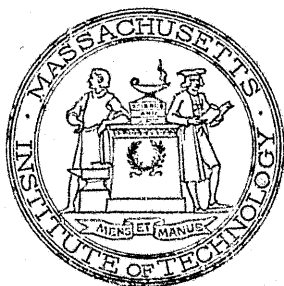


MASSACHUSETTS  
INSTITUTE OF TECHNOLOGY

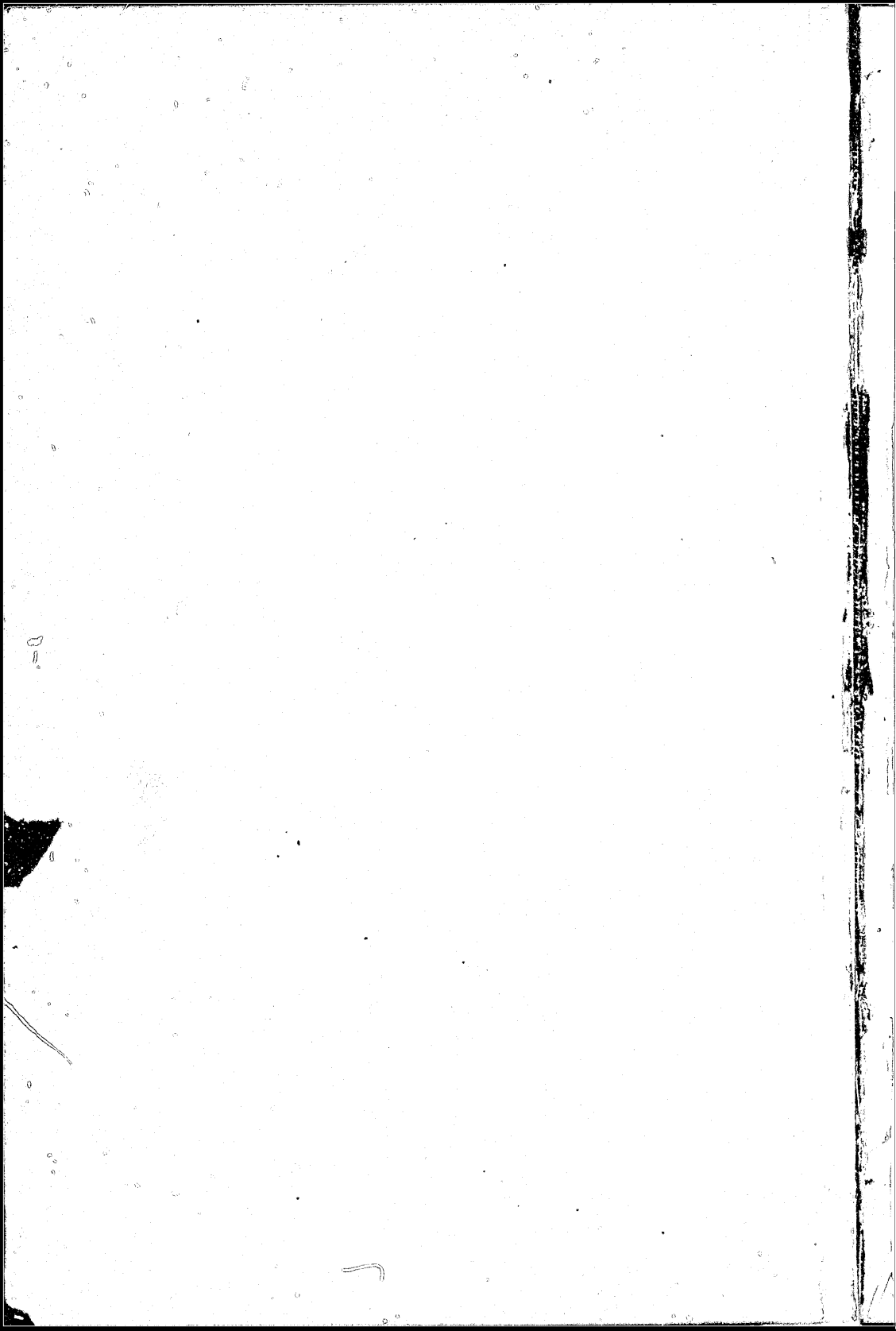
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ANNUAL REPORT  
OF THE  
PRESIDENT AND TREASURER,

DECEMBER 12, 1900.



BOSTON:  
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1900.



## Committees of the Corporation.

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### Executive Committee.

