper the surveys made in the field, and in making both working-drawings and finished plans from direct measurement of actual engineering structures, a large number of which are found in the immediate neighborhood of the Institute.

The course in Civil Engineering embraces roads, railroads, bridges, rivers, harbors, canals, water-power, water-supply, sewerage, drainage, and irrigation. The subject of 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. The course in Hydraulic Engineering embraces the subjects of theoretical hydraulics with its practical applications, — hydrology, rivers and canals, water-supply, water-power, coast and harbor works, and irrigation. The practical application of the principles of hydraulics is illustrated by numerous examples; and in hydrometry the student is made practically familiar with the best methods, by actual practice in gauging rivers with instruments of various kinds, which have been provided for the use of the classes. The subjects of hydrology and irrigation are considered in detail, with reference to the conditions found in the United States. Special attention is given to the sources and supply of water, to its flow in natural and artificial channels, and to the methods of collecting, storing, filtering, raising, and distributing water for domestic purposes, with practical details for carrying out such works. A particular study is also made of the control and improvement of rivers, of the construction of locks, dams, and canals, and of the utilization and distribution of water as a motive-power, frequent 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 main-

tenance of channels, and the protection of coasts. The subject of Sanitary Engineering embraces the study in detail of the house, with its apparatus, the disposal of sewage by surface or sub-surface irrigation for isolated buildings, the collection and removal of sewage in the larger towns, sanitary drainage for cities, and drainage and irrigation for agricultural purposes. Frequent opportunities are given to the student for the inspection of actual examples of sanitary engineering, and a special study is made of the questions of the day in relation to public health.

The course in Bridges and Roofs embraces a thorough study of the methods of determining the stresses in structures of this kind, and of investigating the stability and strength of piers, abutments, arches, and retaining-walls. Particular attention is paid to bridge design, and the student is required to make complete designs and working-drawings for several structures of this class. Parallel with the above, and as a part of the same course, runs an extended examination of wood, iron, steel, brick, stone, mortar, and cement, and a study of the practical details by means of which these materials are applied to use. The student is taken to the quarry, the foundry, the rolling-mill, the stone-cutting sheds, the shops for bridge-building, and to numerous works in process of construction, and is shown the origin of the different materials he is to use, and the method of applying them in actual structures. Following the above, comes a study of various engineering works, especial care being taken to call attention to defective methods and to faulty construction, and to impress upon the student the importance of thorough and exact knowledge as the basis of sound engineering.

The study of Specifications and Contracts includes the various methods of obtaining the quantities, and estimating the cost of engineering structures, the study in detail of a variety of actual specifications, the preparation of working-drawings, and other operations preliminary to carrying out any work of construction. Under the head of Practice in Designing, the student selects some piece of work, and proceeds as if he were about to build it; studying it generally

and in detail; drawing on his previous theoretical studies, and also on any illustrations he can get from actual works; making all necessary computations and drawings; laying the work out on the ground if the subject admits of it; and concluding with a thesis, which is placed on file as evidence that he has satisfactorily completed his studies.

The object throughout the above course is not only to make the student familiar with the general principles of engineering, but also with the practical details through which alone those principles can be made of use. The several subjects are in every case presented by the threefold method of lectures, reference to books, and examination of actual works; and the whole course is so arranged as to lead the student gradually from the methods of the school to those of the practical engineer. By the kindness of many active members of the engineering profession, and especially through the courtesy of Mr. W. H. Barnes, general manager of the Boston and Albany Railroad, and of Mr. James T. Furber, general manager of the Boston and Maine Railroad, the classes have been able to inspect a great variety of engineering works, and thus to see the connection between their studies and the best practice of the day. The help thus received has been of very great value.

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.

Instruction is given in the principles of mechanism, in the construction of gear-teeth, in the slide-valve and link-motions; and also, by means of certain courses specially prepared for the purpose, the students are familiarized, as far as possible, with the mechanism of the shop and mill machinery to be found in the market at the present time. This is followed by the study of thermo-dynamics, of steam

and heat engines, of steam-boilers, and of other subjects connected with steam, such as the indicator, cylinder condensation, pressure on the crank, steam-heating, etc.

Lectures are given on the rate of flow of water and on hydraulic motors, and on a variety of subjects connected with machinery and with steam. A course in design is also given. Some of the designs are readily solved by calculation, and are almost in the form of problems; while others, such as the design of a boiler, or of some more or less elaborate machine, require a considerable amount of study, of calculation, of drawing, and sometimes of research.

During the fourth year the student is allowed to make a choice of one of the three following courses of lectures: first, a course on Marine Engineering; second, a course on Locomotive Construction; third, a course on Mill Engineering.

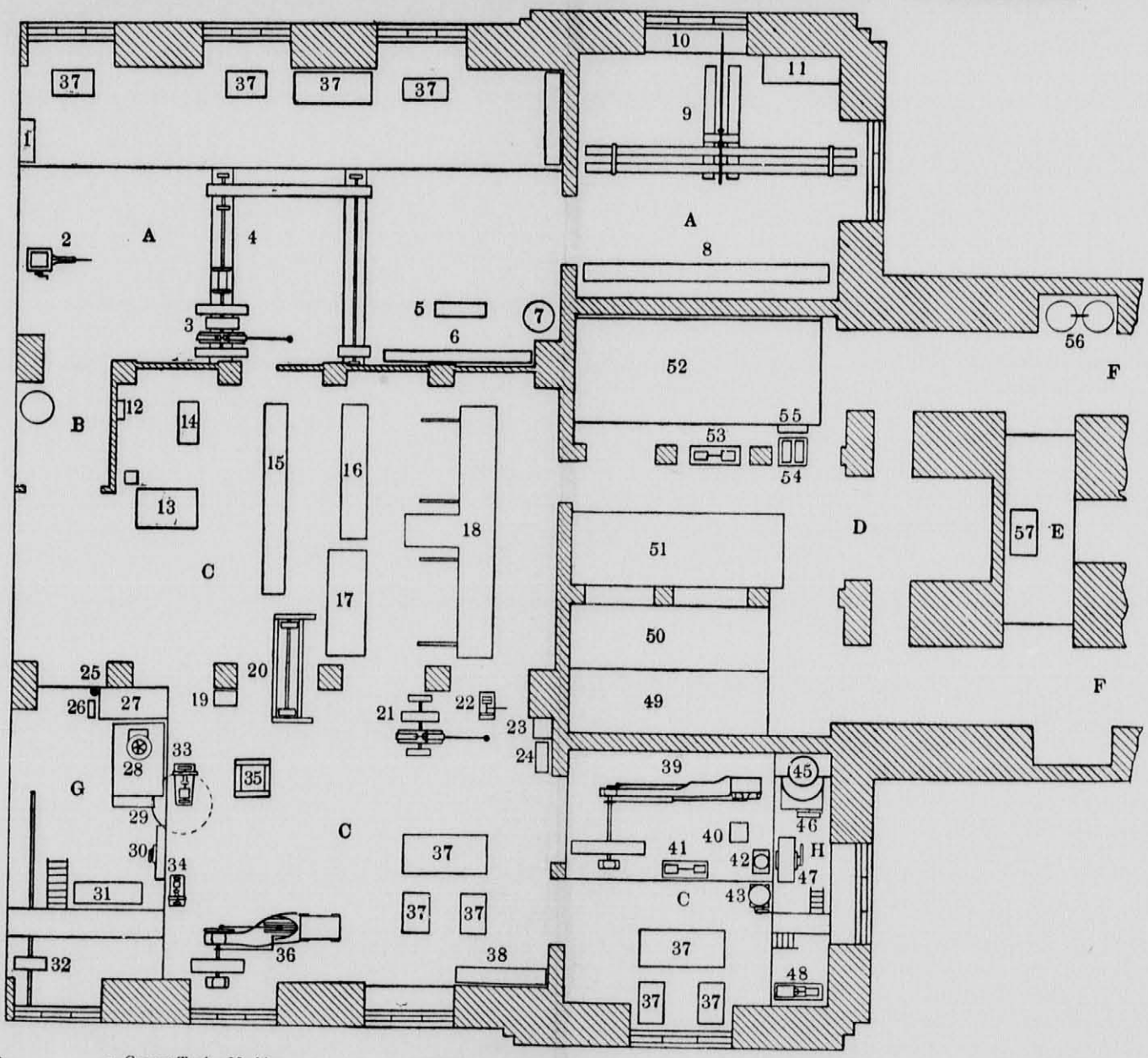
The laboratory work, in its earlier portions, is devoted to some of the more simple experiments, such as will impart to the students a familiarity with the manner of running the engines, taking indicator cards, and using the other apparatus in the laboratory. The later laboratory work takes very largely 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."

The students of mechanical engineering receive also instruction in carpentry, wood-turning, forging, chipping, filing, and machine-tool work in the mechanical laboratories in the building on Garrison Street. (See p. 46.)

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-

LABORATORIES OF APPLIED MECHANICS AND MECHANICAL ENGINEERING.



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

1. Workbench.
2. Olsen Testing-Machine. (50,000 lbs.)
3. Friction Brake. (30 H.P.)
4. Machine for Testing Shafting.
5. Cement-Testing Machine.
6. Specimen Case.
7. Forge.
8. Machine for Time Tests of Beams.
9. Transverse Testing-Machine. (50,000 lbs.)
10. Workbench.
11. Dark Room.
12. Yarn-Testing Machine.
13. Cotton Card.
14. Drawing Frame.
15. Speeder.
16. Fly Frame.
17. Ring-Spinning Frame.
18. Mule.
19. Standard Gauge and Square Inch.
20. Belt-Testing Machine.
21. Friction Brake. (20 H.P.)
22. Webber Dynamometer.
23. Workbench.
24. Lathe.
25. Mercury Column.
26. Knowles's Pump.
27. Tank for Turbine.
28. Swain Turbine.
29. Cistern.
30. Tank on Scales.
31. Large Surface-Condenser.
32. Main Shaft to New Building.
33. Large Centrifugal Pump.
34. Small Centrifugal Pump.
35. Belt-Testing Machine.
36. Porter-Allen Engine. (80 H.P.)
37. Desk.
38. Instrument Case.
39. Harris-Corliss Engine. (16 H.P.)
40. Small Condenser.
41. Blake Pump.
42. Barrus Calorimeter.
43. Tank on Scales.
45. Small Tank at Foot of Standpipe.
46. Large Tank at Foot of Standpipe on Scales.
47. Tank on Scales.
48. Deane Vacuum Pump.
49. Low-Pressure Boiler No. 1.
50. Low-Pressure Boiler No. 2.
51. High-Pressure Boiler No. 3.
52. High-Pressure Boiler No. 4.
53. Blake Pump.
54. Worthington Pump.
55. Mack Injector.
56. Tanks for Use during Boiler Tests.
57. Tank on Scales for Use during Boiler Tests.

belt to enable it to carry a given power, at a given speed, with no more than a given amount of slip.

5. Two brakes so constructed that a given amount of work can be put at will on either engine, and in such a manner that this work can be accurately measured.

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

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

8. Two calorimeters.

9. A dynamometer.

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

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

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

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

A plan of the laboratory will be found between pp. 50 and 51.

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 opera-

tions, such as prospecting, boring, sinking of shafts, driving of levels, different methods of working, hoisting, pumping, ventilation, etc. These lectures are illustrated by photographs, drawings, and a set of models from Freiberg, Saxony, which show in detail the methods of working underground, by underhand and overhand stoping, the timbering and walling of shafts and levels, the arrangement of pumps, man-engines, ladder-ways, hoisting-ways, the sinking of shafts, etc.

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.

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

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

The experimental work of the laboratory is carried on by the students under the immediate charge of an instructor. A sufficiently large quantity of ore is assigned to each student, who first examines it for its component minerals, sorts and samples it, and determines its character and value by analysis and assays, and makes such other preliminary examinations as serve to indicate the proper method of treatment.

He then treats the given quantity, makes a careful examination of the products at each step of the process, ascertains, wherever practicable, the amount of power, water, chemicals, fuel, and labor expended, and thus learns approximately the effectiveness and economy of the method adopted. He learns, also, the value of chemistry as a check upon metallurgical work. Each student is assisted in working his ore by his classmates, each of whom has an opportunity in turn to manage the machines and furnaces.

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

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

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

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

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

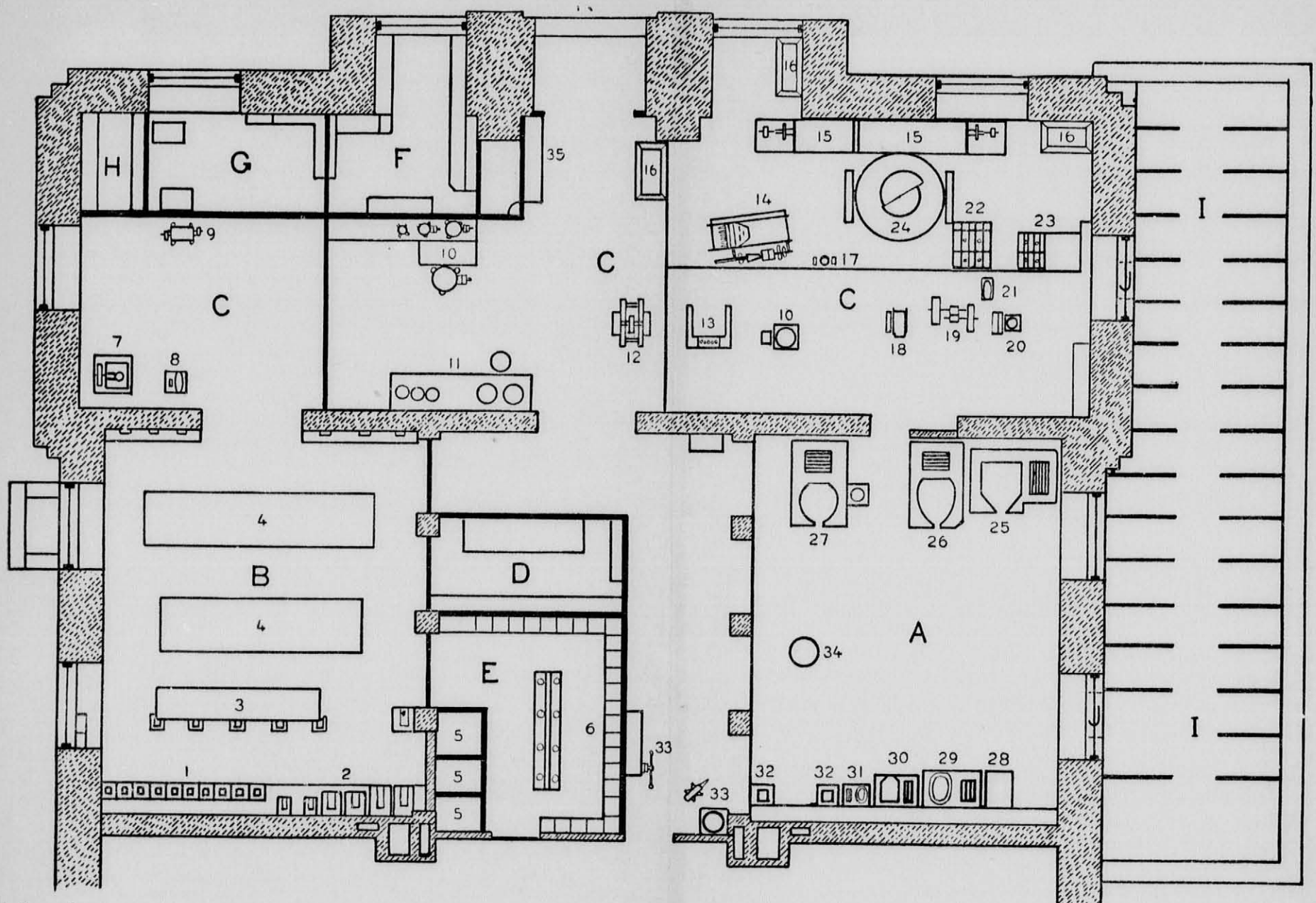
III. A set of four amalgamating-pans, 30, 18, 12, and 8 inches in diameter respectively, also a 36-inch settler, and a little automatic kieve for separating mercury from pulp.

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

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

The furnace-room contains a water-jacket blast-furnace, a copper-refining furnace, a lead-smelting furnace, two roasting-furnaces, furnaces for cupellation, furnaces for fusion, a black-

MINING LABORATORY.



A. Furnace Room.
B. Assay Room.
C. Milling Room.
D. Supply Room.
E. Toilet Room.
F. Private Laboratory.
G. Office.
H. Balance Room.

I. Vaults.
J. Entrance to Vaults.
K. Newbury-street Door.

1. Crucible Furnaces.
2. Muffle Furnaces.
3. Iron Work-table.
4. Students' desks.

5. Closets.
6. Clothes Lockers.
7. Steam Engine.
8. Dynamo.
9. Root Blower.
10. Amalgamating Pans.
11. Leaching Tubs.
12. Ball Amalgamator.

13. Stamp Mill.
14. Frue Vanner.
15. Slime Tanks and Pumps.
16. Drying Tables.
17. Automatic Kieve.
18. Blake Crusher.
19. Cornish Rolls.
20. Sampling Mill.

21. Dust Fan.
22. Larger Jigs.
23. Smaller Jigs.
24. Evans Table.
25. Calcining Furnace.
26. Copper Refining Furnace.
27. Lead Smelting Furnace.
28. Kiln.

29. Large Cupelling Furnace.
30. Small Calciner.
31. Small Cupelling Furnace.
32. Pot Furnaces.
33. Forge Anvil, Vise Bench.
34. Water Jacket Smelter.
35. Carpenter's Bench.

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

The Instruction in Mineralogy. — Crystallography is taught with the aid of models, diagrams, and a series of crystals. In Descriptive Mineralogy, specimens are freely used, an example of each of all the more important species being placed before each student; while a collection of typical specimens is always open to students. The collection in this department is supplemented by that in the museum of the Boston Society of Natural History, as explained in the next section. In Determinative Mineralogy, students are taught to identify minerals by their crystallization and physical properties, as well as by their blowpipe or chemical characters. The instruction in Blowpipe Analysis is given in a separate laboratory, and is supplemented by sufficient practice to insure familiarity with the methods.

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

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

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

II. *Structural Geology, including a systematic course in Lithology.* — Oral instruction and laboratory work are com-

bined in this course, the aim being to place in the hands of each student a specimen of each type to be considered. The principal structural features characterizing large masses of rocks, embracing stratification, joint structure, faults, folds, slaty-cleavage, veins, dikes, etc., are taught as practically as circumstances will allow. This instruction is supplemented by frequent excursions to localities of geological interest in the vicinity of Boston. The instruction in Chemical Geology and the history of crystalline formations comprises the formation, alteration, and decay of rocks, the origin of veinstones and ore deposits, of rock-salt and mineral waters, and of coal and petroleum; also a general sketch of the chemical forces which co-operated with physical agencies in the formation of the earth. The collections in this department are extensive, and specially adapted to the laboratory method of instruction; and a complete series of typical rocks is accessible to students at all times.

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

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

In addition to the efficient collections in the Rogers Building, the students in this department have access at all times to the extensive and valuable mineralogical and geological collections of the Boston Society of Natural History. These are very conveniently placed, and have been arranged with spe-

cial reference to the needs of students, each division of mineralogy and geology being separately and fully illustrated in the order in which it is taken up in the Institute course.

The Instruction in Biology begins in the second year with a course of lectures, recitations, and laboratory exercises in General Biology. Attention is given to fundamental ideas of life and living matter, protoplasm, cells, tissues, and organs; and these are illustrated upon the simpler forms of animal and vegetable life, such as the yeast-plant, amœba, moulds, bacteria, etc. Afterwards higher forms, like the lobster, fern, seed-plant, frog, and rabbit, are carefully dissected and studied. Stress is laid not less on physiological than on anatomical facts and theories, and painless studies of the living specimen are regarded as of prime importance.

This general introductory course extends into the third year, and is followed by a more special course in comparative anatomy and embryology (chiefly of vertebrates), accompanied likewise by practical laboratory studies, with dissections, the histology of the embryo chick, etc.

In the fourth year animal physiology and histology are taken up, and pursued till graduation. They are taught experimentally in the laboratory, and by lectures and recitations. Physiological chemistry also receives due 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. During the present year lectures will be given by the instructors in charge, by Dr. C. S. Minot of Harvard University, Professor S. F. Clarke of Williams College, Professor E. B. Wilson of Bryn Mawr College, and others. A biological-journal club, to which the more advanced students are admitted, was formed during the past year, and has been very successful as a means of keeping abreast of current progress in biology, and in giving practice in bibliography.

Students of biology have also privileges of great value in connection with the Boston Society of Natural History, of

which the museum, the library, and the teaching-collections are freely accessible.

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

The Instruction in Architecture. — The 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 practised 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 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, the following additions have been made, mostly by gifts: a considerable collection of photographs, lithographs, and drawings presented to the Institute by French, English, and American architects, taken from their own works, including sets of actual working-drawings, with details and specifications; a complete series of drawings, mostly presented by the late Ernst Benzon, Esq., of London, formerly a merchant of Boston, illustrating the course of architectural instruction in the École des Beaux-Arts in Paris, — *Esquisses-Esquisses, Projets Rendus, Projets d'Ordre, Projets de Construction, Grand Prix de Rome, Envoi de Rome.* Besides these, a very large number of 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 nearly four hundred well-selected volumes; and the principal technical periodicals, both American and foreign, are regularly taken. The publications of the

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

The Instruction in Military Science and Tactics. — In conformity with the requirements of the Act of Congress of July 2, 1862, and of the Act of the General Court of Massachusetts in furtherance thereof, the Institute provides instruction in military tactics. All students who take two or more first-year studies are required to attend three times a week an exercise in tactics, unless specially excused by the Faculty. A written and a drill examination are held at the end of the year. For the drill-exercises, they are required to provide themselves with uniforms which are made from measures and by contract, in order to secure uniformity of material and manufacture as well as cheapness. The whole cost to each student does not exceed fifteen dollars. Applications to be excused from drill may be granted by the Faculty, when the student is an alien, a college graduate, or over twenty-one years of age, when he has a surgeon's certificate of disability, or is able to pass an examination satisfactory to the department, in both theoretical and practical tactics and drill.