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GEORGE WIGGLESWORTH. }  
ALEXANDER S. WHEELER. FRANCIS H. WILLIAMS.  
HOWARD STOCKTON. THOMAS L. LIVERMORE.  
A. LAWRENCE LOWELL.

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### Finance Committee.

WILLIAM ENDICOTT. CHARLES C. JACKSON.  
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### Committee on the Society of Arts.

HOWARD A. CARSON. GEORGE A. GARDNER.  
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### Committee on the Lowell School of Industrial Design.

PERCIVAL LOWELL. JOHN D. RUNKLE.  
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### Auditing Committee.

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THORNTON K. LOTHROP. GEORGE A. GARDNER.  
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FRANCIS BLAKE.



TO THE MEMBERS OF THE CORPORATION OF THE MASSACHUSETTS  
INSTITUTE OF TECHNOLOGY:

GENTLEMEN: I have been with you but little more than two months, and the report which I have the honor to present at this time contains, in the nature of the case, little beyond the details furnished by the heads of the several departments. Later, with longer acquaintance, I shall ask your attention to certain recommendations regarding the work of the departments, which I feel at this time that I am not prepared to make. I wish to congratulate the Corporation on the thorough and earnest spirit of work, among both Faculty and students, which, even in so short a time as I have been here, has been evident to me.

I am glad to acknowledge, also, cordial help from my predecessor, President Crafts. It has been a source of pleasure both to the Faculty and to myself that he still remains with us as an adviser and friend, and continues to pursue his chemical researches in a private laboratory in the Walker Building.

Since your last annual meeting the Corporation has lost by death three of its members: Mr. Augustus Lowell, Mr. John E. Hudson, and Mr. Thomas Gaffield. Mr. Lowell became a member of the Corporation in 1873, Mr. Gaffield in 1896, and Mr. Hudson in 1899. In the death of these three members of the Corporation we have lost those whose counsel and whose friendship have been of great assistance to the Institute. Mr. Lowell in particular has been long identified with it. He has been since 1883 a member of the Executive Committee, and during seventeen years he has devoted his time and his thought unsparingly to the Institute, and has supported it most generously with his means. In the very short acquaintance which I had with him he im-

pressed me with his strength and breadth of character, and I felt when he died a great sense of loss. Memorials of Mr. Lowell and Mr. Hudson were presented at the last meeting of the Corporation and will be found in the "Technology Review" for January.

#### WALKER MEMORIAL BUILDING.

The completion of the Henry L. Pierce Building practically exhausted the land at present available for building purposes, that on Garrison street being too remote. On the other hand, the removal of the tracks of the Boston & Providence Railroad offered an unequalled opportunity for securing additional land contiguous to our own. After prolonged negotiations, the Executive Committee, with the approval of the Corporation, secured a tract of 51,000 square feet, completing the rectangle bounded by Clarendon and Stanhope streets, Trinity place, and the passageway along the present Engineering Building "A." This purchase has direct relation to a matter which I consider of immediate importance, and to which I now call your attention.

Most of those interested in a thoughtful way in the educational institutions of the United States feel that the question of physical culture is one which as yet has been successfully dealt with in very few of our colleges and technical schools. The present attitude of most institutions of learning toward the instruction of their students in the care of health is either one of absolute neglect, or else one which fosters to an undue degree certain athletic games. In the first case the result is that most students receive no instruction as to exercise, diet, and the proper care of their bodies; while in the second case, a few students are encouraged, often at the expense of scholarship and health, to a system of severe training that is out of all proportion to normal life.

The Institute of Technology maintains a small gymnasium and provides an instructor in gymnastics for those who care to avail themselves of his services. Military instruction oc-

cupying three hours a week is given to the first-year class, and in the course of the year one lecture is given to them on the care of the body. Up to this time, however, we have not undertaken to conduct a department of physical culture, or to supervise in any way the athletic contests into which our students enter.

It is a singular thing that, while the development of modern science has been used with such success in all that pertains to the intellectual side of our development, we have been slow to avail ourselves in the same way of that knowledge which helps to prevent disease, and to conserve health. The time has come when it seems not only of vital importance, but of absolute necessity to provide a system of rational instruction in the care of the body which shall conserve the health of our students. To quote from a man who is not likely to give undue weight to the matter of physical training: "Since vigorous health and its accompanying high spirits are larger elements of happiness than any other things whatever, the teaching how to maintain them is a teaching that yields in moment to no other whatever." At present we are not giving such instruction, nor are we providing our students with a rational system of physical culture. I have, therefore, to recommend that we inaugurate at the earliest possible moment a department of physical culture.