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

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

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

The Boston Society of Natural History grants to the students of the Institute the full use of its valuable library. The unusual facilities of the Boston Public Library, of 459,400 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. 83). Attendance on both days of one examination or the other is required.

Entrance examinations were held in June, 1885, in New-York City, Philadelphia, Chicago, Cincinnati, St. Louis, Washington, San Francisco, St. Paul, Nashville, Atlanta, New Orleans, and Denver. Arrangements will probably be made for examining applicants in June, 1886, 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. 83).

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 sixteen years,[1] and must pass a satisfactory examination in Arithmetic, Algebra, Plane Geometry, French, English Grammar and Composition, History and Literature, and Geography.

The requirements in the various subjects are as follows: —

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

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

[1] After September, 1886, no student will be admitted who is under seventeen years of age.

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

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

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

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

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

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

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

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

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

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

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

Certificates of clear admission to colleges or technical schools of recognized standing, and with requirements equivalent to those of this school, will be accepted in place of the entrance examinations.

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

Students will find their progress in Physics and Chemistry

promoted by making themselves thoroughly familiar with so much of Physics as is contained in Balfour Stewart's Primer.

A knowledge of the Latin language is not required for admission; but the study of Latin is strongly recommended to persons who purpose to enter this school, as it gives a better understanding of the various terms used in science, and greatly facilitates the acquisition of the modern languages. Those who intend to take the course in Natural History or in Biology, preparatory to Medical Studies, will find it advantageous to acquire also the elements of Greek.

Second, Third, and Fourth Years. — To be admitted as a regular student in either of these classes, the applicant for this advanced standing must have attained the proper age (seventeen, eighteen, and nineteen years respectively),[1] 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. 63 to 66, and pp. 23 to 33. Applicants for advanced standing in the course preparatory to Medical Studies will not for the present be received.

Graduates of Colleges who are prepared to enter upon most of the studies of the third year will be afforded opportunity to make up any studies of the earlier years in which they are deficient: they will, in general, be credited with all subjects in earlier or later years in which they can show, by examination or otherwise, a standing satisfactory to the Faculty, and be received provisionally as regular students. The attention of such applicants is particularly called to the schedules of courses on pp. 23 to 33, and to the schedule of topics on pp. 67 to 82. 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.

[1] After September, 1886, candidates for advanced standing must have attained the ages of eighteen, nineteen, and twenty years respectively.

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. 33), i.e., to partial or special courses, the applicant must have attained the age of at least sixteen years (after September, 1886, seventeen years), and must pass satisfactorily such examinations as shall prove him to be qualified to pursue to advantage the subjects chosen.

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

Special students in Architecture and Chemistry must pass the regular entrance examination to the first-year class (p. 63). Special students in Architecture are required to take as a minimum the full two years' partial course given at p. 33, but may, with the consent of the Faculty, substitute equivalent studies, or take such additional ones as they may desire.

SCHEDULE OF TOPICS.

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

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

By a careful consideration of the schedule, in connection with the pages on the "Methods and Apparatus of Instruction" (35 to 62), 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. 63 and 64.

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

MATHEMATICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
26	Algebra and Logarithms . .	Rec.	Skinner, French, Tyler.	All reg. students . .	1	1	15	4	(1) (2)
27	Solid Geometry	Rec.	Runkle, Skinner, French, Tyler.	All reg. students . .	1	2	6	5	(3)
28	Plane Analytic Geometry . .	Lect., Rec.	Runkle, Osborne, Wells, Skinner.	All reg. students . .	2	1	15	3	(29 A)
29A	Plane Trigonometry . . .	Rec.	Runkle, Skinner, French, Tyler.	All reg. students . .	1	2	9	5	(26) (27)
29B	Spherical Trigonometry . .	Rec.	Skinner.	I., IX.	2	1	8	2	(29 A)
30	Differential Calculus . . .	Lect., Rec.	Runkle, Osborne, Wells.	All courses except VII.	2	2	15	3	(28)
31	Integral Calculus	Lect., Rec.	Runkle, Osborne.	All courses except VII.	3	1	5 10	4 2	(30)
32	Applied Mechanics (Statics and Stresses in Frames) .	Lect., Rec.	Sondericker.	I., II., III., IV., VI., VIII. . .	3	1	10	2	(31) (126)
33	Applied Mechanics (Strength of Materials, Kinematics, and Dynamics)	Lect., Rec.	Sondericker.	I., II., III., IV., VI., VIII.	3	2	15	3	(32)
34	Applied Mechanics (Strength of Materials, Hydraulics, and Dynamics)	Lect., Rec., Lab.	Lanza, Sondericker.	I., II., III., IV., VI., VIII. . .	4	1	15	3	(33)

MATHEMATICS.

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

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
	DRAWING.								
51	Geometrical and Mechanical Drawing	Lect., Draw.	Faunce, Burrison.	All reg. students	1	1 2	15 15	7 6	
52	Descriptive Geometry	Lect., Rec., Draw.	Faunce.	II., IV., VI.	2	1	15	5	(1) (27) (51) (53)
53	Freehand Drawing	Draw.	Adams.	All reg. students	1	1	15	2	
	NON-PROFESSIONAL STUDIES.								
76	Rhetoric and English Composition	Lect., Rec.	Wheelock.	All reg. students	1	1	15	2	(5) (6)
77	Modern History and English Literature	Lect., Rec.	Wheelock.	All reg. students	1	2	15	2	(76)
78	Modern History	Lect., Rec., Writ.	Atkinson.	All reg. students	2	1, 2	30	2	
79	English History and Literature (collateral reading and study)	Read.	Atkinson.	IX.	2	2	15	2	
80	Constitutional History	Rec., Writ., Read.	Atkinson.	All reg. students	3	1	15	2	

NON-PROFESSIONAL STUDIES.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
81	Constitutional History of the United States	Lect., Rec.	Atkinson.	IX.	4	1	15	2	
82	English History and Literature (special studies)	Read.	Atkinson.	IX.	4	1	15	2	
83	Modern History and Literature	Lect.	Atkinson.	IX.	3	1, 2	30	3	
84	Political Economy	Lect., Rec.	The President.	All reg. students	3	2	15	2	
85	International Law	Lect., Rec.	The President.	IX.	3	2	15	2	
86	Pol. Economy and Finance	Rec.	The President.	IX.	4	1	–	–	
87	French (grammar and translation)	Lect., Rec.	Luquiens, Cook.	All reg. students	1	1, 2	30	3	(4)
88	Advanced French	Lect., Rec.	Luquiens.	IV., IX.	–	1, 2	30	3	(87)
90	German (elementary)	Lect., Rec.	Otis, Cook.	All reg. students	2	1, 2	30	3	
91	German (grammar and translation)	Lect., Rec.	Otis.	All reg. students	3	1, 2	30	3	(90)

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.
92	German (advanced) . . .	Lect., Rec.	Otis.	IX.	4	1, 2	30	3	(91)
93	Language	Lect., Rec.	Otis or Luquiens.	IV., V., VII., IX. .	3, 4	1, 2	30	2	(87) (90)

CHEMISTRY.

101	General Chemistry	Lect., Lab.	Nichols, Frost.	All reg. students . .	1	1, 2	30	6	(1) (2) (3) (4) (5) (6) (7)
102	Chemical Analysis	Lect., Lab.	Drown, Pope.	III., V., VII., VIII., IX. . .	2	1, 2	30	–	(87) (101)
103A	Theoretical Chemistry . .	Lect., Rec.	Nichols.	III., V., VII., VIII., IX. . .	2	1	15	2	(101)
103B	Theoretical Chemistry . .	Lect., Rec.	Nichols.	V., VIII., IX. . . .	3	2	15	1	(103 A)
104	Chemical Analysis	Lab.	Drown, Pope.	III., V.	3	1, 2	30	–	(90) (102)
105	Chemical Analysis	Lab.	Drown, Pope.	VII.B., VIII. . . .	3	1	30	–	(102)
106	Special Methods.	Rec.	Drown, Pope.	III., V.	3	1	15	2	(90) (102)
107	Industrial Chemistry . . .	Lect.	Norton.	V., IX.	3	1, 2	15	2	(90) (102) (51)
108	Chemical Analysis	Lab.	Drown, Pope.	III., V., VIII. . .	4	1	15	–	(104)

CHEMISTRY.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
109	Chemical Analysis. . . .	Lab.	Drown, Pope.	'II., V.	4	2	15	–	(108)
110	Organic Chemistry . . .	Lect.	Norton.	V., IX.	4	1, 2	30	2	(103) (90) (104)
111	Organic Chemistry . . .	Lab.	Norton.	V.	4	1, 2	30	12	(110)
112	Industrial Chemistry . . .	Lab.	Norton.	V., IX.	4	1	15	12	(104) (107)
113	Sanitary Chemistry . . .	Lab.	Nichols, Mrs. Richards.	V., VII.B.	3	–	15	6	(104) (106)
114	Industrial Chemistry . . .	Lab.	Norton.	V.	3	2	15	6	(105) (107)
115	Sanitary Chemistry . . .	Lab.	Nichols, Mrs. Richards.	V.	4	1	15	4	(104) (106)

PHYSICS.

126	Physics	Lect.	Cross.	All reg. students . .	2	1, 2	30	3	(29)
127	Descriptive Astronomy . .	Read.	Pickering.	VIII.	–	–	–	–	(27)
128	Mechanics, Acoustics, and Electricity (in connection with 126)	Rec.	Pickering.	VI., VIII.	2	1, 2	30	2	(29)
129	Physical Laboratory . . .	Lab.	Holman, Pickering, Woodbridge.	VI., VIII.	2	2	15	2	(126)[1] (128)

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

PHYSICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
132A	Physics: Heat	Lect.	Holman.	All reg. students . .	3	1	7	2	(126)
132B	Physical Laboratory . . .	Lab.	Holman, Pickering, Woodbridge.	All reg. students . .	3	1, 2	23	2	(132A)
133	Physical Laboratory . . .	Lab.	Cross, Holman, Pickering, Woodbridge.	V., VIII.	3	–	–	–	(126)
134	Physical Laboratory . . .	Lab.	Holman, Pickering, Woodbridge.	VI.	3	1, 2	15 15	2 3	(129)
135	Electricity	Read.	Cross.	V., VI.	3	1, 2	30	3	(128)(132B)(87)(31)
136	General Physics (optics or acoustics)	Read.	Cross, Pickering.	VIII.	3	1, 2	30	3	(132B) (87) (28)
137	Advanced Physics (memoirs, etc.)	Read.	Cross, Holman.	VI., VIII.	4	–	–	–	(132B) (87)
138	History of Physical Science,	Read.	Cross.	VIII.	3	–	–	–	(87) (90) (126) (132A)
139	Physics	Lab.	Cross, Holman, Pickering.	V., VI., VIII. . . .	4	1	15	–	(132B)

PHYSICS.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
140	History of Physical Science .	Read.	Cross.	VIII.	4	–	–	–	(87) (90) (132B)
141	General Physics	Read.	Cross, Holman, Pickering.	VIII.	4	1, 2	–	–	(87) (31) (132B) (90)
143	Physical Laborat'y (acoustics),	Lab.	Cross, Woodbridge.	VII.B.	–	–	–	–	(130) (132)
144	Electrical Engineering . .	Lect.	Cross.	VI.	4	1, 2	15 15	3 2	(134) (135)

CIVIL ENGINEERING.

151	Surveying	Lect., Rec., F'ld, Draw.	Burton, Porter.	I., III., IX.	2	1, 2	30	8	(29) (51)
152	Adv. Geometrical Drawing .	Draw.	Burton, Porter.	I.	2	1	15	4	(51)
153	Elements of Topography . .	Draw.	Burton.	I.	2	2	15	4	(29) (51)
154	Railroad Engineering . . .	Lect., Rec., F'ld, Draw.	Vose.	I.	3	1, 2	30	3	(151) (153)
155	Advanced Topography . .	Draw.	Burton.	I.	3	1, 2	30	4	(151) (153)

CIVIL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
156	Bridges and Roofs	Lect., Rec., Draw.	Swain.	I.	4	1, 2	30	3	(33)
157	Railroad Engineering	Lect., Rec.	Vose.	I.	4	1	15	3	(154)
158	Hydraulic Engineering	Lect., Rec., Draw., Field.	Swain.	I.	4	1, 2	30	3	(33)
160	Sanitary Engineering	Lect., Rec., Draw.	Porter.	I.	4	1, 2	30	3	(154) (158)
161	Specifications and Contracts	Lect., Rec.	Vose.	I.	4	2	15	3	(156) (160)
162	Topography and Geology	Lect., Draw., Field.	Burton.	I.	–	1	15	6	(151)

MECHANICAL ENGINEERING.

176	Mechanism (must take also 28 and 52)	Lect., Rec., Draw.	Schwamb, Stephens, Purinton.	II., VI.	2	1	15	4	(29) (51)
177	Mechanism (must take also 30)	Lect., Rec., Draw.	Schwamb, Stephens.	II., VI.	2	2	15	9	(176)

MECHANICAL ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
178	Mechanical Engineering (must take also 31, 32, and 132)	Lect., Rec., Draw.	Peabody.	II., VI.	3	1	15	9	(30) (177)
179	Mechanical Engineering (must take also 33 and 132)	Lect., Rec., Draw., Lab.	Peabody.	II., VI.	3	2	15	11	(178)
180	Mechanical Engineering (must take also 34) . . .	Lect., Rec.	Lanza, Peabody.	II., VI.	4	1, 2	30	5	(179)
181	Designing (must take also 34)	Draw.	Schwamb.	II.	4	1	15	8	(179)
182	Mechanical Engineering . .	Lab.	Lanza, Peabody.	II., VI.	4	1, 2	30	4	(179)
183	Carpentry and Wood-Turning	Shop.	Merrick.	II., VI., IX. . . .	2	1	15	4	
184	Pattern Work	Shop.	Merrick.	II.	2	2	7	4	(183)
185	Forging, Chipping and Filing,	Shop.	Lambirth.	II.	3	1, 2	23	6	
186	Machine Tool Work . . .	Shop.	Stephenson.	II.	4	1, 2	30	6	

MINING ENGINEERING.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
201	Mineralogy (including Blow-pipe Analysis and Crystallography)	Lect., Lab.	Crosby.	III., V., VII., IX. .	2	2	15	6	(3) (101)
202	Mining Engineering . . .	Lect.	Richards.	III.	3	1, 2	30	3	(126) (201)
203	Assaying by Fire	Lab.	Clark.	III., V.	3	2	5	6	(102)
204	Metallurgy	Lect.	Richards.	II.	4	1	15	1	(101)
205	Metallurgy	Lect.	Richards.	III., V., IX. . . .	4	1	9	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.	III.	4	2	15	3	(205)

ARCHITECTURE.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
226	Architectural History . . .	Lect.	King.	IV.	2	1, 2	30	1	Students in Architecture must follow the regular course (p. 26), or the partial two-year course (p. 33). The regular examinations for admission (see p. 58) are required for either course.
227	Orders	Lect., Draw.	King.	IV.	2	1	12	4	
228	Materials of Architecture .	Lect.	Clark.	IV.	2	1	15	2	
229	Common Constructions . .	Lect.	Clark.	IV.	2	2	15	1	
230	Shades, Shadows, and Perspective	Lect., Draw.	Clark, King.	IV.	2	2	7	2	
231	Working Drawings	Lect., Draw.	Clark.	IV.	3	1	15	1	
232	Iron Construction	Lect.	Clark.	IV.	3	2	15	1	
233	Fine Art	Lect.	Walker.	IV.	3, 4	1	15	1	
234	Sketching	Draw.	Carlsen.	IV.	3, 4	1, 2	30	2	
235	Specifications and Contracts,	Lect.	Clark.	IV.	4	1, 2	30	1	
236	Problems in Construction .	Lect., Draw.	Clark.	IV.	4	1, 2	30	1	
238	Schools, Theatres, Churches, Hospitals, etc.	Lect.	Clark.	IV.	4	2	15	1	

ARCHITECTURE.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
239	Planning	Lect.	Clark.	IV.	4	2	15	1	
240	Designing	Draw.	Létang.	IV.	–	1, 2	30	–	
241	Elementary Mechanics . .	Lect.	King.	IV. (Sp.)	1	1, 2	30	3	
242	Heating, Ventilation, and Drainage	Lect.	Woodbridge.	II., IV., VII. . . .	4	1	15	–	

NATURAL SCIENCES.

251	Physical Geography . . .	Lect.	Niles.	I., III., V., VII., IX.,	2	2	15	3	(7)
252	General Biology	Lect., Rec., Lab.	Sedgwick.	VII..	2	1	15	2	(1) (2)
253	General Biology and Botany,	Lect., Rec., Lab.	Sedgwick.	III., V., VII., IX. .	2	2	15	3	(1) (2)
254	Zoölogy and Palæontology .	Lect., Lab.	Hyatt.	III., VII., IX.. . . .	3	2	30	2	

NATURAL SCIENCES.

	Subject.	Lect., Rec., Lab., Draw., or Field.	Professor or Instructor.	Taken by	Year.	Term.	No. of Weeks.	Hours per Week.	Preparation Required.
256	Geology (Elements of Lithology and Structural Geology)	Lect., Lab.	Crosby.	I., IV., IX.	3	1	15	2	(101) (251)
257	Geology (Lithological, Structural and Chemical) . . .	Lect., Lab.	Crosby.	III., V., VII. . . .	3	1	15	3	(201) (251)
258	Historical Geology	Lect., Rec.	Niles.	I., III., V., VII., IX.,	3	2	15	3	(256) or (257)
260	Embryology	Lect., Lab.	Sedgwick.	VII., IX.	3	2	15	2	(252) (253)
261	Animal Physiology and Histology	Rec., Lab.	Sedgwick.	VII., IX.	3	1, 2	30	–	(252) (253)
262	Comparative Anatomy . .	Lab.	Sedgwick.	VII. B	3	1	15	6	(252)
263	Germs and Germicides . .	Lect., Lab.	Sedgwick.	VII. B	4	2	15	–	(101) (252)
264	Climatology	Lect., Rec.	Niles.	VII., IX.	4	2	–	–	

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 1885–86.

School year began	Monday, Sept. 28, 1885.
Second term will begin	Tuesday, Feb. 2, 1886.
Degrees conferred	Tuesday, June 1, 1886.
First Entrance Examinations . . .	Thursday, June 3, 1886, and Friday, June 4, 1886.
Second Entrance Examinations . .	Tuesday, Sept. 21, 1886, and Wednesday, Sept. 22, 1886.
Examinations for Advanced Standing,	Thursday, Sept. 23, 1886.
School year of 1886–87 will begin . .	Monday, Sept. 27, 1886.

CALENDAR FOR 1886–87.

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

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

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

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

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

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

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

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

Attendance Paper.—At the opening of each term of every year, the student should fill out, and present to the Secretary, an attendance paper, blank forms for which will be supplied. This paper should contain, in the case of a regular student, the course to be pursued, and, in the case of a special student, a statement of every subject which he desires to take during the term, and the years (1st, 2d, 3d, or 4th) in which these subjects are given. 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 insure prompt placing of the names upon the class-lists, and to give opportunity for the immediate determination of qualifications. After the first week of the term, no changes can be made in the attendance papers except by special vote of the Faculty.

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, L L. D., the benefit of which is given to meritorious students on recommendation of the Faculty.

Applications for any of these scholarships should be made to the Faculty. No student will be recommended for a scholarship who has not been in the Institute at least one year, and shown himself an earnest and faithful student.

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.

NAME.	HOME.	RESIDENCE.
Atherton, Walter, C.E., Lawrence Scientific School.	*Stoughton.*	Stoughton.
Atkinson, Charles H., A.B., Harvard University.	*Brookline.*	Brookline.
Blake, Edward, Ph.B., Sheffield Scientific School.	*New Haven, Conn.*	303 Col'mb's Ave.
Brainerd, William H., B.A., Iowa College.	*Grinnell, Ia.*	Dorchester.
Converse, Charles H., A.B., Harvard University.	*Newton.*	Newton.
Cushing, William C., B.A., University of New Brunswick.	*St. John, N.B.*	298 Col'mb's Ave.
Doak, John E., Ph.B., University of the Pacific.	*Stockton, Cal.*	85 Dartmouth St.
Folwell, Amory P., A.B., Brown University.	*Brooklyn, N.Y.*	749 Tremont St.
Foss, Fred E., A.B., Bates College.	*Lewiston, Me.*	56 Chandler St.
Fox, Frederick, Jun., S.B., Mass. Institute of Technology.	*Portland, Me.*	188W.Br'kl'ne St.
Frost, Edgar A., A.B., University of Wooster.	*Chillicothe, O.*	362 Col'mb's Ave.
Gardner, Charles H., B. S., Columbian University.	*Washington, D.C.*	74 Chester Sq.
King, Thomas C., A.B., Howard College.	*Marion, Ala.*	52 Dwight St.
Mahon, William L. E., Ph.B., University of Michigan.	*Boston.*	290 Col'mb's Ave.
Patterson, George W., Jun., A.B., Yale College.	*Westfield, N.Y.*	71 Chandler St.
Talbot, Marion, A.M., Boston University.	*Boston.*	66 Marlboro' St.
Taylor, Frederick S., A.B., Harvard University.	*Boston.*	231 Marlboro' St.
Thornbury, William G., B.S., Agr. and Mech. College of Kentucky.	*Lexington, Ky.*	Hyde Park.
Vielé, Maurice A., B.S., Hobart College.	*Geneva, N.Y.*	1 St. James Ave.

REGULAR STUDENTS.

FOURTH YEAR.

NAME.	COURSE.	HOME.	RESIDENCE.
Aborn, George P.,	II.	*Wakefield.*	Wakefield.
Anthony, Arthur,	III.	*Boston.*	285 Marlboro' St.
Bartlett, Dana P.,	VI.	*Boston.*	24 Milford St.
Batcheller, Birney C.,	II.	*Wallingford, Vt.*	96 Chandler St.
Blake, Edward, Ph.B.,	VI.	*New Haven, Conn.*	303 Col'mb's Ave.
Brainerd, William L.,	IV.	*So. Englewood, Ill.*	Boston St.
Burlingham, Charles L.,	III.	*Chicago, Ill.*	161 W. Ch'st'r Pk.
Chadbourn, Wm. H., Jun.,	III.	*Wilmington, N.C.*	22 Berwick Pk.
Clifford, Harry E. H.,	VI.	*South Boston.*	801 Broadway.
Cobb, Louis R.,	I.	*Chicago, Ill.*	Cambridgeport.
Crane, Frank H.,	VI.	*Stoughton.*	Stoughton.
Cutter, Louis F.,	I.	*Winchester.*	Winchester.
Doe, Charles C.,	VII.A.	*Boston.*	224 Com'w'h Ave.
Doolittle, Orrin S.,	V.	*Wallingford, Conn.*	19 St. James Ave.
Duff, James C.,	V.	*Charlestown.*	14 Sheafe St.
Farmer, George W.,	II.	*Rutland, Vt.*	48 Appleton St.
Foss, Edward S.,	V.	*Malden.*	Malden.
Foss, Fred E., A.B.,	I.	*Lewiston, Me.*	56 Chandler St.
Foster, Theodore R.,	II.	*Boston.*	4 Harvard St.
Garfield, Alexander S.,	II.	*Lexington.*	Lexington.
Higgins, Edward E.,	VI.	*Chelsea.*	Chelsea.
Ingalls, Walter R.,	III.	*Lynn.*	Lynn.
Jordan, William F.,	I.	*Auburn, Me.*	56 Chandler St.
Kenney, C. Belle,	V.	*East Boston.*	111 Saratoga St.
Leach, Albert E.,	II.	*Newtonville.*	Newtonville.
Locke, Frank L.,	I.	*Boston.*	7 Eaton St.
Low, Wilson H.,	V.	*Brookline.*	Brookline.
Lynde, James P.,	III.	*Athol.*	Hotel Farwell.
Mahon, Wm. L'E., Ph.B.,	II.	*Boston.*	290 Col'mb's Ave.
McKim, Alexander R.,	I.	*Jamaica Plain.*	Jamaica Plain.
Merriam, Harry B.,	I.	*Fort Scott, Kan.*	112 Dartm'th St.
Merriam, Henry P.,	VI.	*Lawrence.*	Lawrence.
Miller, Edward F.,	II.	*Cambridge.*	Cambridge.
Mumford, Edgar H.,	II.	*Dorchester.*	73 Columbia St.
Noyes, Arthur A.,	V.	*Newburyport.*	Newburyport.
Pierce, Edward L., Jun.,	II.	*Milton.*	Milton.
Reynolds, George F.,	II.	*Evanston, Ill.*	57 Clarendon St.
Richardson, Charles F.,	II.	*Brooklyn, N.Y.*	66 Beacon St.
Robbins, Arthur G.,	I.	*Carlisle.*	West Newton.
Seavey, John F.,	II.	*Boston.*	27 Polk St.

NAME.	COURSE.	HOME.	RESIDENCE.
Simpson, James E.,	III.	*Lawrence.*	Lawrence.
Stebbins, Theodore,	VI.	*Omaha, Neb.*	407 Col'mb's Ave.
Stoughton, Augustus B.,	II.	*Philadelphia, Penn.*	7 Charles St.
Taylor, William M.,	II.	*Indianapolis, Ind.*	184 W. Canton St.
Thacher, Lawrence M.,	I.	*Yarmouth.*	46 Dwight St.
Turnbull, Charles D.,	II.	*Boston.*	111 Beacon St.
Van Alstine, David,	II.	*Louisville, Ky.*	184 W. Canton St.
Williams, Sidney,	I.	*Boston.*	15 Arlington St.
Wilson, Elwood J.,	III.	*Jamaica Plain.*	Enfield St.
Wood, Charles,	I.	*Edinburgh, Scot.*	377 Col'mb's Ave.
Woodbury, Charles H.,	II.	*Lynn.*	Lynn.
Worcester, Vernor F.,	II.	*Chelsea.*	Chelsea.
Young, Fred R.,	III.	*Brookline*	Brookline.

THIRD YEAR.

Armington, George A.,	II.	*Weymouth.*	Weymouth.
Atkinson, Charles H., A.B.,	II.	*Brookline.*	Brookline.
Barbour, Fred F.,	VI.	*Cambridgeport.*	Cambridgeport.
Bartlett, Sidney R.,	VII.B.	*Boston.*	13 Arlington St.
Barton, Charles A.,	II.	*Waltham.*	Waltham.
Blake, William B.,	I.	*Newburyport.*	Newburyport.
Bowles, Stephen W., Jun.,	VI.	*Springfield.*	349 Col'mb's Ave.
Brace, Walter C.,	III.	*Leavenworth, Kan.*	43 Concord Sq.
Brainerd, Henry B.,	IX.	*Montreal, P.Q.*	41 Union Pk.
Brainerd, Thomas D.,	IX.	*Montreal, P.Q.*	41 Union Pk.
Brainerd, William H., B.A.,	IV.	*Grinnell, Ia.*	Dorchester.
Bryant, Henry F.,	I.	*Bryantville.*	Bryantville.
Burgess, Frank G.,	I.	*Boston.*	175 Warren Ave.
Cameron, Julian A.,	II.	*Westford.*	273 Chandler St.
Carney, Frank D.,	III.	*Thomaston, Me.*	2 Sunderland St.
Cole, Winthrop,	II.	*Newton.*	Newton.
Conant, Henry J.,	II.	*Watertown.*	Watertown.
Cooley, Maurice W.,	I.	*Little Britain, N.Y.*	132 Chandler St.
Curtis, Ralph E.,	II.	*Newburyport.*	Newburyport.
Cushing, William C., B.A.,	I.	*St. John, N.B.*	298 Col'mb's Ave.
Fogg, Arthur G.,	I.	*Norwood.*	Norwood.
Fox, John M.,	VI.	*Portland, Me.*	190 W. Br'kline St.
Frink, William P.,	VI.	*Greenland, N.H.*	115 Chandler St.
Gay, Joseph B.,	IV.	*Boston.*	99 Pinckney St.
Gleason, Walter H.,	V.	*Boston.*	24 Bowdoin St.
Gulliver, Frederic P.,	III.	*Norwich, Conn.*	112 Dartm'th St.
Hadaway, Wm. S., Jun.,	VIII.	*Plymouth.*	Plymouth.
Hathaway, Savory C., Jun.,	VI.	*New Bedford.*	16 Circuit St.

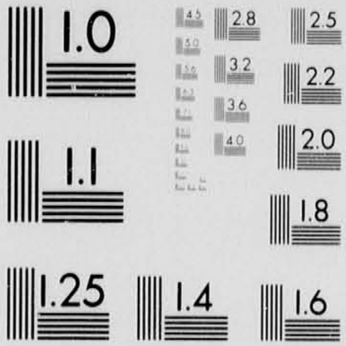
NAME.	COURSE.	HOME.	RESIDENCE.
Hill, Henry F.,	I.	*Augusta, Me.*	60 E. Newton St.
Hobart, James C.,	II.	*Cincinnati, O.*	312 Col'mb's Ave.
Hussey, Oren S.,	II.	*Nashua, N.H.*	484 Col'mb's Ave.
Jones, Edward A.,	II.	*Pittsfield.*	19 Upton St.
Kendall, Charles B.,	V.	*Manchester, N.H.*	29 Union Pk.
Knox, George A.,	II.	*Lynn.*	Lynn.
Livermore, William D.,	V.	*Charlestown.*	45 Soley St.
Mossman, Philip A.,	III.	*Beverly.*	Beverly.
Mulliken, Samuel P.,	V.	*Newburyport.*	Newburyport.
Norris, George L.,	III.	*Melrose.*	Melrose.
Patterson, G. W., Jun., A.B.,	VI.	*Westfield, N.Y.*	71 Chandler St.
Pearson, Edwin R.,	VI.	*Portsmouth, N.H.*	14 Temple St.
Peters, Quintard,	IX.	*Atlanta, Ga.*	314 Col'mb's Ave.
Ruffin, Roulhac,	I.	*Old Church, Va.*	290 Col'mb's Ave.
Schwarz, Franz H.,	II.	*Boston.*	157 Charles St.
Sears, Henry D.,	VI.	*Dubuque, Ia.*	5 Moseley Ave.
Sears, Willard T.,	II.	*Plymouth.*	Hyde Park.
Shepard, Frank E.,	II.	*Dorchester.*	Ashland St.
Smith, Charles P.,	II.	*Cambridge.*	Cambridge.
Smith, Harry E.,	V.	*Marshalltown, Ia.*	1 Yarmouth St.
Solomon, Frank L.,	I.	*Somerville.*	Somerville.
Souther, Henry, Jun.,	III.	*South Boston.*	546 Broadway.
Spaulding, Hollon C.,	II.	*East Boston.*	9 Princeton St.
Sprague, T. W.,	III.	*Fitchburg.*	366 Col'mb's Ave.
Stanwood, James H.,	I.	*Portland, Me.*	298 Col'mb's Ave.
Stoddard, Henry F.,	II.	*Plymouth.*	129 Pemb'ke St.
Taintor, Giles,	VI.	*Keene, N.H.*	15 St. James Ave.
Thomas, Edward G.,	II.	*Hingham Centre.*	484 Col'mb's Ave.
Thorp, Frank H.,	III.	*Bloomington, Ill.*	195 W. B'kl'ne St.
Twombly, Alexander H.,	II.	*Boston.*	39 High St.
Vose, Ralph,	VI.	*Hyde Park.*	Hyde Park.
Whitmore, Walter G.,	VI.	*Plymouth.*	Plymouth.
Whitney, Granger,	III.	*Beverly.*	Beverly.
Whitney, William A.,	I.	*Boston.*	75 Kendall St.
Wilcox, Herbert A.,	III.	*Somerville.*	Somerville.

SECOND YEAR.

Aldrich, Will S.,	IV.	*Freeport, Me.*	524 Tremont St.
Baldwin, Hiram E.,	I.	*Niles, O.*	89 Appleton St.
Beaman, William M.,	VI.	*Rutland, Vt.*	Auburndale.
Belser, James L.,	II.	*Marlboro'.*	Marlboro'.
Bigelow, Henry F.,	IV.	*Clinton.*	34 Mt. Vernon St.
Binney, Harold O.,	VI.	*Newport, R.I.*	76 Mt. Vernon St.

NAME	COURSE.	HOME.	RESIDENCE.
Bird, Herbert S.,	V.	*City Mills.*	City Mills.
Blanchard, Winslow,	II.	*Dorchester*	Park St.
Blood, William H., Jun.,	VI.	*Auburndale.*	Auburndale.
Bradlee, Arthur T.,	II.	*Boston.*	113 Beacon St.
Brown, Charles L.,	III.	*Stoughton.*	Stoughton.
Capen, Frank I.,	III.	*Stoughton.*	Stoughton.
Caughey, Edward G.,	II.	*Allegh'y City, Penn.*	Newton.
Center, David A.,	VI.	*Gloucester.*	Gloucester.
Cheney, Frank P.,	VI.	*Lowell.*	Lowell.
Child, Stephen,	I.	*West Newton.*	West Newton.
Claflin, George E.,	VI.	*Providence, R.I.*	12 Highland Ave.
Cobb, Sylvanus H.,	VI.	*Hyde Park.*	Hyde Park.
Colby, Russell H.,	V.	*Leominster.*	50 Monument Sq.
Cole, Fred B.,	II.	*Kingston.*	Kingston.
Collins, Bertrand R. T.,	II.	*Chebeague Isl'd, Me.*	207 Col'mb's Ave.
Collins, Edward, Jun.,	VI.	*Milton.*	Milton.
Conner, Arthur J.,	V.	*Boston*	437 Col'mb's Ave.
Converse, Chas. H., A.B.,	VI.	*Newton*	Newton.
Cromwell, Charles H.,	II.	*Baltimore, Md.*	84 Charles St.
Dean, Luther,	I.	*Taunton.*	Taunton.
Devens, Richard,	II.	*Boston.*	19 St. James Ave.
Doak, John E., Ph.B.,	II.	*Stockton, Cal.*	85 Dartmouth St.
du Pont, Maurice,	VI.	*H. Clay P.O., Del.*	357 Col'mb's Ave.
Dutton, Edgar F.,	VI.	*Boston*	534 Warren St.
Eastman, Henry F.,	II.	*Lowell.*	142 Chandler St.
Edgett, Horace P.,	I.	*Beverly*	Beverly.
Ellsworth, Alfred B.,	I.	*Buffalo, N.Y.*	38 Upton St.
Eppes, Richard, Jun.,	II.	*City Point, Va.*	233 W. Cant'n St.
Fay, Ralph M.,	IX.	*Xenia, O.*	199 W. N'wt'n St.
Ferguson, Louis A.,	VI.	*South Boston.*	121 K St.
Flint, Bertram P.,	II.	*Roxbury.*	27 Linwood St.
Folwell, Amory P., A.B.,	I.	*Brooklyn, N.Y.*	749 Tremont St.
Foque, Theodore A.,	II.	*Malden.*	Malden.
Fukuzawa, Stejirau,	I.	*Tokio, Japan.*	620 Tremont St.
Fuller, J. Edward, Jun.,	IV.	*Worcester.*	311 Col'mb's Ave.
Gerrish, William H.,	II.	*Lowell.*	Lowell.
Graves, Edward H.,	II.	*Orange, N.J.*	161 W. Ch'st'r Pk.
Greeley, James T.,	V.	*Nashua, N.H.*	290 Col'mb's Ave.
Greene, Irving G.,	I.	*Boston.*	480 Col'mb's Ave.
Gross, Harold G.,	VII.B.	*Eureka, Cal.*	604 Tremont St.
Hamblet, George W.,	II.	*Lawrence.*	Lawrence.
Hampton, Alfred,	I.	*Columbia, S.C.*	290 Col'mb's Ave.
Harris, William L.,	VII.B.	*Marblehead.*	Marblehead.
Harvey, George L.,	II.	*Chicago, Ill.*	287 Col'mb's Ave.

NAME.	COURSE.	HOME.	RESIDENCE.
Hastings, Charles F.,	III.	*West Newton.*	West Newton.
Hawes, John W.,	VI.	*Boston.*	121 Beacon St.
Heath, George L.,	V.	*Everett.*	Everett.
Herrick, Edward W.,	II.	*Northampton.*	311 Col'mb's Ave.
Hodgkins, Howard G.,	IV.	*Boston.*	77 M'tgomery St.
Holman, George U. G.,	VI.	*Valparaiso, Chile.*	20 Chelsea St.
Holton, Edward C.,	V.	*Winchester.*	Winchester
Horn, Henry J., Jun.,	I.	*St. Paul, Minn.*	22 Berwick Pk.
Howes, Herbert M.,	II.	*Somerville.*	Somerville.
James, Frank M.,	II.	*Haverhill.*	Haverhill.
Jones, Arthur W.,	VI.	*Philadelphia, Penn.*	Norfolk House.
Jones, Everett S.,	IX.	*Spencer.*	688 Tremont St.
Jordan, Edwin O.,	V.	*Auburndale.*	Auburndale.
Keough, William T.,	II.	*East Boston.*	25 Maverick St.
Lee, George S.,	I.	*Acton.*	Acton.
Linzee, John W., Jun.,	I.	*Boston.*	Clarendon Hotel.
Lockett, Benjamin C.,	IV.	*New York, N.Y.*	312 Col'mb's Ave.
Loveland, James W.,	V.	*East Boston*	25 Princeton St.
Mann, Arthur S.,	II.	*West Medway*	West Medway.
McLauthlin, George V.,	V.	*East Bridgewater.*	E. Bridgewater.
Mead, Adelbert F.,	II.	*West Acton.*	West Acton.
Merrell, Charles G.,	V.	*Cincinnati, O.*	21 Pinckney St.
Moore, Harry C.,	II.	*Brookline.*	Brookline.
Moore, Frank A.,	IV.	*Worcester*	311 Col'mb's Ave.
Mott, William E.,	I.	*Burlington, N.J.*	369 Col'mb's Ave.
Newell, Joseph P.,	I.	*Mt. Tabor, Ore.*	8 Ferdinand St.
Newell, Lorenzo B.,	II.	*Newton Centre.*	Newton Centre.
Nichols, Fred R.,	VI.	*Keene, N.H.*	130 Dartm'th St.
Nickerson, Addison D.,	I.	*Harwichport.*	401 Col'mb's Ave.
Perley, Clarence W.,	III.	*Lynn.*	Lynn.
Pierce, Herbert F.,	I.	*South Braintree.*	South Braintree.
Pitman, Harold A.,	II.	*Somerville.*	Somerville.
Ranlett, Foster P.,	I.	*Newtonville*	Newtonville.
Ray, John,	II.	*Boston*	116 Chandler St.
Robb, Russell,	VI.	*Detroit, Mich.*	620 Tremont St.
Sabine, Charles W., Jun.,	II.	*Brookline.*	Brookline.
Safford, Frederick H.,	VI.	*Lawrence.*	Lawrence.
Sawyer, Alfred H.,	II.	*Concord*	Concord.
Sayer, Frederick L.,	II.	*New Bedford.*	31 Yarmouth St.
Scales, George C.,	I.	*Newton.*	Newton.
Shaw, Walter K.,	II.	*Lexington.*	Lexington.
Silsbee, Walter E.,	II.	*Lynn.*	Lynn.
Silverberg, David,	VI.	*Washington, D.C.*	241 W. Cant'n St.
Sjöström, Ivar L.,	I.	*Lawrence.*	Lawrence.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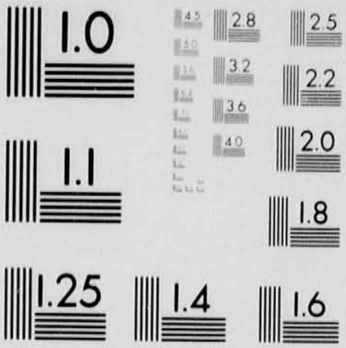
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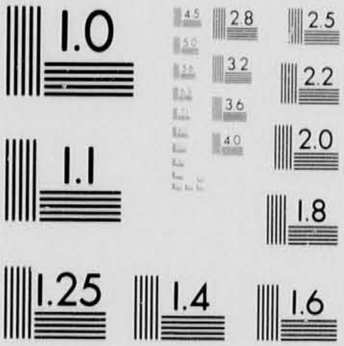
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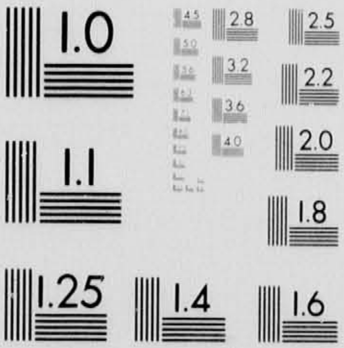
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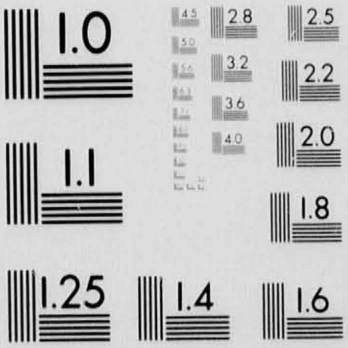
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M.I.T. ANNUAL CATALOGUES AND BULLETINS
1885/86
02 OF 02

NAME.	COURSE.	HOME.	RESIDENCE.
Smith, Edward M.,	II.	*No. Hampton, N.H.*	N. H'mpt'n, N.H.
Snow, William G.,	II.	*Watertown.*	Watertown.
Stetson, Frank O.,	V.	*Newton.*	Newton.
Stone, Charles A.,	VI.	*Newton.*	Newton.
Sully, John M.,	III.	*Cambridge.*	Cambridge.
Swasey, Sumner E.,	III.	*Cambridgeport.*	Cambridgeport.
Taylor, Frederick S., A.B.,	IV.	*Boston.*	231 Marlboro' St.
Thompson, Sanford E.,	I.	*Newton Highlands.*	Newton Highl'ds.
Towne, Walter I.,	VI.	*Topsfield.*	
Vorce, Clarence B.,	I.	*Farmington, Conn.*	115 Appleton St.
Warren, Algernon S.,	III.	*Newport, R.I.*	29 W'st Cedar St.
Webster, Edwin S.,	VI.	*Boston.*	232 Newbury St.
Williams, Arthur S.,	VI.	*Boston.*	15 Arlington St.
Windett, Victor,	II.	*Chicago, Ill.*	132 Chandler St.
Woodward, Amos E.,	III.	*East Somerville.*	East Somerville.
Wrightington, Stewart,	V.	*Brookline.*	Brookline.
Wynne, Philip H.,	II.	*Boston.*	121 Beacon St.
Young, John E.,	I.	*Danielsonville, Ct.*	147 Warren Ave.

FIRST YEAR.