At the head of this department should be a man familiar with student life, a trained physician, who should spend his whole time in the care and supervision of the department.

As a centre for the life of this department, we must have at an early date the Walker Memorial Building. It should be not a gymnasium in the narrow sense, but a building for physical culture and direction, in which, under the care of the head of the department, students may be introduced by the laboratory method to a knowledge of the proper laws of health. A system of physical culture could be begun which for first-year students would be compulsory. The main

features of this system would be, in addition to such lectures as the head of the department might give, the following:

(1.) Each man entering the first-year class should have a strict physical examination, and should receive in accordance therewith directions from the head of the department as to exercise, diet, and the proper method of preserving health. A careful record of these examinations and of subsequent examinations would of themselves form a most valuable series of observations.

(2.) Under the direction of the head of the department each student so examined should spend a prescribed time daily in good weather in open-air exercise. Such exercises or sports should be adapted to the need of the individual, so that, for example, the student who is inclined to be flat-chested or who is inclined to pulmonary disease may be directed to one thing, and one who suffers from an excess of fat may be sent to another. An athletic field would be a convenient but not necessary part of this system.

(3.) At times when the weather does not permit exercise out of doors, students should be required to exercise for a prescribed amount of time in a well-lighted and well-ventilated room.

(4.) Only such competitive sports should be encouraged as may secure out-door exercise, and particularly those, such as track athletics, which afford opportunity to the individual, rather than those which depend on expensive and time-consuming team work. In general, all such sports should be conducted in a way not only consistent with good scholarship, but subordinate to it.

The alumni, who began two years ago to secure subscriptions for the erection of such a building, have already obtained pledges for more than one-third of the amount desired. With a definite statement from the Corporation as to what may be available for a site for this building, together with a guarantee to furnish a man of proper qualities to direct such



a department, I feel sure that the remainder of the fund will be subscribed promptly. I have therefore to urge most strongly that the alumni of the Institute be informed that, in case the sum of one hundred thousand dollars is subscribed before July 1, 1901, the Corporation will set aside from the land recently purchased on Trinity place a site for this building, and that it will provide a director of a department of physical culture. There is no other need at this moment which in my mind is so pressing, and it seems to me absolutely necessary to dispose of this question before taking up others which will soon demand our attention. I feel that this matter is of such importance that any other recommendation which I might make to you at this time would be secondary to it.<sup>1</sup>

#### ATTENDANCE.

I have to report an attendance at the present time in the Institute of twelve hundred and seventy-seven (including four non-resident) students, the largest number which it has ever known. The increase in number has taxed the resources of some departments to the utmost, and any considerable increase above the present attendance will require additional facilities and additional space.

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<sup>1</sup> The following votes were passed by the Corporation at a special meeting held December 26:

*Resolved*, That the President is authorized to state to the Alumni that the Executive Committee will recommend that the Corporation set aside 10,000 square feet of the land on Trinity place, corner of Stanhope street, or, if preferred, 48,000 feet on Garrison street, for a site for the Walker Memorial building, on condition that \$100,000 is subscribed by July 1, 1901, for the erection of the building. The Executive Committee will also provide a suitable man to conduct a department of physical culture.

*Resolved*, That the Faculty of the Institute be requested to confer with representatives of the Alumni and to submit to the Executive Committee a plan for the Walker Memorial building and for its use.

## CHANGES IN THE FACULTY AND INSTRUCTING STAFF.

Professor Wells has been granted a year's leave of absence after a long period of continuous service. It is hoped that he may return with much improvement in health.

Captain William Baird succeeds Lieutenant James Hamilton as Professor of Military Science and Tactics. Assistant Professors Ripley, Vogel, and Woodbridge have been appointed Associate Professors of Economics and Sociology, Modern Languages, and Heating and Ventilation respectively.

Professor Ripley graduated at the Institute in the course of Civil Engineering in 1890, and remained a year for special work in economics. He subsequently held a fellowship at Columbia University, and received the degree of Doctor of Philosophy in 1892. He was appointed Instructor in Political Economy in the same year, Assistant Professor in 1895, and has shown marked ability in his work as a teacher and an investigator.

Professor Vogel was appointed Instructor in Modern Languages in 1888, Assistant Professor in 1892, and has devoted several of his vacations to continuing his philological studies in Germany.