NAME.	HOME.	RESIDENCE.
Abbott, Leon M.	*Keene, N.H.*	193 West Canton St.
Alley, George R.	*Jamaica Plain.*	Revere St.
Andrews, Clinton O.	*Lawrence.*	Lawrence.
Appleton, Edmund K.	*Haverhill.*	298 Columbus Ave.
Ashton, Albert C.	*Somerville.*	Somerville.
Ayer, Arthur W.	*East Somerville.*	East Somerville.
Badger, Abram H.	*Chicago, Ill.*	287 Columbus Ave.
Bailey, Hayden G.	*Boston.*	63 Chauncy St.
Bailey, Harry H.	*Malden.*	Malden.
Banes, Robert C.	*Philadelphia, Penn.*	286 Beacon St.
Bardwell, Arthur F.	*Springfield.*	22 Yarmouth St.
Bartlett, Spaulding.	*Webster.*	288 Newbury St.
Basford, George M.	*Boston.*	Parker Hill Ave.
Bates, Charles H.	*Boston.*	41 Mt. Vernon St.
Bates, Harry W.	*Newton Centre.*	Newton Centre.
Bates, Sturgis G.	*Greenup, Ky.*	16 Ashburton Pl.
Beach, Edward J.	*Dubuque, Iowa.*	1204 Washington St.
Beals, Charles E.	*Stoughton.*	Stoughton.
Bixby, Willard G.	*Salem.*	Salem.
Blagden, Edward R.	*Greenfield.*	84 Charles St.
Blair, Donald M.	*Boston.*	31 Upton St.
Bliss, Zenas W.	*Providence, R.I.*	41 Fairfield St.

NAME.	HOME.	RESIDENCE.
Borden, Charles N.	*Fall River.*	369 Columbus Ave.
Boutwell, Frederic S.	*Andover.*	Andover.
Bradley, Frederick W.	*Lowell.*	Lowell.
Brainerd, Frederick H.	*So. Englewood, Ill.*	Boston St.
Braley, Jasper W., Jun.	*New Bedford.*	East Boston.
Brewer, Nathaniel, 3d.	*Swampscott.*	Swampscott.
Brown, E. Lyman.	*Boston.*	80 Mt. Vernon St.
Brown, Harry W.	*Marblehead.*	Marblehead.
Cabot, John W.	*Mansfield.*	Mansfield.
Calkins, Frederic E.	*Chicago, Ill.*	331 Columbus Ave.
Cheney, Charles.	*So. Manchester, Conn.*	Jamaica Plain.
Clement, Harry W.	*Rutland, Vt.*	311 Columbus Ave.
Codman, Thomas N.	*South Lincoln.*	South Lincoln.
Conant, Elbridge R.	*Acton.*	Acton.
Craigin, Henry A.	*Boston.*	41 Fairfield St.
Crossman, Fred A.	*Providence, R.I.*	20 Milford St.
Curtis, William G.	*Abington.*	Abington.
Cutter, Roland N.	*Winchester.*	Winchester.
Dame, Frank L.	*Boston.*	19 Temple Pl.
Davenport, William S.	*Roxbury.*	190 Dudley St.
Davis, Arthur L.	*San Francisco, Cal.*	85 Dartmouth St.
Deetz, Charles H.	*Sellersville, Penn.*	311 Columbus Ave.
Dodge, Charles B.	*Skowhegan, Me.*	22 Wyoming St.
Dow, William H.	*Portland, Me.*	42 Concord Sq.
Draper, James S.	*Canton.*	Canton.
Duane, William M.	*West Newton.*	West Newton.
Dunbar, Kinsley.	*Canton.*	Canton.
Dunphe, Carroll S.	*East Bridgewater.*	East Bridgewater.
Durfee, Nathan.	*Fall River.*	369 Columbus Ave.
Dwelley, Edwin F.	*West Hanover.*	West Hanover.
Dyar, Harrison G.	*Rhinebeck, N.Y.*	170 West Chester Pk.
Edwards, Arthur V.	*Milton.*	Milton.
Estabrook, Willard W.	*Boston.*	42 Rutland Sq.
Ewen, Alexander S.	*Fitchburg.*	Fitchburg.
Fairbairn, John T.	*Hyde Park.*	Hyde Park.
Field, Frank R.	*Greenfield.*	84 Charles St.
Fiske, J. Parker B.	*Auburndale.*	Auburndale.
Forristall, Arthur M.	*Boston.*	172 West Newton St.
French, Edward V.	*Lynn.*	Lynn.
French, Hollis.	*Boston.*	200 Commonw'th Ave.
Gannett, Earl W.	*Omaha, Neb.*	127 St. Botolph St.
Gardiner, Irving L'H.	*Milford, Penn.*	6 Allston St.
Gilbert, James P.	*Jamaica Plain.*	Chestnut Ave.
Gilman, Charles W.	*Palisades, N.Y.*	86 Mt. Vernon St.

NAME.	HOME.	RESIDENCE.
Goodrich, David P.	*South Boston.*	801 Broadway.
Greenwood, Joseph N.	*Lawrence.*	Lawrence.
Grose, Charles W.	*North Abington.*	North Abington.
Guppy, Benjamin W.	*Jamaica Plain.*	Myrtle St.
Hall, Roderick D.	*Longwood.*	Longwood.
Ham, Fred.	*East Somerville.*	East Somerville.
Harding, George C.	*Pittsfield.*	Auburndale.
Harrington, Edward M.	*Reading.*	Reading.
Hart, Francis.	*New Bedford.*	Jamaica Plain.
Hawkins, Paul R.	*Springfield.*	111 Warren Ave.
Hazard, Schuyler.	*Georgetown, S.C.*	Braintree.
Hill, Foster B.	*Billerica.*	Billerica.
Hills, Frederic A.	*Newtonville.*	Newtonville.
Hobart, Henry M.	*Boston.*	60 West Rutland Sq.
Hobbs, Franklin W.	*Brookline.*	Brookline.
Hollis, Frederick S.	*Newton Highlands.*	Newton Highlands.
Hooker, Richard.	*Boston.*	19 Forest St.
Hopkins, Fred. L.	*Lawrence.*	Lawrence.
Howe, George E.	*Boston.*	7 Bowdoin St.
Hunt, Harry H.	*Melrose.*	Melrose.
Huntoon, Edmund J. B.	*Canton.*	Canton.
Hutchins, Edward S	*Providence, R.I.*	5 St. James Ave.
Hyde, John S.	*Bath, Me.*	105 Pembroke St.
Johnson, William Stone.	*Saxonville.*	Saxonville.
Johnson, Williams S.	*Lynn.*	Lynn.
Jonas, Frank B.	*New Orleans, La.*	101 Boylston St.
Kaufman, George C.	*Syracuse, N.Y.*	196 West Canton St.
Kendricken, Paul J.	*Boston.*	376 Dudley St.
Kilham, Walter H.	*Beverly.*	Beverly.
Kinsman, Arthur D.	*Ipswich.*	Beverly.
Knapp, Willard P.	*Mooers, N.Y.*	50 Chandler St.
Kunhardt, Lewis H.	*Melrose Highlands.*	Melrose Highlands.
Lauder, George B.	*Concord, N.H.*	U. S. Hotel.
La Rose, Anthime W.	*Albany, N.Y.*	62 Berkeley St.
Latta, Louis M.	*Boston.*	180 Commonw'th Ave.
Laws, Frank A.	*Brockton.*	Brockton.
Lewis, William W.	*Hyde Park.*	Hyde Park.
Manning, J. Woodward.	*Reading.*	Reading.
Marcy, George D.	*Portsmouth, N.H.*	41 Grey St.
Marsh, Edmund P.	*Newton.*	Newton.
Mauran, J. Lawrence.	*Providence, R.I.*	Newton.
May, John E., Jun.	*Philadelphia, Penn.*	25 Lambert Ave.
McCarthy, William P.	*Lowell.*	Lowell.
McConnell, George B.	*Roxbury.*	153 Blue Hill Ave.

NAME.	HOME.	RESIDENCE.
Merrick, Sumner B.	*Arlington Heights.*	Arlington Heights.
Merrill, William H., Jun.	*Boston.*	61 Chester Sq.
Mildram, Samuel H.	*Neponset.*	Neponset.
Moore, Carlos B.	*Brookline.*	Brookline.
Morgan, Roger.	*Springfield.*	111 Warren Ave.
Morse, Charles H.	*Millbury.*	482 Columbus Ave.
Mower, Frank A.	*Lynn.*	Lynn.
Nash, Frank C.	*Cherryfield, Me.*	407 Columbus Ave.
Newell, Samuel M.	*West Newbury.*	23 Austin St.
Norris, Almon E.	*Lexington.*	Lexington.
Norris, Clarence G.	*Hyde Park.*	Hyde Park.
Orrok, George A.	*Dorchester.*	Olney St.
Palmer, Harold P.	*Somerville.*	Somerville.
Park, W Irving.	*Groton.*	82 Appleton St.
Pearson, Gardner W.	*Lowell.*	Lowell.
Pease, Calvin E.	*Dayton, O.*	Hotel Clifford.
Peirce, Eugene E.	*Abington.*	Abington.
Pendleton, Lyman B.	*Stonington, Conn.*	Newton.
Pietsch, Theodore W.	*Chicago, Ill.*	40 Clifford St.
Pike, Clayton W.	*Fryeburg, Me.*	1 Concord Sq.
Pillsbury, Edwin S.	*Derry Depot, N.H.*	32 Clarendon St.
Plumer, William G.	*Peabody.*	Peabody.
Pomeroy, Herbert M.	*Denver, Col.*	523 Columbus Ave.
Power, Charles W.	*Pittsfield.*	19 Upton St.
Putnam, Albert E.	*West Newton.*	West Newton.
Ranno, Fred W.	*Manchester, N.H.*	364½ Tremont St.
Ray, Victor.	*Boston.*	116 Chandler St.
Richardson, George L.	*San Rafael, Cal.*	85 Dartmouth St.
Rogers, Harry L.	*Orchard Lake, Mich.*	17 Upton St.
Rollins, Montgomery.	*Dover, N.H.*	214 Columbus Ave.
Rounds, George W.	*Malden.*	Malden.
Ruffin, Julien B	*Old Church, Va.*	290 Columbus Ave.
Russel, Richard L.	*Pottsville, Penn.*	198 Beacon St.
Russell, George F.	*Lawrence.*	143 Boylston St.
Sanborn, Frank E.	*Roxbury*	103 Moreland St.
Seavey, Herbert T.	*Canton.*	Canton.
Sheldon, Samuel B.	*Manchester.*	Manchester.
Shepard, Edward V.	*Salem.*	Salem.
Sherman, George B.	*Watertown.*	Watertown.
Simpson, Charles L.	*Kansas City, Mo.*	298 Columbus Ave.
Simpson, George P.	*Montreal, P.Q.*	243 Warren St.
Smith, Harry D.	*Boston.*	16 Bond St.
Smith, William L.	*Boston.*	360 Marlboro' St.
Smythe, Frank A.	*Somerville.*	Somerville.

NAME.	HOME.	RESIDENCE.
Spalding, Kaludy.	*Auburndale.*	Auburndale.
Spring, Marcus T.	*Danvers.*	Danvers.
Stedman, William A.	*Newport, R.I.*	6 Park Sq.
Stevens, Everett L.	*Newburyport.*	Newburyport.
Stewart, Rowland W.	*Bangor, Me.*	
Stone, George G.	*Evanston, Ill.*	57 Clarendon St.
Tenney, Walter H., Jun.	*Dorchester.*	Trull St.
Thomas, Albert E.	*South Easton.*	South Easton.
Thomas, Fred A.	*Woonsocket, R.I.*	20 Rutland Sq.
Thurber, William B.	*Plymouth.*	Plymouth.
Truesdell, Arthur E.	*West Stockbridge.*	Newton.
Tutein, Constantine D.	*Revere.*	Revere.
Tuttle, Herbert C.	*Concord.*	Concord.
Van Nostrand, Frank B.	*Charlestown.*	10 Auburn St.
Wadsworth, Oliver F., Jun.	*Boston.*	139 Boylston St.
Wales, George C.	*Boston.*	202 Commonw'th Ave.
Walkup, Thomas, Jun.	*Chicago, Ill.*	132 Chandler St.
Warner, Charles H.	*Fall River.*	275 Newbury St.
Watson, Arthur P.	*Sharon.*	Sharon.
Whipple, George C.	*Chelsea.*	Chelsea.
White, Joseph B.	*Hanson.*	Hanson.
Whiting, Jasper.	*Charlestown.*	100 Main St.
Whitmore, George A.	*Lowell.*	Lowell.
Whitney, Frank P.	*Pittsfield.*	592 Adams St.
Williams, Robert C.	*Marquette, Mich.*	127 Pembroke St.
Williams, Theodore G.	*Roxbury.*	28 Highland P'k Ave.
Willim, William B.	*Stillwater, Minn.*	364½ Tremont St.
Williston, Arthur L.	*Cambridge.*	Cambridge.
Wilson, Benjamin F., Jun.	*Norfolk, Va.*	26 Berwick Park.
Wood, J. Delano.	*New Bedford.*	25 Somerset St.
Wright, Minturn T.	*Philadelphia, Penn.*	115 Berkeley St.
Wuichet, Walter G.	*Dayton, O.*	62 Berkeley St.
Young, Henry G.	*Groton.*	153 West Canton St.

SPECIAL STUDENTS.

NAMES.	HOME.	RESIDENCE.
Adams, Henry S., Civ. Eng., Geol.	*Cambridge.*	Cambridge.
Amory, Arthur, Jun., Math., Chem., Germ.	*Boston.*	133 Marlboro' St.
André, S. Fortun y, Surv., Math., Desc. Geom., Phys., Eng., Germ., Chem.	*Havana, Cuba.*	5 Boylston Pl.
Atherton, Walter, C. E., Arch.	*Stoughton.*	Stoughton.
Baldwin, Annie F., Chem.	*Boston.*	241 Columbus Ave.
Baldwin, George C., Germ., Fr., Chem., Eng.	*Barton, Vt.*	467 Columbus Ave.
Baldwin, James C. T., Phys., Math., Desc. Geom., Shop., Eng., Fr., Mech.	*Jamaica Plain.*	Pond St.
Banes, Warner J., Math., Phys., Mech., Shop., Germ.	*Philadelphia, Penn.*	286 Beacon Street.
Bates, Henry D., Math., Phys., Arch., Eng., Fr., Desc. Geom.	*Racine, Wis.*	626 Tremont St.
Billings, George L., Math., App. Mech., Arch., Germ., Geol.	*Milford, N.H.*	14 Truro St.
Bliss, Will S., Geol., Eng., Civ. Eng., Math., App. Mech., Germ.	*Carson, Nev.*	1507 Washington St.
Blodgett, John, Mech., Shop., Math., Desc. Geom., Phys., Eng., Germ., Fr.	*Pawtucket, R.I.*	98 Pembroke St.
Borden, Richard P., Mech. Eng., Met., App. Mech.	*Fall River.*	369 Columbus Ave.
Bosworth, William W., Arch., Fr.	*Marietta, O.*	14 Worcester Sq.
Bowditch, Nathaniel I., Phys., Math., Desc. Geom., Shop., Eng.	*Framingham.*	29 Commonw'th Ave.
Brett, Franklin, Shop., Math., App. Mech., Phys., Germ.	*Brookline.*	Brookline.
Bridges, Luther W., Math., Phys., Mech., Desc. Geom., Germ., Eng., Shop.	*South Framingham.*	South Framingham.
Bruce, Edward M., Chem., Germ.	*Aurora, Ill.*	13 Allston St.

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

App. Mech.,	Applied Mechanics.	Eng.,	English.	Mil.,	Military Drill.
Arch.,	Architecture.	Fr.,	French.	Min.,	Mining.
Chem.	Chemistry.	Geol.,	Geology.	Phys.,	Physics.
Civ. Eng.,	Civil Engineering.	Germ.,	German.	Physiol.,	Physiology.
Draw.,	Mech. Drawing.	Math.,	Mathematics.	Shop.,	Shopwork.
Desc. Geom.,	Descriptive Geometry.	Mech.,	Mechanism.	Span.,	Spanish.
Elec. Eng.,	Electrical Engineering.	Mech. Eng.,	Mechanical Engineering.	Surv.,	Surveying.
		Met.,	Metallurgy.	Zoöl.,	Zoölogy.

NAMES.	HOME.	RESIDENCE.
Burgess, John K.,	*Dedham.*	Dedham.
Mech. Eng., App. Mech., Shop., Met.		
Buttolph, Benjamin G.,	*Buffalo, N.Y.*	38 Upton St.
Mech., Shop., Math., Desc. Geom., Phys., Fr.		
Carleton, Elbridge S.,	*Rochdale.*	2 Ashburton Pl.
Arch., App. Mech., Mech. Eng., Eng., Germ., Geol.		
Carpenter, Jas. E. R., Jun.,	*Columbia, Tenn.*	25 Holyoke St.
Arch., Math., Fr.		
Carter, Henry M.,	*Granville, O.*	295 Columbus Ave.
Chem., Geol.		
Carter, N. P. Ames,	*Chicopee Falls.*	688 Tremont St.
Math., Germ., Phys., Eng., Shop.		
Cartwright, Jas. W., Jun.,	*Boston.*	503 Columbus Ave.
Chem., Germ., Fr.		
Chadwick, J. C.,	*Boston.*	38 West Cottage St.
Math., Eng., Fr., Draw.		
Chandler, Howland S.,	*Allston.*	Allston.
Arch., Desc. Geom.		
Chandler, Joseph E.,	*Plymouth.*	Plymouth.
Arch., Fr.		
Chase, Arthur T.,	*Haverhill.*	Haverhill.
Phys., Math.		
Church, William L.,	*Malden.*	Malden.
Mech. Eng., App. Mech., Elec. Eng., Fr.		
Cilley, Frank H.,	*Dorchester.*	Dudley St.
Math., Chem., Eng., Draw.		
Clark, Harry W.,	*North Andover.*	North Andover.
Chem., Geol., Phys., Eng.		
Clement, Russell M.,	*Oakland, Cal.*	383 Columbus Ave.
Math., Chem., Draw., Germ., Shop., Eng.		
Cobb, Morton E.,	*Newton.*	Newton.
Mech. Eng., Shop., Germ., Math., App. Mech., Phys., Eng.		
Cooley, Helen,	*Little Britain, N.Y.*	Berk. St., cor. Apple'n.
Chem., Phys., Eng.		
Coombs, Stephen E.,	*Brunswick, Me.*	Brookline.
Civ. Eng., Math., App. Mech., Phys., Geol., Eng., Germ.		
Coulson, Joseph, Jun.,	*Lawrence.*	Lawrence.
Surv., Math., Phys., Eng., Germ.		
Crosby, Clifford F.,	*Framingham.*	Framingham.
Arch., Fr.		
Crosby, Freeman M.,	*Brewster.*	Melrose.
Chem., Germ., Eng.		
Crowninshield, Bowdoin B.,	*Boston.*	164 Marlboro' St.
Chem., Shop., Draw., Fr., Mil.		
Cudworth, Edward A.,	*Boston.*	20 Fountain St.
Arch., Fr.		
Currier, Lillian G.,	*Jamaica Plain.*	Chestnut Ave.
Chem., Germ.		
Curtiss, George F.,	*New Britain, Conn.*	131 W. Newton St.
Phys., Math., App. Mech., Fr., Mech. Eng., Germ.		

NAMES.	HOME.	RESIDENCE.
Daniell, Eugene S.,	*Franklin, N.H.*	214 Columbus Ave.
Mech., Draw., Math., Desc. Geom., Phys., Eng.		
Dearborn, William L.,	*Dorchester.*	Harrison Sq.
Surv., Math., Phys., Eng., Germ.		
Dempsey, George C.,	*Lowell.*	Lowell.
Chem., Phys., Germ.		
Dewing, Fred. M.,	*Holliston.*	Holliston.
Chem., Eng., Fr., Draw., Mil.		
Draper, George O.,	*Milford.*	200 Dartmouth St.
Mech. Eng., Phys., Math., App. Mech., Shop.		
Eisendrath, Simon B.,	*Chicago, Ill.*	117 Berkeley St.
Arch., Fr.		
Elder, Herman S.,	*Lewiston, Penn.*	345 Columbus Ave.
Math., Draw., Shop.		
Ellis, Fred E.,	*Melrose.*	Melrose.
Mech., Shop., Math., Desc. Geom., Phys., Eng., Germ.		
Faunce, Charles L.,	*New Bedford.*	40 Dwight St.
Arch., Phys., Fr., Shop.		
Fessenden, R. G.,	*Boston.*	155 Beacon St
Math., Eng., Germ., Chem.		
Fish, Walter C.,	*Taunton.*	Taunton.
Phys., Germ., Eng., Math., App. Mech., Mech. Eng.		
Fletcher, P. Russell,	*Bellows Falls, Vt.*	48 Appleton St.
Civ. Eng., Math., App. Mech., Geol.		
Fox, Frederick, Jun., S.B.,	*Portland, Me.*	188 W. Brookline St.
Chem.		
Freeman, J. Eugene,	*South Boston.*	395 Fourth St.
Arch., Geol., Eng.		
Frizell, Arthur B.,	*Dorchester.*	Linden, cor. Adams St.
Fr., Math., Mech., Desc. Geom., Germ., Phys., Eng., Shop.		
Frost, Edgar A., A.B.,	*Chillicothe, O.*	362 Columbus Ave.
Civ. Eng.		
Fuller, J. Franklin, Jun.,	*West Newton.*	West Newton.
Germ., Eng., Geol., Fr., Surv.		
Gage, Walter C.,	*Warren.*	Somerville.
Math., Chem., Desc. Geom., Germ., Eng., Shop.		
Gaines, Ambrose P.,	*Nashville, Tenn.*	3 Columbus Sq.
Fr., Math., Chem., Phys., Germ.		
Gale, Edwards J.,	*Exeter, N.H.*	Newton.
Arch., Math., Fr.		
Gammans, James A.,	*Belfast, Me.*	Newton Centre.
Surv., Math., Phys., Eng., Germ.		
Gardner, Charles H., B.S.,	*Washington, D.C.*	74 Chester Sq.
Chem., Min., Phys.		
Goodale, Joseph L.,	*Cambridge.*	Cambridge.
Shop., Draw.		
Goss, Edward O.,	*Waterbury, Conn.*	296 Columbus Ave.
Math., App. Mech., Germ., Phys., Shop., Mech. Eng.		
Gould, Edward S.,	*Andover.*	Andover.
Phys., Germ., Math., Mech. Eng., Desc. Geom., Eng.		