Professor Woodbridge was a member of the class of 1880, and Instructor and Lecturer from 1883 to 1895, when he was appointed Assistant Professor. His special studies in the direction of heating and ventilation have drawn him into professional practice on a large scale, and the Institute is fortunate now in securing a larger share of his time and attention than he has heretofore been able to give.

Mr. Homer Albers, LL.B., has been appointed Lecturer in Business Law, succeeding Mr. Joseph Willard.

Messrs. Charles W. Berry, William D. Coolidge, William T. Hall, George L. Hosmer, Joseph C. Riley, and Alpheus G. Woodman, Assistants of last year, have been promoted to the rank of Instructors.

After the close of the school year Mr. Myron L. Fuller,

Instructor in Geology, was called to the position of Assistant Geologist on the United States Geological Survey. He has been a faithful, vigorous, and successful worker, and he was appreciated for the breadth of his knowledge as well as for his interest in the welfare of the Institute.

By the resignation of Dr. William H. Walker from his position as Instructor in Analytical Chemistry, the Institute has lost the services of an earnest and efficient teacher who was achieving marked success in his work.

Leave of absence has been granted to Mr. Carl H. Clark, Instructor in Naval Architecture, for one year to enable him to obtain more extensive practical experience.

Other Instructors and Assistants of last year who have terminated their connection with the Institute to engage in professional practice or for advanced studies elsewhere are: Messrs. E. M. Bragg, W. B. Russell, and E. W. Rutherford, in Mechanical Engineering; A. A. Blanchard, L. P. Chapin, M. S. Sherrill, and L. J. Seidensticker, in Chemistry; F. H. Watts, in Civil Engineering; J. G. Coffin, in Physics; A. L. Davis, F. L. H. Kimball, and E. Walker, in Mining Engineering.

Dr. Charles Hyde Warren, of Yale University, has been appointed Instructor in Geology, in place of Mr. Fuller; Mr. Walter S. Leland, of the class of 1896, becomes Instructor in Naval Architecture, during the time of Mr. Clark's leave of absence.

The following Assistants have been appointed: R. Wilfred Balcom, John W. Brown, and James H. Walton, Jr., in Chemistry; Edward E. Bugbee, Howard C. Plummer, and William L. Stevens, in Mining Engineering; Charles M. Fosdick and Arthur B. White, in Civil Engineering; Cyrus H. Hapgood, in Physics; Walter H. James, Albert S. Merrill, Timothy C. O'Hearn, and Lawrence S. Smith, in Mechanical Engineering; Carlton Ellis, in Oil and Gas Analysis.

## TEACHERS' FUND.

It is a source of much gratification to the Institute that the teachers' fund for aid in cases of retirement, disability, or death, has been doubled by the generous bequest of Mr. Augustus Lowell. No gift to an institution of learning is of more value than a fund for the assistance and retirement on salary of members of the instructing staff who, by reason of ill health or advancing age, are unable to continue longer in the active service of the Institute.

## DEGREES.

The increasing number of students entering with advanced standing or remaining a fifth year at the Institute, and at the same time the increasing demand for men trained in more than one line of engineering work, have led the Faculty to consider the regulation of candidacy for the degree in two departments at the same time. The result is embodied in the following rule:

An applicant for the degree of Bachelor of Science in two courses at the same time must have made application for such candidacy not later than November 1 next preceding his graduation. Such applications shall be granted only in the case of students who have previously anticipated fourth-year subjects in one or both of the courses in question to such an extent that they have ample time for the work proposed. All such applications shall be referred to a special committee of the Faculty to report as to the eligibility of the candidate, and, in case his application is approved, to have the oversight of all of his work for the remainder of the year, and to report to the Faculty at the close of each term as to the character of the work done. The committee shall decide as to the time and manner of carrying on the thesis work required.

A careful study of our advanced degree requirements has led the Faculty to discontinue the announcement of the

degree of Doctor of Science, and to define the requirements for the degree of Doctor of Philosophy as follows:

The degree of Doctor of Philosophy certifies to high attainments of a grade which qualifies the recipient as a scientific investigator and teacher. The course of study leading to this degree is mainly one of experiment and research, accompanied by such other theoretical subjects as may be useful adjuncts to the main scheme of work. The candidate must pursue his studies and researches under the direction and oversight of the Faculty for at least two school years, furnishing from time to time such evidences of progress as the Faculty may require. His attendance must be continuous except in cases of absence previously approved by the Faculty for the purpose of conducting researches and investigations in the field. He must present a thesis embracing the results of an extended original investigation, and must pass such final examinations as the Faculty may require. No Assistant or Instructor in the Institute, while engaged as such, shall be accepted as a candidate for the degree of Doctor of Philosophy.