NAMES.	HOME.	RESIDENCE.
Guild, Irving T., Arch.	*Lynn.*	Lynn.
Hall, Joseph J., Arch.	*Atlanta, Ga.*	Lexington.
Hall, Prescott F., Math., Chem., Germ.	*Brookline.*	Brookline.
Handy, James O., Met., Min., Chem., Germ.	*Barnstable.*	381 Meridian St.
Hathaway, D. Lewis, Mech. Eng., App. Mech., Met., Shop.	*Rochester.*	78 Chandler St.
Heath, Edward W., Chem., Math., Eng., Germ.	*Waterville, Me.*	142 Chandler St.
Hildreth, William O., Eng., Germ., Shop., Math., App. Mech., Phys.	*Gardiner, Me.*	65 Dorchester St
Hill, Henry E., Arch., Math.	*Kansas City, Mo.*	24 Worcester Sq.
Hiscox, James A., Arch.	*Norwich, Conn.*	6 Cazenove St.
Hix, Edward R., Mech., Phys., Desc. Geom., Math., Shop.	*New York, N.Y.*	236 West Canton St.
Holden, Albert F., Draw.	*Cleveland, O.*	Cambridge.
Holmes, Charles L., Math., Mech., Desc. Geom., Shop., Phys.	*Waterbury, Conn.*	296 Columbus Ave.
Hoppin, Francis L. V., Arch.	*Pomfret, Conn.*	66 Mt. Vernon St.
Howard, Henry, Chem., Math.	*Longwood.*	Longwood.
Hutcheson, Mary, Chem.	*Columbus, O.*	Hotel Copley.
Hyams, Isabel F., Chem., Germ.	*Boston.*	1 Sharon St.
Jarecki, Alexander H., Mech., Shop., Math., Desc. Geom., Phys.	*Erie, Penn.*	524 Columbus Ave.
Johnson, Lewis E., Shop., Germ., Desc. Geom., Draw., Math.	*Waterloo, Ia.*	215 W. Canton St.
Kean, Alexander L., Eng., Germ., Fr.	*Elizabeth, N.J.*	1 Oxford Terrace.
Kimball, Clarence L., Phys., App. Mech., Shop., Mech.	*Lowell.*	Lowell.
Kimball, Harry W., Shop., Math., App. Mech., Phys., Germ., Mech. Eng.	*Bath, Me.*	147 West Newton St.
Kimball, Thomas R., Arch.	*Omaha, Neb.*	28 Yarmouth St.
King, Thomas C., A.B., Germ., Geol., Chem., Shop., Draw.	*Marion, Ala.*	52 Dwight St.
Kirkham, Guy, Arch.	*Springfield.*	150 Chandler St.
Ladd, Frank M., Germ., Math., Shop., Eng.	*Uncasville, Conn.*	115 Appleton St.

NAMES.	HOME.	RESIDENCE.
Laist, Theodore F.,	*Cincinnati, O.*	85 Dartmouth St.
Phys., Chem., Fr., Math., Arch., Eng., Draw., Mil.		
Lane, Benjamin C.,	*Boston.*	623 Tremont St.
Chem., Phys., Germ., Eng., Geol		
Lawrence, John McC.,	*St. John, N.B.*	30 Clarendon St.
Mech. Eng., App Mech., Met., Shop., Fr.		
Lewis, Fred,	*Haverhill.*	Haverhill.
Elec Eng., Mech. Eng., App. Mech.		
Lloyd, James D., Jun.,	*Sandwich.*	Sandwich.
Chem., Phys., Met.		
Loewenthal, Joseph B.,	*Chicago, Ill.*	1 Yarmouth St.
Chem., Eng., Geol.		
Loring, Harrison, Jun.,	*South Boston.*	789 Broadway.
Fr., Math., Draw., Eng.		
Loud, J. Prince,	*Boston.*	135 Mt. Vernon St.
Arch., Geol.		
Lufkin, Elgood C.,	*Titusville, Penn.*	273 Columbus Ave.
Mech. Eng., App. Mech., Met., Shop.		
Manning, George L.,	*Boston.*	1 Yarmouth St.
Mech., Shop., Math., Desc. Geom., Phys., Germ.		
McCortney, John H.,	*Boston.*	52 Chandler St.
Chem., Mech., Met		
Meade, Frank B.,	*Cleveland, O.*	Hotel Berwick.
Arch., Fr., Mil.		
Means, Ellison C.,	*Ashland, Ky.*	25 Berwick Park.
Germ., Chem., Surv., Shop., Met.		
Merrill, Frank A.,	*Exeter, N.H.*	Newton.
Math., Shop., Phys., Germ		
Mirrlees, James H.,	*Glasgow, Scot.*	86 Mt. Vernon St.
Math., App. Mech., Mech. Eng., Phys., Shop		
Moody, Walter S.,	*Chelsea.*	Chelsea.
Mech., Germ., Eng., Math., App. Mech., Phys.		
Morrison, Gilbert W.,	*Exeter, N.H*	Exeter, N.H.
Mech. Eng., Eng., Phys., Shop., Math., App. Mech., Germ.		
Mower, Charles H.,	*West Newton.*	West Newton.
Germ., Eng., Shop., Draw.		
Muhlenberg, Frederick H.,	*Reading, Penn.*	282 Columbus Ave.
Mech., Shop., Math., Desc. Geom., Phys.		
Neave, Joseph S.,	*Cincinnati, O.*	369 Columbus Ave.
Mech. Eng., Shop., App. Mech., Met.		
Neiler, Samuel G.,	*Minneapolis, Minn.*	Wheatland Ave.
Mech., Math., Desc. Geom., Phys., Germ., Shop.		
Nichols, Frank C.,	*New London, Conn.*	29 Berwick Park.
Mech. Eng., Eng., Phys., Shop., Math., Appl. Mech., Germ.		
Nickels, Arthur R.,	*Cherryfield, Me.*	Allston.
Chem., Germ., Min., Math., App. Mech., Phys.		
Noble, Theron A.,	*Des Moines, Ia.*	29 Berwick Park.
Mech. Eng., App. Mech., Met., Germ.		
Northey, Herbert W.,	*Salem.*	Salem.
Arch., Fr., Geol., Math.		

NAMES.	HOME.	RESIDENCE.
Nutter, Oscar E., Mech. Eng., Phys., Eng., Shop., Math., App. Mech., Germ.	*Great Falls, N.H.*	355 Dudley St.
Nye, George H., Civ. Eng., App. Mech.	*New Bedford.*	New Bedford.
Olzendam, Louis H., Math., Fr., Germ., Eng., Chem.	*Manchester, N.H.*	29 Union Park.
Paine, Sumner, Chem.	*Boston.*	87 Mt. Vernon St.
Parker, Wilson B., Arch.	*Morristown, N.J.*	Hyde Park.
Parmelee, George L., Geol., Zoöl.	*Boston.*	15 Chester Park.
Perkins, Dwight H., Arch.	*Chicago, Ill.*	9 Exeter St.
Pierce, Frank L., Math., Chem., Eng., Draw., Mil.	*Springfield.*	44 Chandler St.
Plimpton, Waldo L., Math., Chem., Eng., Draw., Shop., Mil.	*West Newton.*	West Newton.
Pool, George B., Phys., Mech., Math., Desc. Geom., Shop., Eng., Germ., Fr.	*Forest Hills.*	Forest Hills.
Prescott, Howard B. S., App. Mech., Fr., Arch.	*Arlington.*	Arlington.
Prinz, George B., Arch.	*Dayton, O.*	611 Tremont St.
Proctor, Charles A., Phys., Germ., Eng.	*Peabody.*	Peabody.
Proctor, William, Jun., Arch., Math., Eng., Germ.	*Arlington.*	Arlington.
Putnam, Frederick W., Math., App. Mech., Phys., Met., Geol., Fr., Eng., Span.	*Waterville, N.Y.*	407 Columbus Ave.
Quigley, Edward P., Math., Desc. Geom., Phys., Mech., Shop., Germ.	*Pewee Valley, Ky.*	Hotel Waquoit.
Redd, Benoist S., Draw., Mech., Shop., Math., Desc. Geom., Phys., Eng.	*Natchez, Miss.*	25 Union Park.
Regan, William P., Arch.	*Andover.*	348 Shawmut Ave.
Reynolds, Ralph W., Shop.	*Fall River.*	26 Appleton St.
Richardson, Herbert A., Chem., Geol., Phys., Germ., Eng.	*Boston.*	1818 Washington St.
Robinson, Miner, Germ., Eng., Phys., Shop.	*West Newton.*	West Newton.
Rockfellow, Annie G., Arch.	*Mt. Morris, N.Y.*	41 Upton St.
Roper, George W., Math., Phys., Surv., Germ., Eng., Fr.	*Norfolk, Va.*	52 Dwight St.
Russell, L. Kimball, Chem., Phys., Met.	*Arlington.*	Arlington.
Safford, Leandro T., Germ., Shop., Phys.	*Boston.*	308 Columbus Ave.

NAMES.	HOME.	RESIDENCE.
Saunders, Walter M., Chem.	*Olneyville, R.I.*	
Schmid, Richard G., Arch., Shop.	*Chicago, Ill.*	165 Boylston St.
Sever, George F., Phys., Germ., Math., Mech., Desc. Geom.	*Cambridge.*	Cambridge.
Shattuck, George C., Arch., Math., Desc. Geom.	*Nashua, N.H.*	Nashua, N.H.
Shepard, William E., App. Mech., Elec. Eng., Mech. Eng., Math., Phys.	*Hartford, Conn.*	240 West Canton St.
Sherman, Adelaide, Chem., Phys., Germ.	*Roxbury.*	53 Norfolk St.
Shortall, John L., Arch., Fr.	*Chicago, Ill.*	150 Chandler St..
Smith, Joseph C., Chem., Germ.	*Providence, R.I.*	25 Yarmouth St.
Smith, Joseph M., Jun., Chem., Phys., Fr.	*Boston.*	10 Greenwich Park.
Smith, J. Waldo, Civ. Eng., App. Mech.	*Lincoln.*	Lincoln.
Smith, Murray, Arch.	*Boston.*	12 Atherton St.
Smith, Noah B., Chem., Germ.	*Washington, D.C.*	336 Shawmut Ave.
Sparhawk, N. Arthur, Eng., Phys., Math.	*Boston.*	1766 Washington St.
Stearns, Charles K., Mech. Eng., Shop., Math., App. Mech., Phys.	*Newton Centre.*	Newton Centre.
Stearns, John W., Germ., Eng., Math., Surv.	*Waltham.*	Waltham.
Stevens, Charles W., Math., Phys., Chem., Surv., Germ., Fr.	*Cambridge.*	Cambridge.
Stewart, Norman Q., Min., Germ., Geol., Chem., Math., App. Mech., Phys.	*Everett.*	Everett.
Stickney, Delia, Chem.	*Danvers.*	Danvers.
Stickney, Samuel C., Civ. Eng., App. Mech., Phys.	*St. Paul, Minn.*	22 Berwick Park.
Stone, George W., Math., Chem., Eng., Draw., Mil.	*Madisonville, O.*	West Medford.
Sturges, Solomon, Phys., Fr., Chem., Math.	*Chicago, Ill.*	150 Chandler St.
Sweetland, Ralph, Mech., Phys., Math., Eng., Shop., Fr., Desc. Geom.	*Natick.*	Natick.
Sylvester, George E., Civ. Eng., Geol.	*Danversport.*	Danversport.
Talbot, Marion, A.M., Chem.	*Boston.*	66 Marlboro' St.
Taylor, Everett K., Arch.	*South Orange, N.J.*	Cambridgeport.

NAMES.	HOME.	RESIDENCE.
Thomas, William R.,	*Boston.*	16 Circuit St.
Math., App. Mech., Mech. Eng., Germ , Phys., Shop.		
Thompson, Frederick,	*Washington, D.C.*	290 Columbus Ave.
Civ. Eng., Math., App. Mech., Germ., Geol., Eng., Phys.		
Thompson, Walter S.,	*Roxbury.*	33 Rockland St.
Civ. Eng., Math., App. Mech., Germ., Geol , Eng., Phys.		
Thornbury, Wm. G., B.S.,	*Lexington, Ky.*	Hyde Park.
Arch., Math., Phys., Germ.		
Todd, Frederick C.,	*Milltown, N.B.*	45 W. Newton St.
Phys., Math., App. Mech., Mech. Eng., Eng., Germ.		
Totman, Harry F.,	*Fairfield, Me.*	156 Warren Ave.
Math., Phys., Civ. Eng., Germ , Geol.		
Tucker, Greenleaf R.,	*Boston.*	City Hospital.
Math., Draw., Phys., Eng., Met., Chem		
Underhill, William W.,	*Winchester.*	Winchester.
Chem., Math., Desc. Geom., Shop , Germ., Eng.		
Varney, William W.,	*Philadelphia, Penn.*	364 Columbus Ave.
Mech. Eng., App. Mech., Met., Fr., Germ.		
Very, Nathaniel T.,	*Salem.*	Salem.
Desc. Geom., Eng., Germ., Math., Shop.		
Vielé, Maurice A., B.S.,	*Geneva, N.Y.*	1 St. James Ave.
Mech. Eng., App. Mech., Met., Phys.		
Vinton, Raymond P.,	*Pomfret Centre, Ct.*	66 Mt. Vernon St.
Arch.		
Vose, Richard H.,	*Brookline.*	Brookline.
Surv., Math., Phys., Germ., Eng.		
Wakefield, F. Manton,	*St. Paul, Minn.*	159 Warren Ave.
Arch., Math., Germ., Fr.		
Walker, Charles R.,	*Cambridgeport.*	Cambridgeport.
Math., Chem., Fr., Eng.		
Walker, Stoughton,	*Boston.*	237 Beacon St.
Germ., Eng., Physiol.		
Watson, Gertrude L.,	*Dorchester.*	Mather St.
Chem.		
Wheeler, Sam,	*Concord.*	Concord.
Surv., Math., Phys.		
White, J. Foster,	*Brookline.*	Brookline.
Phys., Chem., Germ., Eng., Geol.		
Whitney, Joseph T.,	*Leominster.*	Chelsea.
Phys., Shop., Draw.		
Wilder, C. Morris,	*Cincinnati, O.*	273 Columbus Ave.
Elec. Eng., App. Mech., Math., Mech. Eng., Phys.		
Williams, Rufus P.,	*Boston.*	150 Warren Ave.
Chem.		
Wilson, Horace M.,	*Cambridge.*	Cambridge.
Germ., Phys., Eng.		
Wood, Frederick J.,	*Boston.*	237 West Canton St.
Mech., Math., Phys., Eng., Desc. Geom., Germ., Shop.		
Woodward, Harvey G.,	*Wheeling, Ala.*	75 Waltham St.
Shop., Draw., Chem., Met.		

NAMES.	HOME.	RESIDENCE.
Wright, Julian V.,	*Cincinnati, O.*	357 Columbus Ave.
Math., Phys., Mech., Desc. Geom., Eng., Shop., Fr.		

SUMMARY: SCHOOL OF INDUSTRIAL SCIENCE.

GRADUATE STUDENTS	19
REGULAR STUDENTS, 4th year	53
" " 3d "	63
" " 2d "	112
" " 1st "	187
SPECIAL STUDENTS	194
	628
Deduct names counted twice	19
Total	609

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 astromony, 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 1885–86 are on the following subjects: —

I. *Physiology of the Circulation.* — Twelve lectures and laboratory exercises by Associate Professor Sedgwick, on Mondays and Fridays at 7.30 P.M., beginning Nov. 6.

II. *The Acoustic and Electrical Principles Underlying the Art of Telephony.* — Twelve lectures by Professor Cross, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 9.

III. *Elementary Organic Chemistry.* — Twelve lectures by Associate Professor Norton, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 9.

IV. *Theory and Solution of Higher Equations.* — Twelve lectures by Associate Professor Wells, on Mondays and Wednesdays at 7.30 P.M., beginning Nov. 11.

V. *Crystallography.* — Twelve lectures by Assistant Professor Crosby, on Tuesdays and Thursdays at 7.30 P.M., beginning Nov. 12.

VI. *Slide Valve and Link Motion.* — Twelve lectures by Assistant Professor Peabody, on Tuesdays and Thursdays at 7.30 P.M., beginning Dec. 1.

VII. *Middle High German.* — Twelve lectures by Professor Otis, on Tuesdays and Fridays at 7.30 P.M., beginning Jan. 5.

VIII. *Elementary Electrical Measurements.* — Ten laboratory exercises by Associate Professor Holman, with assistants, on Fridays at 7.30 P.M., beginning Jan. 8.

SCHOOL OF MECHANIC ARTS.

SCHOOL OF MECHANIC ARTS.

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

The general plan of the school is similar to that of the Imperial Technical School of Moscow, the Royal Mechanic Art School of Komotau in Bohemia, the École Municipale d'Apprentis of Paris, or that of the Ambachtsschoole of the principal cities of Holland, but has been specially adapted to the somewhat different conditions existing in our own country. The object is not to fit the pupil for a particular trade, but to develop the bodily and mental powers in harmony with each other, and with reference to the actual wants of life. The handwork is done without regard to pecuniary profit, but is designed to give the student good judgment, self-reliance, and executive power, pieces practically useful being introduced when it can be done without detriment to the systematic arrangement of the courses. Its exact and systematic method affords the direct advantage of training the hand and eye for accurate and efficient service with the greatest economy of time, and the instruction in the use of tools and materials has also proved a valuable aid in intellectual development.

The school occupies a building on Garrison Street, a short distance from the Rogers Building. The facilities for instruction are ample and increasing; and the mechanical

laboratories, in which the instruction in the mechanic arts is given, have a thorough equipment (see p. 46).

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

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

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

The present regular course is as follows: —

REGULAR COURSE.

FIRST YEAR.

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

SECOND YEAR.

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

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

REQUIREMENTS FOR ADMISSION.

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

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

The requirements in the various subjects are as follows: —

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

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

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

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

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

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

REGULATIONS OF THE SCHOOL.

School-year. — The beginning and ending of the school-year and the days of examinations are the same as in the School of Industrial Science (see Calendar, p. 83).

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

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

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

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

Bond. — The regulations concerning the bond are the same as in the School of Industrial Science (see p. 85).

Examinations. — Examinations are held at the close of each term, and a report of the progress of each student is made to his parent or guardian.

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

Scholarships of the Massachusetts Charitable Mechanics' Association. — The two scholarships founded by this Association are awarded, on competitive examination, to sons of present or past members of the Association.

OFFICERS OF INSTRUCTION.

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

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

SCHOOL OF MECHANIC ARTS.

REGISTER OF STUDENTS.

SECOND YEAR.

NAME.	HOME.	RESIDENCE.
Benson, Harry P.,	*Salem.*	Salem.
Dawson, William F.,	*Jamaica Plain.*	Jamaica Plain.
Goddard, Frank C.,	*Woburn.*	Woburn.
Howe, Benjamin M.,	*Natick.*	Natick.
Maxim, Hiram P.,	*Hyde Park.*	Hyde Park.
Pratt, Nathan R.,	*Sudbury.*	Sudbury.
Richardson, Walter P.,	*Salem.*	Salem.
Schneidt, Frederic A.,	*Boston.*	59 Fayette St.
Tripp, Thaxter N.,	*Lynn.*	Lynn.
Turner, William P.,	*Isle au Haut, Me.*	Hotel Clifton.
Whitney, Fred. A.,	*Leominster.*	61 Chandler St.
Wooldridge, N. S.,	*Pittsburg, Penn.*	2 Columbus Sq.

FIRST YEAR.

Bockus, Charles E.,	*Dorchester.*	Ashland St.
Gleason, Albert H.,	*Rock Bottom.*	Rock Bottom.
Hutchinson, Edward P.,	*Danvers Centre.*	Danvers Centre.
Lynde, Frank W.,	*Melrose.*	Melrose.
Moorhead, James K.,	*Pittsburg, Penn.*	2 Columbus Sq.
Pullman, Frederic A.,	*New York, N.Y.*	Lynn.
Ruggles, Horace F.,	*Brookline.*	Brookline.
Smith, Gilbert H.,	*Boston.*	2 Granville Pl.
Sperry, Horace B.,	*Oakland, Cal.*	Hotel Worcester.
Thomas, John H.,	*Louisville, Ky.*	357 Columbus Ave.
Tapp, Will W.,	*Louisville, Ky.*	357 Columbus Ave.
Wilson, Frank S.,	*Brighton.*	Brighton.

SPECIAL STUDENTS.