#### SCHOLARSHIPS.

The Executive Committee assigned for the present year \$5,000 from the Austin Fund for undergraduate scholarships. The number of applicants for Institute scholarships up to the present time has been 178, while 129 submitted applications for the 40 State scholarships. Ninety-one of these made applications in both places, leaving the total number of applicants considered by the Faculty and the State Board of Education 216. Of these, 28 have received scholarships to the amount of full tuition, 129 others have received smaller amounts, averaging somewhat more than \$100 each. In accordance with the Act of the Legislature authorizing division of State scholarships, 26 of the 40 were so divided, thus increasing the number of recipients to 66.

On recommendation of a special committee appointed by

the Faculty, the following votes have been passed in relation to the income of the Austin Fund:

(1.) That teachers who are known to be thoroughly prepared for undertaking graduate work be accepted as candidates for scholarship aid on the same terms with graduate students, and that their applications be presented to the Standing Committee on Advanced Degrees and Fellowships. Such applicants will, in general, be college graduates.

(2.) That, in general, teachers applying for scholarship aid be not required to conform to the regular courses if they have presented definite, well-considered plans of study approved by the Faculty. It is understood that such applicants will be expected to have done good work at the Institute for a year, and to present such evidence of their need of aid as the Committee on Scholarships may require. It is expected that their applications will be made through the heads of the respective departments.

(3.) That aid be allowed towards meeting the cost of the Institute Summer Courses or Summer Schools in exceptional cases on application by the head of the department to the President.

#### GRADUATE SCHOLARSHIPS.

The graduate scholars of the current year are Messrs. Elbert G. Allen, S.B., Stephen F. Gardner, S.B., and Isaac Osgood, S.B., all of the class of 1900, and Frederic A. Watkins, S.B., of the class of 1899; Eric H. Green, A.B., A.M., of Brown University; Carlton R. Rose, Ph.M., of the University of Michigan. Messrs. Allen, Gardner, and Osgood are candidates for the Master's degree. Messrs. Green, Rose, and Watkins are special students in Chemistry, Mining Engineering, and Electrical Engineering, respectively.

#### FELLOWSHIPS.

Mr. Gorham P. Stevens, of the class of 1898, retains the Swett fellowship, and is continuing his studies at the Atelier

Pascal in Paris. His admission to the *École des Beaux-Arts* as twenty-third out of sixty candidates shows the high quality of his work.

The Savage fellowship has been awarded to Mr. Paul L. Price of the class of 1900, who is continuing his architectural studies at the Institute.

Besides these fellowships of long standing, the income from the Austin fund has enabled us to make the following additional appointments:

Mr. Arthur A. Blanchard, of the class of 1898, and for the past two years Assistant in Theoretical Chemistry, Mr. Louis P. Chapin, a graduate of the University of Minnesota and since 1897 Assistant in General Chemistry, and Mr. Miles S. Sherrill, of the class of 1899, Assistant in Analytical Chemistry, are taking courses at the University of Leipzig. Mr. Joseph G. Coffin, of the class of 1898, for the past two years Assistant in Physics, is a graduate student at Clark University. Mr. George B. Ford, of the class of 1900, is taking advanced work in Architecture at the Institute.

The following reports are made on the fellows of last year:

Mr. George K. Burgess, of the class of 1896, has held the Savage fellowship for the last two years. He has taken a course of study in the University of Paris under the immediate charge of Professor Lippmann. His subject of investigation has been a new mode of determining the gravitation constant. The apparatus, a description of which was published in the "*Comptes Rendus*" of Aug. 21, 1899, was of such extreme sensitiveness — surpassing in this respect any previous device — that his investigations were subject to considerable delay. Mr. Burgess expects to take his final examinations next summer. At present he has an appointment as Instructor in Physics at the University of Michigan.

Mr. H. W. Gardner, Instructor in Architecture, was absent in Europe for a year on a grant from the Austin Fund. The greater part of his time was spent in Italy in making careful measured drawings of certain monuments that had special

bearing on his future work at the Institute. In particular he studied the landscape gardening of a number of famous villas. At Lante, near Viterbo, he was allowed full scope to measure and draw as he pleased. He has made a complete drawing of the famous gardens of this villa. Mr. Gardner's own report will soon be ready, when an exhibition of the work that he has done will be given.