NAME.	HOME.	RESIDENCE.
Atwood, Fred M., Shop., Phys., Fr.	*Taunton.*	Salem.
Ball, James T., Shop., Draw.	*Stanstead, P.Q.*	Chelsea.
Bixby, John L., Jun., Math., Shop., Draw.	*Arlington Heights.*	Arlington Heights.
Bullard, Albert M., Shop., Math., Draw.	*Boston.*	Hotel Edinburgh.
Bush, Harry G., Shop., Fr.	*New Orleans, La.*	47 Chandler St.
Claflin, Adelbert E., Draw., Shop., Math.	*Hopkinton.*	Clarendon Hotel.
Clark, Otis R., Draw., Shop.	*Derry, N.H.*	32 Clarendon St.
Cummings, Will R., Math., Draw.	*Lawrence.*	Lawrence.
Currier, Guy W., Shop., Draw.	*Lawrence.*	61 Clarendon St.
Damon, Harry E., Shop., Draw.	*Somerville.*	Somerville.
Edwards, William T., Phys., Draw., Math., Eng., Shop.	*Pittsburg, Penn.*	374 Columbus Ave.
Gleason, Hall, Shop., Draw.	*West Medford.*	West Medford.
Greeley, Guy H., Shop., Eng.	*Nashua, N.H.*	290 Columbus Ave.
Grush, Charles E., Phys., Shop., Draw.	*Beverly.*	Beverly.
Herrick, Charles H., Shop., Draw.	*Winchester.*	Winchester.
Holmes, Charles E., Shop., Draw., Phys.	*Melrose.*	Melrose.
Keep, John H., Jun., Shop., Draw.	*Norwich, Conn.*	128 Marlboro' St.
Killinger, John W., Jun., Math., Eng., Shop., Fr., Phys.	*Lebanon, Penn.*	189 West Canton St.
Mauran, Max, Math., Eng., Fr., Draw., Shop.	*Providence, R.I.*	68 Winthrop St.
Mayhew, Aaron H., Shop., Draw.	*Milford.*	Milford.
McGraw, Fred M., Shop., Draw.	*Cortland, N.Y.*	50 Chandler St.
Meiser, Rudolph J., Shop., Draw.	*Cincinnati, O.*	3 Worcester Sq.
Moore, Joseph W., Shop., Draw.	*Roxbury.*	117 Dale St.

NAME.	HOME.	RESIDENCE.
Osgood, Edward G., Math., Eng., Phys., Fr., Shop.	*Bellows Falls, Vt.*	189 West Canton St.
Pickles, Robert F., Math., Shop., Draw.	*Lawrence.*	Lawrence.
Porter, Rufus K., Math., Shop., Draw., Fr.	*Calais, Me.*	Bellevue St.
Raymond, John W., Jun., Shop., Draw., Phys.	*Beverly.*	Beverly.
Smith, William C., Shop., Draw.	*Brighton.*	Parson St.
Sprague, George W., Math., Draw.	*Pittsburg, Penn.*	14 Holyoke St.
Stevens, George H., Shop., Draw.	*Pittsfield.*	377 Columbus Ave.
Stewart, Samuel B., Jun., Math., Shop., Draw., Phys., Fr.	*Lynn.*	Lynn.
Sutherland, Reynold H., Shop., Draw., Fr., Phys.	*Lynn.*	Lynn.
Taylor, Kenneth M., Shop.	*Brookline.*	Brookline.
Van Sands, Horace, Shop., Draw.	*Middletown, Conn.*	61 Clarendon St.
Walker, Ambrose, Math., Shop., Draw.	*Boston.*	237 Beacon St.
Wright, Walter G., Shop., Draw.	*Lowell.*	Lowell.

SUMMARY: SCHOOL OF MECHANIC ARTS.

REGULAR STUDENTS, 2d YEAR	12
" " 1st "	12
SPECIAL "	36
Total	60

LOWELL SCHOOL OF PRACTICAL DESIGN.

LOWELL SCHOOL OF PRACTICAL DESIGN.

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

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

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

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

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

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

The class is under the personal direction of Mr. CHARLES KASTNER, assisted in the weaving department by Mr. Jos. Coldwell, 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. 27, 1886. 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. 21, 1886. Students are required to be regular in their attendance, the hours being from 9.30 A.M. to 12 M., and from 2 P.M. to 4.30 P.M. Only those students can be retained in the school who, after a fair and patient trial, are found to have some aptitude for the work. At the close of each half-year, the director will, with the approval of the President of the Institute, convey the needed information to such students as shall be found gravely deficient in qualifications for an advantageous pursuit of their studies. No publication will be made of the fact, and such students will be left to withdraw as of their own motion.

STUDENTS.

NAME.	HOME.	RESIDENCE.
Akin, Thomas B.,	*New Bedford.*	New Bedford.
Barstow, Annie H.,	*New Bedford.*	New Bedford.
Bonney, John C. G.,	*New Bedford.*	New Bedford.
Brown, Adelaide L. C.,	*Hamilton.*	172 West Newton St.
Bryant, Albert,	*Melrose.*	Melrose.
Center, Lizzie M.,	*Gloucester.*	Gloucester.
Codding, William A.,	*New Bedford.*	New Bedford.
Coffey, Ella C.,	*Boston.*	4 Gardner Ave.
Crowther, Frank,	*Canton.*	Canton.
Curtis, Marion B.,	*Boston.*	15 Holyoke St.
Dickinson, Marion,	*Springfield.*	232 West Canton St.
Doane, Julia S.,	*Newtonville.*	Newtonville.
Emery, Fred A.,	*Boston.*	201 Ruggles St.
Farnham, Onsville F.,	*Lowell.*	28 Robinson St.
Felton, Louis E.,	*Natick.*	Natick.
Foster, Winfred C.,	*Fitchburg.*	Fitchburg.
Fowle, Willard K.,	*Woburn.*	Woburn.
French, Isabelle C.,	*Dedham.*	Dedham.
Fuller, Margaret,	*Cambridge.*	Cambridge.
Gardner, Harriet E.,	*Brockton.*	Brockton.
Goering, Edwin B.,	*Boston.*	16 Beethoven St.
Goodwin, Georgie I.,	*Boston.*	12 Gray St.
Gould, Mary B.,	*Boston.*	29 Union Park.
Green, Fred W.,	*Boston.*	365 Silver St.
Hadley, Walter C.,	*New Bedford.*	New Bedford.
Hall, Albert G.,	*Boston.*	7 Walden Park.
Haushalter, Leona,	*Glenwood.*	Glenwood.
Hawes, Nellie L.,	*Dorchester.*	Harrison Square.
Hawes, William C.,	*New Bedford.*	New Bedford.
Henchman, Russel B.,	*Hyde Park.*	Hyde Park.
Hoogs, Margarete I.,	*Hyde Park.*	Hyde Park.
Hoyt, Mabel M.,	*Chelsea.*	Chelsea.
Jennings, Philip B.,	*Warren.*	Malden.
Johnson, Charles F.,	*Portland, Me.*	31 Buckingham St.
King, S. Roscoe,	*Bradford.*	Cambridge.
Knowland, John B., Jun.,	*Middleborough.*	Middleborough.

NAME.	HOME.	RESIDENCE.
Lampry, Belle,	*Boston.*	137 High St.
Lawrie, Fred H.,	*East Boston.*	77 Webster St.
Mathewson, Frank C.,	*Providence, R.I.*	18 Claremont Park.
Nealley, Grace H.,	*Dover, N.H.*	Dover, N.H.
Pope, William F.,	*Leominster.*	25 Pinckney St.
Rand, James L. G.,	*Dover, N.H.*	14 Gates St.
Reed, Eaton V.,	*South Weymouth.*	South Weymouth.
Richards, Caroline,	*Boston.*	33 Hollis St.
Ricker, Everett W.,	*Jamaica Plain.*	Jamaica Plain.
Robbins, Anna S.,	*Dorchester.*	204 Dartmouth St.
Robinson, Lilian V.,	*Boston.*	286 Beacon St.
Sheehy, William C.,	*New Bedford.*	New Bedford.
Sjöström, Ebba C. S.,	*Lawrence.*	Lawrence.
Sloane, Bertha L.,	*Hyde Park.*	Hyde Park.
Smith, Annette,	*East Boston.*	177 Lexington St.
Stedman, Joseph C.,	*Jamaica Plain.*	Jamaica Plain.
Sweet, Mary R.,	*Hyde Park.*	Hyde Park.
Tirrell, Herbert W.,	*East Weymouth.*	East Weymouth.
Turner, Frances E.,	*Vineland, N.J.*	7 Hereford St.
Underwood, John C.,	*Groton.*	Groton.
Underwood, Western,	*Boston.*	643 Tremont St.
Vogel, Emma C.,	*South Boston.*	53 B St.
Whipple, Lillian W.,	*Salem.*	Salem.
Whitman, Grace,	*Newton.*	Newton.
Wilson, J. H.,	*Jamaica Plain.*	Lamartine St.

TOTAL . . . . . 61.

THE SOCIETY OF ARTS.

THE SOCIETY OF ARTS.

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

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

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

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

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

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.

Students of the Institute may be present at the meetings by permission of the Secretary of the Faculty.

Among the papers that have been read before the Society during the past year may be mentioned the following: Recent Improvements in Building, by Prof. T. M. Clark; The Etiology and Progress of Cholera, by Dr. George B. Shattuck; The Asiatic Cholera, from a Layman's point of view, by Prof. William H. Brewer; Underground Telegraph Wires, by Mr. W. W. Jacques; Boston Harbor, by Major C. W. Raymond, U.S.A.; Recent Improvements in Electric and Interlocking Railway Signals, by Mr. George W. Blodgett; Coal Tar, and Colors derived from it, by Prof. Lewis M. Norton; Korean Architecture, by Mr. Percival Lowell; The Edison Central-Station Electric Lighting System, by Mr. W. J. Jenks; Heavy Gun Construction, by Capt. Charles Shaler, U.S.A.; Casting Heavy Guns at South Boston, by Capt. D. A. Lyle, U.S.A.; The Function of Submarine Mines in Sea-Coast Defence, by Gen. Henry L. Abbot, U.S.A.; The Products of Petroleum as related to Sanitary Legislation, by Prof. S. F. Peckham; The Tehuantepec Ship Railway, by Mr. E. L. Corthell and Capt. James B. Eads; Automatic Sprinklers for Protection against Fires, by Mr. C. J. H. Woodbury; The Utilization of the Sun's Rays in Heating and Ventilating Apartments, by Prof. Edward S. Morse.

During the present year a number of interesting papers are expected, among which may be mentioned the following: The Pneumatic Dynamite Gun, by Lieut. E. L. Zalinski, U.S.A.; Distribution of Steam, by Mr. Charles E. Emery; The Bessemerizing of Copper, by Dr. Edward D. Peters; Yacht-Designing, by Mr. Edward Burgess; Electrical Distribution of Power, by Lieut. F. G. Sprague and others.

OFFICERS OF THE SOCIETY FOR 1885–86.

President.

FRANCIS A. WALKER, LL.D.

Executive Committee.

GEORGE W. BLODGETT, *Chairman.*

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

Secretary.

LINUS FAUNCE.

LIST OF MEMBERS.

Life-Members.

Allen, Stephen M. . Boston.
Amory, William . . "
Atkinson, Edward . "
Atkinson, Wm. P. . "

Baker, William E. . "
Batchelder, J. M. . Cambridge.
Bond, George W. . Boston.
Bouvé, T. T. . . . "
Bowditch, J. I. . . "
Bowditch, Wm. I. . Brookline.
Brimmer, Martin . Boston.
Browne, C. Allen . "
Bullard, W. S. . . "

Carruth, Charles. . "
Clapp, W. W.. . . "
Cummings, John. . Woburn.
Cummings, Nath'l . Boston.

Dalton, Charles H. . "
Davenport, Henry . "
Delano, J. C. . . . New Bedford.
Dresser, Jacob A. . Boston.
Dupee, James A. . "

Endicott, Wm., Jun., "

Farmer, Moses G. . Salem.
Fay, Joseph S. . . Boston.
Fay, Mrs. Sarah S. . "
Flint, C. L. . . . "
Forbes, John M. . . "
Forbes, Robert B. . "
Foster, John . . . "
Francis, James B. . Lowell.
Fuller, H. Weld . . Boston.

Gaffield, Thomas . "
Gardner, John L. . "
Gibbens, Joseph M.. "
Gookin, Samuel H. . Lexington.
Greenleaf, R. C. . . Boston.
Grover, William O. . "
Guild, Henry . . . "

Hemenway, Mrs. M., Boston.
Henck, J. B. . . . "
Hoadley, J. C. . . . "
Holmes, O. W. . . "
Homans, C. D. . . "
Hubbard, Chas. T. . "

Johnson, Samuel . "

Kehew, John . . . "
Kidder, Henry P. . "
Kneeland, Samuel . New York.

Lawrence, Amos A., Boston.
Lee, Henry. . . . "
Lincoln, F. W. . . "
Little, James L. . . "
Lothrop, S. K. . . "
Lowe, N. M. . . . "
Lowell, John . . . Newton.
Lyman, Theodore . Boston.

Matthews, Nathan . "
May, F. W. G. . . "
May, J. J. . . . . "

Ordway, John M., New Orleans, La.

Peabody, O. W. . . Boston.
Philbrick, E. S. . . "
Philbrick, J. D. . . Danvers
Pickering, E. C. . . Cambridge.
Pratt, Miss. . . . Boston.
Preston, Jonathan . "

Rice, Alexander H. . "
Richardson, Geo. C. "
Ritchie, E. S. . . . Brookline.
Rogers, Henry B. . Boston.
Ross, M. Denman . Jamaica Plain.
Ross, Waldo O. . . "
Runkle, John D. . . Brookline.

Salisbury, D. Waldo, Boston.
Sayles, Henry . . "
Smith, Chauncey . "
Sullivan, R. . . . "

Tobey, Edward S. . "

Wales, George W. . "
Wales, T. B. . . . "
Wales, Miss . . . "
Ware, William R., New York, N.Y.
Ware, C. E. . . . Boston.
Warren, Cyrus M. . Brookline.
Whitaker, Channing, Lowell.
Wilder, M. P. . . . Boston.
Williams, H. W. . . "
Winthrop, R. C. . . "
Wolcott, J. H. . . "

Associate Members.

Adams, Joseph H. . Boston.
Allen, W. S. . . . New Bedford.
Andrews, C. W. . . Boston.
Amory, Thomas C. . "
Atwood, Nath'l E. . Provincetown.

Baker, C. M. . . . Boston.
Barton, George H. . "
Beal, James H. . . "
Bernstein, A. . . . "
Billings, George H. . South Boston.
Blodgett, A. D. . . Boston.
Blodgett, G. W. . . Boston.
Brown, G. W. . . . "
Burton, A. E. . . . "

Carpenter, Geo. O. . "
Carson, H. A. . . . "
Carter, J. W. . . . Newton.
Carty, J. J. . . . . Boston.
Chandler, S. C. . . Cambridge.
Clapp, Charles M. . Boston.
Clark, F. W. . . . "
Clark, T. M. . . . "
Clark, John M. . . "
Clark, John S. . . . "

Coffin, F. S. . . . Boston.
Crosby, W. O. . . "
Cross, Charles R. . "

Davis, Barnabas . . "
Deblois, S. G. . . "
Dewson, F. A. . . Newtonville.
Doane, Thomas . . Charlestown.
Drown, Thos. M.. . Boston.

Eastman, Ambrose . "
Ely, Edward F. . Providence, R.I.

Faunce, Linus . . . Boston.
Fisher, C. H. . . . Lowell.
Freeland, James H.. Boston.
Frost, H. V. . . . "

Gale, H. B. . . . "
Gardiner, E. G. . . "
Guild, Curtis . . . "
Guild, Henry . . . "

Hammond, Geo. W., "
Hathaway, John G. . "
Haven, Franklin . . "
Henck, John B., Jun., "
Hewins, Edmund H., "
Hill, Hamilton A. . "
Hollingsworth, S. . S. Braintree.
Holman, Silas W. . Boston.
Howe, H. M. . . . "
Hyde, George B. . "
Hyde, Henry D. . . "

Jackson, George . . "
Jacques, W. W. . . "

Kastner, Charles . . "
Kendall, J. H. . . Cambridgep't.
Kendall, Edward . . Boston.
Ladd, W. H. . . . "
Lanza, Gaetano . . "
Little, James L., Jun., Brookline.
Little, John M. . . Boston.

Low, J. G. . . . . Chelsea.
Lowell, A. L. . . . Boston.
Lowell, Percival . . "
Lodge, H. Ellerton . "

Marble, George R. . "
Markoe, G. F. H. . "
McPherson, W. J. . "
Mixter, S. J. . . . "
Moore, Alexander . South Boston.
Morris, Charles W.. Boston.
Mower, George A. . "

Nichols, Wm. R. . Roxbury.
Niles, William H. . Cambridge.
Norton, Jacob . . Boston.
Norton, L. M. . . Natick.

Osborne, George A., Boston.

Paine, W. J. . . . "
Paul, J. F. . . . . "
Peabody, C. H. . . "
Peabody, W. B. O. . "
Pickering, H. W. . "
Pickering, Wm. H. . "
Pope, Edward E. . "
Pope, T. E. . . . "
Porter, Dwight . . "
Prang, Louis . . . "
Purinton, James . . "
Purinton, A. J. . . "
Putnam, George F. . "

Richards, R. H. . . Jamaica Plain.
Robbins, James M. . Milton.
Roberts, George L. . Boston.
Robinson, J. R. . . "
Rollins, William H.. "
Rotch, A. Lawrence, "
Ruggles, John . . "
Russell, Robert S. . "

Sawyer, Edward . . Newton.
Sawyer, Joseph . . Boston.

Sawyer, Jacob H. . Boston.
Sawyer, Timothy T., Charlestown.
Schofield, W. J. . . Boston.
Schwamb, Peter . . "
Scott, Charles A. . Hyde Park.
Sears, Philip H. . . Boston.
Sedgwick, W. T. . "
Sewall, James W. . "
Shaw, Henry S. . . "
Sherwin, Thomas . Jamaica Plain.
Shurtleff, A. M. . . Boston.
Sill, A. N. . . . . "
Sinclair, Alex. D. . "
Skinner, J. J. . . . "
Sparks, W. E. . . "
Stantial, F. G. . . Melrose.
Stevens, Benj. F. . Boston.
Stevens, W. L. . . "
Sturgis, John H. . . Brookline.
Swain, George F. . Boston.
Taber, C. A. . . . Lynn.
Thompson, Wm. H., Boston.
Tolman, James P. . W. Newton.
Tufts, John W. . . Boston.
Tuttle, Joseph H. . "

Vose, George L. . . "

Walker, Francis A. . "
Warren, Samuel D. . "
Watson, R. S. . . Milton.
Watson, William. . Boston.
Weeks, G. W. . . . Clinton.
Wellington, C. A. . Boston.
Weston, David M. . "
Whitman, Herbert T. "
Whitmore, Wm. H., "
Wight, W. W. . . Natick.
Williams, F. H. . . Boston.
Wing, Charles H. . Boston.
Winton, H. D. . Wellesley Hills.
Woodbridge, S. H. . Boston.
Woodbury, C. J. H. . Lynn.
Wyman, Morrill . . Cambridge.

GRADUATES

FROM THE

SCHOOL OF INDUSTRIAL SCIENCE.

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

1868.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
ELLERY C. APPLETON, Canajoharie, N.Y.	III.	Civil Engineer.
WHITNEY CONANT, Pugwash, N.S.	III.	Mining Engineer.
*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., Ia.	III.	Chief Engineer, Iowa Improvement Company.
CHARLES E. GREENE, Ann Arbor, Mich.	I.	Professor of Civil Engineering, University of Michigan.
ALBERT F. HALL, Boston, Mass.	II.	Draughtsman in the employ of the George F. Blake M'f'g Company.
WILLIAM E. HOYT, Portsmouth, N.H.	I.	Chief Engineer of Rochester and Pittsburg R. R. Co., Rochester, N.Y.
ROBERT H. RICHARDS, Boston, Mass.	III.	Professor of Mining and Metallurgy, Mass. Institute of Technology.
WALTER H. SEARS, 35 Congress Street, Boston.	I.	Civil Engineer.
*CHARLES A. SMITH,	I.	Died Feb. 4, 1884.
JOSEPH STONE, Lawrence, Mass.	I.	Superintendent Worsted Department, Lower Pacific Mills.
BRYANT P. TILDEN, Carrington, D.T.	III.	Chief Engineer, Jamestown and Northern Railroad.
JAMES P. TOLMAN, West Newton, Mass.	III.	Manufacturer of Cordage, 164 High Street, Boston.

1869.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM H. BAKER, San Marcial, N.M.	I.	Resident Engineer, Rio Grande Div., Atchison, Topeka, & Santa Fé R.R.
HOWARD A. CARSON, 68 Devonshire Street, Boston.	I.	Civil Engineer.
J. RAYNER EDMANDS, Cambridge, Mass.	II.	In charge of Time Service at the Observatory of Harvard University.
WILLIAM RIPLEY NICHOLS, Boston, Mass.	V.	Professor of General Chemistry, Mass. Institute of Technology.
CHANNING WHITAKER, Box 524, Lowell, Mass.	II.	Mill and Steam Engineering.

1870.

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

1871.

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

NAME AND ADDRESS.	COURSE.	OCCUPATION.
HENRY M. HOWE, 75 State St., Boston, Mass.	III.	Mining Engineer and Lecturer on Metallurgy, Mass. Inst. Tech.
ALBERT H. HOWLAND, 12 West St., Boston, Mass.	I.	Civil Engineer.
G. RUSSELL LINCOLN, Box 65, Harrisburg, Penn.	III.	In business.
WILLIAM A. PIKE, Minneapolis, Minn.	I.	Professor of Engineering, University of Minnesota.
GEORGE H. PRATT, 774 Broadway, S. Boston, Mass.	V.	Chemist.
EDWARD W. ROLLINS, Box 2157, Denver, Colo.	III.	Dealer in Investment Securities.
WALTER W. SMITH, Dayton, O.	II.	Builder of Steam Pumps and Hydraulic Mch'y (Smith, Vaile, & Co.)
CHARLES F. STONE, Waltham, Mass.	III.	Lawyer.
*ALMARIN TROWBRIDGE, Jun.	II.	Died Dec. 5, 1878.
ISAIAH S. P. WEEKS, Lincoln, Neb.	I.	Asst. Engineer, Burlington and Missouri Railroad in Nebraska.
RANDALL WHITTIER, Portland, Me.	V.	Union Mutual Life Insurance Company.

1872.

C. FRANK ALLEN, Albuquerque, N.M.	I.	Atchison, Topeka, and Santa Fé Railroad.
B. 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., Steubenville, O.
FREDERIC A. EMMERTON, Joliet, Ill.	V.	Chemist at the Joliet Iron and Steel Company's Works.
JAMES A. HERRICK, Pittsburg, Penn.	V.	General Superintendent, Spang Steel and Iron Company.
JAMES M. HODGE, Plymouth, Mass.	III.	Geologist, Kentucky Geological Survey.
BRADFORD H. LOCKE, Central City, Colo.	III.	Mining Engineer and Superintendent.
CHARLES S. MINOT, Boston, Mass.	V.	Instructor in Histology and Embryology, Harvard Medical School.
MAURICE B. PATCH, Houghton, Mich.	III.	Asst. Supt. and Chemist, Detroit and Lake Sup. Cop. Co's Smelt'g W'ks.
WALTER SHEPARD, Arion Street, Dorchester, Mass.	I.	Division Engineer, Boston and Albany Railroad.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
RICHARD H. SOULE, Frankfort, Herkimer Co., N.Y.	II.	Superintendent of Motive Power, N. Y., W. S., & B R'y.
CLARENCE S. WARD, Care Andrew H. Ward, Boston, Mass.	III.	Lawyer.

1873.

AMORY AUSTIN, 82 Water Street, Boston, Mass.	V.	Analytical Chemist.
GEORGE W. BLODGETT, 63 Kilby St., Boston, Mass.	I.	Manufacturing Electrician, and Electrician, B. & A. R.R.
WILLIAM E. BROTHERTON, Cincinnati, O.	V.	Book-keeper, Second National Bank.
*SAMUEL A. FABENS, Jun.,	I.	Died March 14, 1875.
SAMUEL M. FELTON, Jun., 21 Cortlandt St., N. Y. City.	I.	Vice-President of N. Y., L. E., & W. R'y Co.
FREDERICK L. FISHER, Medway, Mass.	I.	Insurance Agent and Broker, 35 Kilby St., Boston.
FREDERICK GUILD, Jun., Boston, Mass.	Sci. and Lit.	With Whittier Machine Company, 1176 Tremont Street.
WILLIAM D. HARRIS, 292 Nelson St., Ottawa, P.Q., Can.	I.	Assistant Chief Engineer, P. P. & J. Railway.
CLARENCE L. HOWES, Hanover, Mass.	I.	Physician.
*WILLIAM P. JEWETT,	I.	Died Jan. 4, 1884.
WILLIAM A. KIMBALL, 83 Mercer St., New York, N.Y.	II.	Silk-Manufacturer.
*WILLIAM C. MAY,	V.	Died March 11, 1878.
FRANK B. MORSE, Murphy's, Cal.	I.	Superintendent, Oro Plata Mining and Milling Company.
CHARLES O. PARSONS, 77 State St., Boston, Mass.	III.	Mining Engineer.
HENRY A. PHILLIPS, Worcester, Mass.	IV.	Superintendent, Worcester Division, Fitchburg R. R.
GEORGE PHILLIPPS, Marshfield, Mass.	III.	Mining Engineer.
ELLEN H. RICHARDS, Boston, Mass.	V.	Instructor in Sanitary Chemistry, Mass. Institute of Technology.
HENRY L. RIPLEY, Care Horatio Adams, Box 2526, Boston, Mass.	I.	1st Lieutenant 24th Infantry, Fort Sill, I.T.
ROBERT A. SHAILER, Milwaukee, Wis.	I.	Engineer, Bridges and Buildings, C., M., & St. P. R.R.
C. EDWARD STAFFORD, Care Shoenberger & Co., Pittsburg, Penn.	III.	In charge of Steel Plants, Juniata Iron and Steel Works.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
SAMUEL E. TINKHAM, City Engineer's Office, Boston, Mass.	I.	Assistant Engineer, New York and New England Railroad.
FRANK W. VERY, Allegheny, Penn.	V.	Assistant Astronomer, Allegheny Observatory.
WEBSTER WELLS, Boston, Mass.	I.	Associate Professor of Mathematics, Mass. Institute of Technology.
RANDALL WHITTIER.	I.	(See Record of Class of 1871.)
FRANCIS H. WILLIAMS, 100 Boylston Street, Boston, Mass.	V.	Physician and Instructor in Materia Medica, Harvard Medical School.
LOUIS F. WOOD, 34 Oliver St., Boston, Mass.	V.	Chemical and Color Manufacturer.

1874.

HERBERT BARROWS, 33 Oliver St., Boston, Mass.	I.	Of the Chauncy Rubber Company.
GEORGE H. BARRUS, 81 Milk St., Boston, Mass.	II.	Consulting Steam Engineer.
WILLIAM T. BLUNT, 44 Euclid Ave., Cleveland, O.	I.	Of the firm of Eisenmann & Blunt, Architects and Engineers.
GEORGE E. DOANE, Middleborough, Mass.	I.	Of the firm of J. & G. E. Doane, Hardware.
WILLIAM B. DOWSE, 33 Oliver St., Boston, Mass.	IV.	Of the Chauncy Rubber Company.
JOSEPH S. EMERSON, Honolulu, Hawaiian Islands.	I.	Field Assistant, Government Survey.
ELIOT HOLBROOK, Hartford, Conn.	I.	Superintendent, Hartford Division, N. Y. & N. E. R.R.
AECHIRAU HONGMA, Tokio, Japan.	I.	Civil Engineer.
CHARLES P. HOWARD, Hartford, Conn.	I.	Secretary, with J. L. Howard & Co., dealers in Railway and Car Builders' Supplies.
FRANK H. JACKSON, Maple Hill, Kan.	III.	Stock-raising.
*WILLIS H. MYRICK,	II.	Died Oct. 17, 1875.
HERBERT B. PERKINS, Appleton, Wis.	I.	Professor of Mathematics and Astronomy, Lawrence University.
FRANK H. POND, 707 Market St., St. Louis, Mo.	II.	Proprietor, Pond Engineering Company.
EDWARD S. SHAW, 5 Pemberton Sq., Boston, Mass.	I.	Consulting Engineer.
FRANCIS H. SILSBEE, Lawrence, Mass.	II.	Mechanical Engineer, Pacific Mills.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
*ARTHUR W. SWEETSER,	I.	Died April 10, 1878.
*ROBERT C. WARE,	Sci. and Lit.	Died June 25, 1883.
STEPHEN H. WILDER, 65 West Third St., Cincinnati, O.	Sci. and Lit.	Of the firm of Ferris & Wilder, Attorneys-at-law.

1875.

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

NAME AND ADDRESS.	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 Woollen Goods.
WILLIAM A. PRENTISS, Holyoke, Mass.	Sci. and Lit.	Of the firm of Geo. W. Prentiss & Co., Manufacturers of Iron Wire.
FRANCIS T. SARGENT, 515 Sixth Ave., N.Y. City.	II.	President of Poultney Slate Works.
WELLAND F. SARGENT, Pullman, Ill.	I.	In charge of Civil Engineering Department, Pullman Palace Car Co.
WILLIAM H. SHOCKLEY, Candalaria, Esmeralda Co., Nev.	III.	Superintendent, Mount Diablo Mill and Mining Company.
JAMES B. STANWOOD, Care 1st Nat'l B'k, Cincinnati, O.	II.	Mechanical Engineer, with Lane & Bodley.
H. L. J. WARREN, Red Cliff, Eagle Co., Colo.	III.	Mining Engineer, and Editor "Eagle River Shaft."
WILLIAM R. WEBSTER, 424 Walnut St., Phila., Penn.	III.	Bridge Inspector for Kellogg & Maurice.

1876.

CHARLES F. ALLEN, Occidental Hotel, San Francisco, Cal.	III.	Mining Engineer and Metallurgist.
THOMAS ASPINWALL, Brookline, Mass.	I.	Civil Engineer, 7 Exchange Place, Boston.
WILLIAM P. ATWOOD, 81 Appleton St., Lowell, Mass.	V.	Chemist at the Hamilton Print Works.
THOMAS W. BALDWIN, Bangor, Me.	I.	In Business.
WALTER B. BARROWS, Middletown, Conn.	VIII.	Curator of Museum, Wesleyan University.
AARON D. BLODGETT, 63 Kilby St., Boston, Mass.	II.	Manufacturing Electrician.
JOSHUA B. F. BREED, 1026 Fourth Av., Louisville, Ky.	I.	Assistant City Engineer, Louisville. In charge of Sewers, West. Dist.
HARRY T. BUTTOLPH, Buffalo, N.Y.	I.	Assistant City Engineer, in charge of Paving.
FREDERICK K. COPELAND, 175 Dearborn St., Chicago, Ill.	I.	Secretary, Diamond Prospecting Company
WILLIAM O. CROSBY, Boston, Mass.	VII.	Assistant Professor of Mineralogy and Lithology, Mass. Institute of Technology.
WILLIS E. DAVIS, 211 Drumm St. San Francisco, Cal.	Sci and Lit.	Employed by Davis & Cowell, Manufacturers of Santa Cruz Lime.
*CLARENCE L. DENNETT,	II.	Died June 5, 1878.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHARLES R. FLETCHER, Herald Building, Boston, Mass.	V.	Lecturer on Chemistry in Boston University.
JOHN R. FREEMAN, Lawrence, Mass.	I.	Principal Assistant Engineer, Essex Water-Power Company.
FRANCIS E. GALLOUPE, 30 Kilby Street, Boston, Mass.	II.	Mechanical Engineer.
*ROBERT H. GOULD,	VI.	Died Nov. 19, 1878.
JOHN B. HENCK, Jun., Boston, Mass.	VIII.	
FRANK W. HODGDON, Arlington, Mass.	I.	Asst. Engineer, with the Harbor and Land Commissioners of Mass.
SUMNER HOLLINGSWORTH, South Braintree, Mass.	II.	Paper-Manufacturer.
SILAS W. HOLMAN, Boston, Mass.	VIII.	Associate Professor of Physics, Mass. Institute of Technology.
ALFRED E. HUNT, 98 Fourth Ave., Pittsburg, Penn.	III.	Chemist and Metallurgical Engineer, Pittsburg Testing Lab.
WILLIAM W. JACQUES, 95 Milk St., Boston, Mass.	VIII.	Electrician of the Am. Bell Telephone Co., and Instructor, Mass. Institute of Technology.
SAMUEL JAMES, Jun., Rico, Colo.	III.	Metallurgist, Pasadena Reduction Company.
ALFRED C. KILHAM, Springfield, Mo.	II.	Employed in repair-shops of St. Louis and San Francisco Railroad.
J. AUSTIN KNAPP, Abington, Mass.	II.	Of the firm of J. B. Knapp & Co.
THEODORE J. LEWIS, 212 North Thirty-Fourth St., Philadelphia, Penn.	II.	With the Standard Steel Works, 220 South Fourth Street.
ALBERT H. LOW, Denver, Colo.	V.	Chemist.
CHARLES T. MAIN, Lawrence, Mass.	II.	Mechanical Engineer, Lower Pacific Mills.
ARTHUR L. MILLS, Fort Littleton, Fulton Co., Penn.	I.	Resident Engineer, Southern Pennsylvania Railroad.
WILLIAM E. NICKERSON, 351 Broad'y, N. Somerville, Mass.	V.	Chemist.
D. W. PHIPPS, 209 Washington St., Boston.	Phil.	Counsellor-at-Law.
CHARLES F. PRICHARD, Lynn, Mass.	II.	Superintendent of the Lynn Gas-Light Company.
HENRY RAEDER, Jun., Hyde Park, Mass.	I.	
CHARLES L. RICH, East Jaffrey, N.H.	I.	Clerk, Monadnock National Bank.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
*T. W. ROBINSON,	III.	Died Nov. 3, 1880.
CHARLES A. SAWYER, Sci. and Lit. 125 Dearborn St., Chicago, Ill.		Agent and Manufacturer, Johnson's Patent Boilers.
THEODORE E. SCHWARZ, Silverton, 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.	Chemist, Avery Lactate Company, 173 Devonshire Street.
HENRY M. WAITT, Nantucket, Mass.	I.	Land Surveying.
*ROBERT C. WARE,	Phil.	Died June 25, 1883.
HENRY B. WOOD, South Framingham, Mass.	I.	With Boston Water-Works.

1877.

JOHN ALDEN, Lawrence, Mass.	V.	Chemist at the Pacific Mills.
CHARLES S. BACHELDER, San Francisco, Cal.	V.	Exchange Teller in the Pacific Bank.
GEORGE BARTOL, Cleveland, O.	III.	In charge of Mill and Forge Dept., Otis Iron and Steel Works.
J. WILLIAMS BEAL, Hanover P.O., So. Scituate, Mass.	IV.	Architectural Draughtsman.
WILLIAM H. BEECHING, 61 Bl'kstone St., Boston, Mass.	II.	Cork-Manufacturer.
G. WALTER CAPEN, Canton, Mass.	IV.	Architect.
HENRY H. CARTER, 55 St. James St., Roxbury, Mass.	I.	Engineer in charge, Farm Pond Conduit, Boston Water-Works.
WILLIAM E. CHAMBERLIN, 6 Beacon St., Boston, Mass.	IV.	Of the firm of Chamberlin & Whidden, Architects.
*GEORGE H. CHAPMAN,	II.	Died Jan. 21, 1879.
LINUS FAUNCE, Boston, Mass.	II.	Assistant Professor of Drawing, Mass. Inst. of Technology.
CHARLES H. FISHER, 23 P.O. Block, Lowell, Mass.	II.	Mechanical Engineer.
*WILLIAM C. FLINT,	III.	Died June 14, 1881.
PIERCE P. FURBER, 304 N. Eighth St., St.Louis, Mo.	IV.	Manager, office of Peabody & Stearns, Architects.
MARTIN GAY, W. New Brigh'n, Staten Isl., N.Y.	I.	Assistant Engineer, Department of Public Works of New-York City.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
JOSEPH P. GRAY, 125 Grand Street, Lowell, Mass.	I.	Assistant Engineer in office of Proprietors of Locks and Canals on Merrimack River.
EDMUND GROVER, Zanesville, O.	I.	Asst. Engineer, C., B., & Q. R.R.
RICHARD A. HALE, Lawrence, Mass.	I.	Assistant Engineer with the Essex Water-Power Company.
JOHN E. HARDMAN, 158 Stackpole St., Lowell, Mass.	III.	Mining Engineer, Oldham, N.S.
HENRY D. HIBBARD, Butte City, M.T.	III.	General Superintendent, Parrot Silver and Copper Company.
WALTER JENNEY, 56 G St., So. Boston, Mass.	III.	Superintendent, Petroleum Refinery, Jenney Manufacturing Co.
JOSEPH KIRK, Worcester, Mass.	II.	Draughtsman for L. J. Knowles & Bros., Loom-Manufacturers.
GEORGE W. KITTREDGE, Zanesville, O.	I.	Engineer, Maintenance of Way, Muskingum Valley Div., Pittsburg, Cincinnati, & St. Louis R.R.
CHARLES F. LAWTON, Anthracite, Colo.	I.	Mine Superintendent, Whitebreast Coal and Mining Co.
BENJAMIN C. MUDGE, 70 Kilby St., Boston, Mass.	I.	N. E. Sales Agent for H. R. Worthington's Hydraulic Works, etc.
CECIL H. PEABODY, Boston, Mass.	II.	Asst. Prof. of Steam Engineering, Mass. Institute of Technology.
ARTHUR L. PLIMPTON, 7 Hawthorn St., Roxbury, Mass.	I.	Marine and Landscape Photographer.
HARRY C. SOUTHWORTH, Ishpeming, Mich.	III.	Manager, Rogers Gold and Silver Company.
*CHARLES E. STEWART,	I.	Died Oct. 7, 1877.
THOMAS F. STIMPSON, Providence, R.I.	III.	Overseer, Printing Dept., Silver Spring Bleaching and Dyeing Co.
GEORGE F. SWAIN, Boston, Mass.	I.	Asst. Professor of Civil Engineering, Mass. Inst. of Technology.
FRANK E. WIGGIN, Santa Fé, Argentine Republic.	I.	Engineer, *Ferro Carril de Sta Fé a las Colonias.*
FREDERICK W. WOOD, Steelton, Dauphin Co., Penn.	III.	Superintendent, Pennsylvania Steel Company.
		1878.
WILLIAM B. ALLBRIGHT, Chicago, Ill.	V.	Chemist, with N. K. Fairbank, 18th and Blackwell Streets.
CHARLES M. BAKER, 74 Devonshire St., Boston, Mass.	IV.	With Chase & Barstow, Stock Brokers.
TAKUMA DAN, Osaka, Japan.	III.	Professor of Chemistry, Osaka University.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHARLES S. EATON, 63 Hanover Street, Boston, Mass.	IV.	In business.
ALFRED S. HIGGINS, 35 Howard St., Boston, Mass.	IV.	With R. R. Higgins & Co.
JULIAN A. KEBLER, Ottumwa, Io.	I.	Gen. Superintendent, Whitebreast Coal and Mining Co.
FRANK H. MORGAN, Ithaca, N.Y.	V.	Instructor in Chemical Analysis, Cornell University.
EVERELL J. NICHOLS, Burlington, Iowa.	I.	Engineer Corps, Chicago, Burlington, and Quincy Railroad.
FREDERICK H. PRENTISS, 28 State St., Boston, Mass.	II.	Mechanical Engineer.
JAMES RITCHIE, Cleveland, O.	I.	Asst. Prof. of Civil Eng. and Math., Case School of App. Science.
JAMES W. ROLLINS, Jun. Hicksford, Va.	I.	Chief Engineer, Atlantic and Danville Railroad.
CHARLES D. SAWIN, 349 Main St., Charlest'n, Mass.	Sci. and Lit.	Physician and Surgeon to Massachusetts State Prison.
PETER SCHWAMB, Boston, Mass.	II.	Asst. Prof. of Mechanism, Mass. Institute of Technology.
FREDERIC P. SPALDING, 471 Middlesex St., Lowell, Mass.	I.	Civil Engineer, City Engineer's Office, Boston, Mass.
ISAAC M. STORY, Somerville, Mass.	I.	With Keene Granite Company.
EDMUND TANEY, Washington, D.C.	I.	With the U.S. Coast and Geodetic Survey.
LINWOOD O. TOWNE, Rico, Col.	III.	Assayer, Chemist, and Mining Engineer.
ÉMILE F. WILLIAMS, 230 Washington Street, Boston, Mass.	I.	In business.
JAMES G. WOOLWORTH, Providence, R.I.	V.	

1879.

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

NAME AND ADDRESS.	COURSE.	OCCUPATION.
W. OTIS DUNBAR, 223 S. Fourth St., Phila., Penn.	II.	Signal Department, Pennsylvania Railroad.
GEORGE W. FABENS, Chariton, Iowa.	I.	Division Roadmaster, Chicago, Burlington, & Quincy R.R.
CHARLES S. GOODING, 28 School St., Boston, Mass.	II.	Mechanical Engineer and Draughtsman.
ERNEST G. HARTWELL, 68 Devonshire Street, Boston, Mass.	IV.	With Hartwell & Richardson, Architects.
RAPHAEL M. HOSEA, Swan, Marion County, Ia.	I.	Mine Superintendent, Whitebreast Coal and Mining Company.
HORACE J. HOWE, 35 Wall St., New York, N.Y.	I.	Draughtsman, with Geo. S. Morison, Civil Engineer.
FRED B. KNAPP, Cambridge, Mass.	I.	Superintendent of Buildings and Instructor in Surveying and Drawing, Harvard University.
FRED. H. LANE, Cleveland, O.	II.	With Standard Oil Company.
FRED. R. LORING, 8 Greenwich Pk., Boston, Mass.	VII.	Studying in Germany.
WILLIAM W. MACFARLANE, 110 Oxford St., Phila., Penn.	V.	Assistant Superintendent, Quaker City Dye-Works.
ARTHUR H. METCALF, Pawtucket, R.I.	II.	Mechanical Engineer.
EDWIN C. MILLER, 156 Tremont St., Boston, Mass.	II.	Assistant Superintendent, Henry F. Miller & Sons' Piano Company.
EDWARD H. OWEN, Jun., Lowell, Mass.	II.	Mill Engineer, Lowell Machine Shop.
WILLIAM H. PICKERING, Boston, Mass.	VIII.	Instructor in Physics, Massachusetts Institute of Technology.
GEORGE F. RIGGS, Memphis, Tenn.	I.	Assistant Engineer, K. C., S., and M. R.R.
FRANK G. STANTIAL, Melrose, Mass.	V.	In charge of Cochrane Chemical Company's Ammonia Works, East Cambridge.
WILLIAM S. STEARNS, Wyoming, O.	I.	Supt., Stearns & Foster Co.'s Cotton Factory, Cincinnati, O.
ARTHUR M. WAITT, 37 Arch St., Boston, Mass.	II.	General Foreman, Car Department, Boston and Maine Railroad.
	1880.	
GEORGE H. BARTON, Boston, Mass.	III.	Assistant in Geology, Massachusetts Institute of Technology.
CHARLES H. BROWN, Cleveland, O.	I.	Assistant Engineer, C. C. C. & I. R.R.

NAME AND ADDRESS.	COURSE	OCCUPATION.
EDWIN E CHASE, Central City, Colo.	I.	United-States Deputy Surveyor and Mining Engineer.
FREDERICK W. CLARK, Boston, Mass.	III.	Instructor in Mining and Metallurgy, Mass. Institute of Technology.
GEORGE W. HAMILTON, 350 Charles St., Boston, Mass.	I.	Inspector, Charles River Embankment and Sea Wall, Park Dept.
LORING R. MILLEN, 16 Beaver St., New York, N.Y.	III.	Wholesale Lumber Dealer, with Bacon, Pike, & Co.
WILLIAM T. MILLER, 156 Tremont St., Boston, Mass.	Elective.	Salesman, with Henry F. Miller & Sons' Piano Company.
*NATHANIEL C. SMALL,	V.	Died July 14, 1880.

1881.

IRA ABBOTT, Windsor Hotel, Montreal, P.Q.	I.	Vice-President and Assistant Engineer, Dominion Bridge Company.
JOHN H. ALLEN, Box 733, Pueblo, Colo.	III.	Chemist, Pueblo Smelting and Refining Company.
*JAMES S. ATKINSON,	II.	Died Dec. 17, 1883.
AMOS BINNEY, A.B., Walpole, Mass.	V.	Chemist, Walpole Dye and Chemical Works.
DAVID S. BISSELL, Bissell Block, Pittsburg, Penn.	III.	Chemist.
FRANK H. BRIGGS, 78 High St., Boston, Mass.	IX.	Broker in East-India and Singapore Goods.
FRANK E. CAME, Windsor Hotel, Montreal, P.Q.	I.	Assistant Engineer, Dominion Bridge Company.
FRANK D. CHASE, Pueblo, Colo.	III.	Assayer, Pueblo Smelting and Refining Company.
BENJAMIN G. COLLINS, Edgartown, Mass.	II.	Mate, Schooner "Ira Bliss."
HARRY H. CUTLER, Akron, O.	II.	Superintendent, Citizens' Electric Light Company.
F. GRAEF DARLINGTON, Arch St., Allegheny City, Penn.	IX.	Engin'r of Maintenance of Way, P. C. & St. L. Div., P. C. & St. L. R.R.
JOHN DUFF, Georgetown, Colo.	V.	With Staunton Engineering Company.
DAVID S. GODDARD, Steelton, Penn.	III.	In charge of Forge and Sp. Steel Department, Penn. Steel Co.
*MARIE G. HOLMAN, A.M.	V.	Died May 5, 1885.
WALTER J. KOEHLER, Socorro, N.M.	V.	Metallurgist, Graphic Mining and Smelting Company.
EDWIN J. LEWIS, Jun., 60 Devonshire St., Boston, Mass.	IV.	Draughtsman, with Peabody and Stearns, Architects.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM B. LINDSAY, A.B., Carlisle, Penn.	V.	Professor of Chemistry, Dickinson College.
JAMES LUND, 28 Sever St., Charlestown, Mass.	V.	Chemist, Cochrane Chemical Co.
GEORGE A. MOWER, West Newton, Mass.	II.	Expert Engineer, Crosby Steam Gage and Vapor Company.
WEBSTER NORRIS, Melrose, Mass.	III.	Chemist, Boston Sugar Refining Co.
EVELYN M. ORDWAY, Tulane Univ., New Orleans, La.	V.	
THEODORE PARKER, Burlington, Ia	I.	Assistant Engineer, C., B., and Q. Railroad.
NATHANIEL W. SHED, Nashua, N.H.	V.	Chemist, with the Nashua Iron and Steel Company.
WILLIAM R. SNEAD, 318 W. Chestnut Street, Louisville, Ky.	IV.	Gen. Superintendent, Snead & Co.'s Architectural Iron Works.
HAROLD E. STEARNS, Montreal, P.Q.	II.	Proprietor, Dominion Wadding Company's Mills.
EDWARD R. WARREN, Crested Butte, Col.	VII.	United-States Deputy Mineral Surveyor.
CHARLES M. WILKES, 5 Bulfinch Pl., Boston, Mass.	IV.	Civil Engineer.
ARTHUR WINSLOW, Raleigh, N.C.	II	Engineer and Geologist.

1882.

CLARA P. AMES, Northampton, Mass.	V.	Teacher in Girls' Classical School.
THOMAS B. CARSON, Moline, Ill.	II.	Vice-President and Manager, Moline Screw Company.
EDWARD F. ELY, A.B., Brookline, Mass.	IV.	Draughtsman, with H. H. Richardson, Architect.
GEORGE FAUNCE, A.B., Mansfield Valley, Allegheny Co., Penn.	III.	Assistant Superintendent of Pennsylvania Lead Company's Works.
*HARRY A. FOSS,	II.	Died Aug. 19, 1885.
CHARLES A. FRENCH, Boston, Mass.	III.	Assistant in Mathematics, Massachusetts Institute of Technology.
HOWARD V. FROST, Arlington, Mass.	V.	Instructor in General Chemistry, Mass. Institute of Technology.
EDWARD G. GARDINER, Boston, Mass.	VII.	Assistant in Biology, Massachusetts Institute of Technology.
FRANCIS P. HALL, Columbia St., Dorchester, Mass.	V.	Assayer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
GEORGE L. HEINS, 51 W. Tenth St., New York, N.Y.	IV.	Architect.
CHARLES D. JENKINS, 32 Hawley St., Boston, Mass.	V.	Assistant State Inspector of Gas.
JAMES W. JOHNSON, Brockton, Mass.	I.	Civil Engineer.
JOHN F. LOW, Chelsea, Mass.	V.	Of the firm of J. G. & J. F. Low, Art Tile Works.
HARRY G. MANNING, Box 244, Newton, Mass.	II.	Draughtsman, Motive-Power Dept., B. & A. R.R. Machine Shops.
GEORGE W. MANSFIELD, Greenville, N.J.	III.	Assistant Electrician, Daft Electric Light Company.
FRANK C. MORRISON, 89 Court St., Boston, Mass.	I.	Engineer and Draughtsman.
JAMES P. MUNROE, Boston, Mass.	III.	Secretary, Massachusetts Institute of Technology.
CARRIE L. RICE, 744 Lawrence St., Denver, Colo.	V.	Teacher of Chemistry and Physics, Denver High School.
WILLIAM T. RIPLEY, Centre Rutland, Vt.	II.	Sup'rintendent Ripley Sons' Wholesale Marble Works.
HENRY F. ROSS, Jamaica Plain, Mass.	III.	With Boston Thread and Twine Company.
JOHN H. ROSS, Jamaica Plain, Mass.	Elective.	Superintendent, Boston Thread and Twine Company.
GRENVILLE T. SNELLING, Care of Hollinguer et Cie, 38 rue de Provence, Paris, France.	IV.	Student of Architecture, *École Nationale et Speciale des Beaux Arts.*
WALTER B. SNOW, Watertown, Mass.	II.	Foreman, Reversible Collar Company, Cambridge, Mass.
ANTHONY C. WHITE, North Dighton, Mass.	VIII.	Electrician.

1883.

HERBERT T. BARDWELL, Box 1265, Springfield, Mass.	I.	With Holyoke Water-Power Company.
GEORGE H. BRYANT, Lowell, Mass.	II.	Office of Proprietors of Locks and Canals.
HARVEY S. CHASE, 53 Summer St., Haverhill, Mass.	II.	
FRANK E. DAVIS, Washington, D.C.	II.	
JOHN G. EPPENDORFF, 28 West 23d St., New York, N.Y.	IV.	Draughtsman, with Bruce Price, Architect.
GEORGE J. FORAN, 54 Oliver Street, Boston, Mass.	II.	Agent for Deane Steam-Pump Company.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
WILLIAM B. FULLER, St. Paul, Minn.	I.	Asst. Engineer of Track, Bridges, and Buildings, N. P. R.R.
HORACE B. GALE, Stanhope St., Boston, Mass.	II.	Assistant Electrician, N. E. Weston Electric Light Company.
GEORGE H. GUSTIN, Quibdó, U.S. of Col., S.A.	III.	Mining Engineer, Atrato Mining and Developing Company.
FREDERIC O. HARRIMAN, Jaltipan, Mex.	I.	Tehuantepec Inter-Oceanic Railroad.
JAMES H. HUTCHINGS, Boston, Mass.	II.	
HARVEY M. MANSFIELD, Wakefield, Mass.	III.	Chemist, with Somerset Fibre Company, Boston.
ROBERT W. SCOTT, 1227 So. Sixth Street, Philadelphia, Penn.	II.	Mechanical Engineer and Draughtsman.
GEORGE A. SMITH, South Chicago, Ill.	V.	Assistant Chemist, North Chicago Rolling Mill Company.
FRANK TENNEY, Steelton, Dauphin Co., Penn.	III.	Asst. Superintendent, Blast Furnace Department, Penn. Steel Co.
CHARLES H. TOMPKINS, Jun., Boise City, I.T.	III.	Assistant Engineer, Idaho Mining and Irrigation Company.
GEORGE R. UNDERWOOD, Boston, Mass.	V.	Assistant in Industrial Chemistry, Mass. Institute of Technology.
DAVID WESSON, Eighteenth St., cor. Blackwell, Chicago, Ill.	V.	With N. K. Fairbank & Co.
		1884.
CHARLES B. APPLETON, 61 Mt. Pleasant Ave., Roxbury, Mass.	II.	Draughting for the Golden Gate Concentrator Company, Boston.
HENRY F. BALDWIN, Louisville, Ky.	II.	Asst. Engineer's Office, Louisville & Nashville R.R.
FRED. L. BARDWELL, Boston, Mass.	V.	Assistant in General Chemistry, Mass. Institute of Technology.
T. HARRIS BARTLETT, Ainsworth, W.T.	III.	Civil Engineering Department, Northern Pacific R.R.
HENRY A. BOARDMAN, Providence, R.I.	V.	Chemist, Silver Spring Bleaching and Dyeing Company.
CHARLES C. BOTHFELD, Pittsburg, Penn.	I.	Asst. Engineer, Keystone Bridge Company.
ALICE I. BROWN, Bradford, Mass.	V.	Teacher of Natural Science, Bradford Academy.
W. FRANK CARR, Minneapolis, Minn.	I.	Instructor in Civil Engineering, University of Minnesota.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
CHRISTOPHER J. CARVEN, 1604 Dorchester Ave., South Boston, Mass.	I.	City Engineer's Office, Boston.
ROSCOE L. CHASE, 110 Oxford St., Phila., Penn.	V.	Chemist, Quaker-City Dye-Works.
ALFRED O. DOANE, Newtonville, Mass.	III.	Resident Graduate, Mass. Institute of Technology.
ALFRED L. FITCH, Boston, Mass.	II.	Assistant in Mechanical Engineering, Mass. Inst. of Technology.
GEORGE L. R. FRENCH, Lincoln, Neb.	I.	With Burlington and Missouri River Railroad.
AUG. H. GILL, Boston, Mass.	V.	Assistant in Sanitary Chemistry, Mass. Institute of Technology.
FRED. M. HAINES, Boston, Mass.	III.	Mining Engineer.
GEORGE H. HEYWOOD, Gardner, Mass.	III.	With Heywood Bros., Chair-Manufacturers.
JAMES G. HOLDER, 9 Lowell Street, Lynn, Mass.	V.	Apothecary.
GEORGE F. KNAPP, Cambridge, Mass.	III.	Assistant in General Chemistry, Mass. Institute of Technology.
CAPT. D. A. LYLE, U.S.A., Box 2253, Boston, Mass.	III.	Inspector of Ordnance, United-States Army.
PHILIP S. MORSE, Pueblo, Col.	III.	Asst. Chemist, Pueblo Smelting and Refining Company.
CHARLES O. PRESCOTT, Boston, Mass.	V.	
WILLIAM L. PUFFER, Boston, Mass.	III.	Assistant in Physical Laboratory, Mass. Institute of Technology.
ARTHUR J. PURINTON, Boston, Mass.	II.	Assistant in Mechanical Engineering, Mass. Inst. of Technology.
WILLIAM J. RICH, Johnstown, Penn.	III.	Assistant Chemist, Cambria Iron Company.
FRANKLIN B. RICHARDS, Joliet, Ill.	III.	Assistant Chemist, Joliet Steel and Iron Works.
C. SNELLING ROBINSON, Wareham, Mass.	III.	Mining Engineer.
THEODORE W. ROBINSON, Joliet, Ill.	III.	Chemist, Joliet Steel-Works.
A. LAWRENCE ROTCH, 3 Commonwealth Ave., Boston, Mass.	II.	Director, Blue-Hill Meteorological Observatory.
JOSIAH P. RYDER, College Hill, Mass.	V.	Assistant in Chemistry, Tufts College.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
AMY M. STANTIAL, Melrose, Mass.	V.	Private Assistant to Prof. Nichols, Mass. Institute of Technology.
ALFRED STEBBINS, Jun., Denver, Col.	III.	Mining Engineer.
ELLIOT T. STURGIS, Gunderson P.O., Silver Bow County, M.T.	III.	Assayer, W. A. Clark's Colusa Mine and Works, Butte City.
HARRY W. TYLER, Boston, Mass.	V.	Assistant in Mathematics, Massachusetts Institute of Technology.
NAHUM WARD, Mt. Seaver Ave., Roxbury, Mass.	V.	Chemist, with N. Ward Co.
WILLIAM M. WHITNEY, Winchendon, Mass.	II.	With Baxter D. Whitney, Manufacturers Wood-working Machinery.
FRANK C. WILLIAMS, Jun., Roxbury, Mass.	I.	Civil Engineer.

1885.

CHARLES R. ALLEN, New Bedford, Mass.	V.	Assistant in Gen. Chemistry, Mass. Institute of Technology.
DAVID BAKER, Steelton, Penn.	III.	With the Pennsylvania Steel Company.
EDWARD R. BENTON, Ph.D., Brookline, Mass.	IV.	Draughtsman, with H. H. Richardson, Architect.
HEYWOOD COCHRAN, Louisville, Ky.	II.	Draughtsman, with Louisville Bridge and Iron Company.
EDWARD H. DEWSON, Jun., Quincy, Mass.	II.	Employed in Shops of the B. & A. R.R., Boston, Mass.
FREDERICK FOX, Jun., Boston, Mass.	V.	Graduate Student, Massachusetts Institute of Technology.
THOMAS W. FRY, Chicago, Ill.	II.	With M. C. Bullock Manufacturing Company.
ROBERT R. GOODRICH, Stone Cliff, W. Va.	III.	Mining Engineer.
WALTER K. HARRINGTON, Hoosick Falls, N.Y.,	I.	With the Norman Water Works Company.
ELEAZER B. HOMER, 68 Devonshire St., Boston, Mass.	IV.	With Hartwell & Richardson, Architects.
FRANK H. LORD, Somerville, Mass.	II.	Assistant in Drawing, Massachusetts Institute of Technology.
TRACY LYON, Oswego, N.Y.	II.	
HUGH MACRAE, Wilmington, N.C.	III.	Mining Engineer.

NAME AND ADDRESS.	COURSE.	OCCUPATION.
HENRY MARTIN, Lowell, Mass.	V.	Assistant in Chemical Analysis, Mass. Institute of Technology.
ALLYNE L. MERRILL, Cambridge, Mass.	II.	Asst. in Mechanical Engineering, Mass. Institute of Technology.
EBEN G. MERRILL, Omaha, Neb.	I.	With Union Pacific Railroad Company.
EVERETT MORSS, 323 Marlboro' St., Boston, Mass.	III.	With Morss & Whyte, Wire-Workers.
FREDERICK H. NEWELL, Macksburg, O.	III.	With the Ohio Geological Survey of Oil-Fields.
JOSEPH E. NUTE, 813 South Nineteenth St., Omaha, Neb.	I.	With United Gas Improvement Company of Philadelphia, Penn.
MARCELLA I. O'GRADY, Baltimore, Md.	IX.	Science Teacher in Bryn Mawr School.
FRANK A. PICKERNELL, Boston, Mass.	VI.	Asst. in Mechanical Engineering, Mass. Institute of Technology.
RICHARD H. PIERCE, A.B., Brockton, Mass.	VI.	With Edison Electric-Light Co.
NEWBERT M. RANDALL, Boston, Mass.	III.	Asst. in Mining and Metallurgy, Mass. Institute of Technology.
OTIS T. STANTIAL, Melrose, Mass.	III.	Private Assistant to Prof. Richards, Mass. Institute of Technology.
HENRY P. TALBOT, Holliston, Mass.	V.	Assistant in Chemical Analysis, Mass. Institute of Technology.
GEORGE P. VANIER, Steelton, Penn.	III.	With the Pennsylvania Steel Company.
ERASTUS WORTHINGTON, Jun., Middleborough, Mass.	I.	Assistant Engineer, Middleborough Water-Works.

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 1877	32
" " 1869	5	" " 1878	19
" " 1870	10	" " 1879	23
" " 1871	17	" " 1880	8
" " 1872	12	" " 1881	28
" " 1873	26	" " 1882	24
" " 1874	18	" " 1883	18
" " 1875	27	" " 1884	36
" " 1876	43	" " 1885	27
Total			387
Deduct names counted twice			2
			385

TITLES OF THESES

OF SUCCESSFUL CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE, JUNE, 1885.

CHARLES RICKETSON ALLEN,
Nitrogen in Sewage.

DAVID BAKER,
Treatment of an Argentiferous Manganese Ore by Amalgamation.

EDWARD RAYMOND BENTON, Ph.D.,
Some Points in Theatre Construction.

HEYWOOD COCHRAN,
An Investigation of the Modulus of Elasticity and Some Other Properties of Cast-Iron.

EDWARD HENRY DEWSON, Jun.,
An Experimental Study of the Balancing of the Action of the Reciprocating Parts of a Locomotive.

FREDERICK FOX, Jun.,
Albertite.

THOMAS WILDER FRY,
Results of Experiments on the Steam-Engines in the Mechanical Engineering Laboratory of the Massachusetts Institute of Technology.

ROBERT RHEA GOODRICH,
Concentration of Calumet Sand for Copper.

WALTER KENDRICK HARRINGTON,
Design for a Wrought-Iron Arched Bridge, to carry the Main Avenue across the Pond in the Boston Public Garden.

ELEAZER BARTLETT HOMER,
Design for a Theatre.

FRANK HERBERT LORD,
A Study of the Effect of the Reciprocating Parts on the Crank-Pin Pressure of Certain Engines.

TRACY LYON,
An Investigation of the Valve Gear of Several Types of Stationary Engines.

HUGH MACRAE,
Copper Refining.

HENRY MARTIN,
Action of Bromine on the Substituted Anilides.

ALLYNE LITCHFIELD MERRILL,
Experiments on the Slipping and Friction of Oak-Tanned Leather Belts.

EBEN GILES MERRILL,
A Comparison of Tubes and Current Meters, and an Investigation of Sub-surface Velocities, principally in Rectangular Flumes.

EVERETT MORSS,
The Smelting of Vershire Copper Ore and of Argentiferous Galena Concentrates.

FREDERICK HAYNES NEWELL,
The Geology of the Bradford (Penn.) Oil Rocks.

JOSEPH EDSON NUTE,
The Sewerage of Malden, Mass.

MARCELLA IMELDA O'GRADY,
Studies in the Comparative Anatomy of the Sympathetic Nervous System.

FRANK ALBERT PICKERNELL,
Electro-motors and their Efficiency.

RICHARD HENRY PIERCE, A.B.,
Measurement of Strong Currents and High Electro-motive Forces.

NEWBERT MOSES RANDALL,
The Smelting of Calumet "Black Jack" for Black Copper.

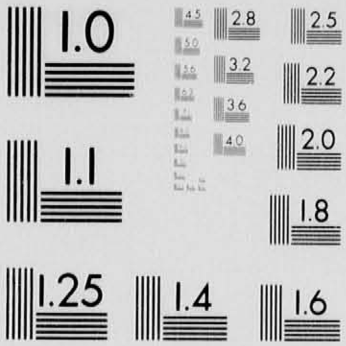
OTIS TALBOT STANTIAL,
Treatment of Sombrerete Ore by Patera and Russell Processes.

HENRY PAUL TALBOT,
Decomposition of Paraffine Hydrocarbons by Heat.

GEORGE PHILIAS VANIER,
Concentration of Low-grade Ores.

ERASTUS WORTHINGTON, Jun.,
System of Water-supply for the Town of Canton, Mass.

ALPHABETICAL INDEX.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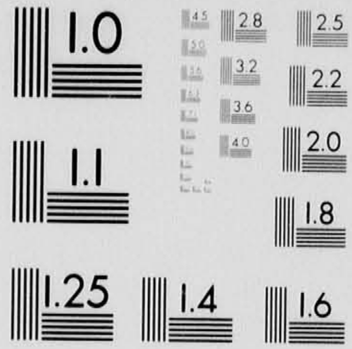
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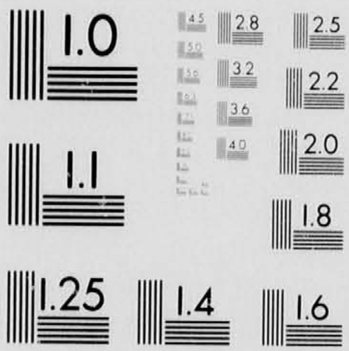
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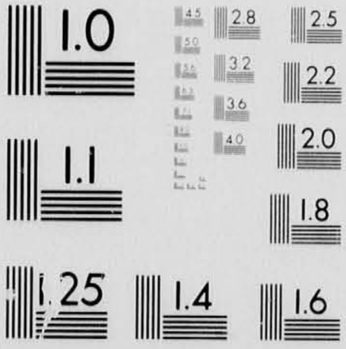
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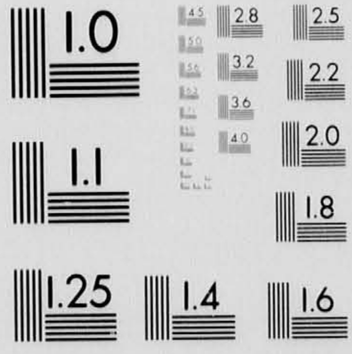
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