#### ADVISERS.

During the year the system of advisers has had some additional development. This system was introduced seven years ago, and, while data as to the results are necessarily meagre, it is believed to have worked reasonably well. Heretofore the new students of each year — about four hundred and fifty — have been distributed somewhat uniformly among the entire instructing staff. Last spring the Faculty adopted the plan of appointing a definite committee of student advisers, numbering about thirty members, selected with special reference to the service desired. The number of students assigned to each adviser is proportionately increased, but it is not likely to prove burdensome. During the first weeks of students' connection with the Institute, when many of them are meeting unaccustomed responsibilities, and when mistakes may have far-reaching consequences, it is of great importance — difficult though the task is — for us to secure adequate acquaintance with them.

#### " TECHNOLOGY REVIEW."

The publication of the "Technology Review" has been continued by an editorial committee representing the Association of class secretaries, and the great success of the "Review" in every respect reflects the highest credit on its management. In spite of a discouraging deficit at the end of the first year, the committee has, without any sacrifice of the high standard set by the early numbers, made such improve-



ments and retrenchments as to make the publication nearly self-supporting. It is to be hoped that the subscription list of the "Review" will be so maintained and increased by all who are interested in the Institute as to relieve the editorial board of a burdensome part of their present loyal service.

#### PARIS EXPOSITION.

As stated in the last report, the Institute was requested by the officials of the United States Commission for the Paris Exposition to be one of two institutions for exhibiting higher education in engineering and architecture in the United States. The Executive Committee authorized the necessary expenditure, and a committee of the Faculty carried out the preparation of the exhibit.

The amount of space allotted to the Institute was at first so limited that an effective exhibit was deemed out of the question; but by the courtesy of Director Rogers a special assignment of hanging space on an important façade was made which permitted an effective display of large architectural designs. The remainder of the exhibit consisted chiefly of photographs of a standard size mounted in wing-frames, and of portfolios with text and photographs illustrating the work of our engineering departments. Liberal use was made of the various Institute publications, and effective aid was rendered by Institute graduates connected with the Massachusetts Commission or resident in Paris. Besides this main exhibit special collections of minerals and other building stones were made through our department of geology. The material for these was collected from all parts of the country by Professor Crosby and Mr. Fuller, and at the close of the Exposition came into the possession of the Institute. The work of the department of economics in the preparation of the exhibit of the Massachusetts State Board of Health is referred to on page 28. All the members of the Faculty who visited the Exposition during the summer brought back most gratifying reports of the success of our exhibit.

The awards made by the Exposition authorities included the *grand prix* for the Institute in the class of Special Industrial and Commercial Education, gold medals in the classes of Higher Education, Special Education in Fine Arts, and Working of Mines, Ore Beds, and Stone Quarries. A gold medal for the exhibit of the Student Coöperative Society was also awarded. Within a few days we have been much gratified to receive a request on behalf of the French government for the presentation of a number of the large architectural designs to the *École des Beaux-Arts*.

#### ECLIPSE EXPEDITION.

Last May the Institute sent a party under the charge of Professor Burton to Washington, Ga., to observe the total eclipse of the sun. While the Civil Engineering Department is not fully equipped to carry on all kinds of astronomical work, such work being not essential for the instruction of the civil engineer, it was felt that the opportunity should not be lost. The party consisted of Professor Burton, Professor Robbins, and Mr. Hosmer, of the Civil Engineering Department; Professor Bartlett, of the Mathematical Department; Mr. H. W. Smith, of the Physical Department; and Mr. Walter Humphreys. The work of the civil engineering staff consisted in the precise determination of the times of contact. A full account of the expedition has been published by Professor Burton in the "Technology Quarterly" and in the "Technology Review."

#### THE DEPARTMENTS.

**Courses I. and XI., Civil and Sanitary Engineering.** — For the sake of uniformity, a slight change has been made in the arrangement of the studies in the Civil Engineering Department. The force of instruction remains as before, except that Mr. F. H. Watts has resigned his position as Assistant to accept a position on a railroad in the West, and that, on account of the large number of students taking courses in

surveying and topographical drawing, two additional Assistants have been required. The number of students in the second-year drawing room is 107, of which number, 41 are taking the course in Mining Engineering, and 4 the course in Landscape Architecture.

The demand for graduates in Civil Engineering has been larger this year than ever before. Since last May applications have been received for not less than 69 men, excluding a number of applications for men to take temporary positions during the summer. One of the recent graduates of the department is engaged in the construction of water-works in Corea, and another in engineering work in Havana.

The thirteenth session of the Summer School of Civil Engineering was held at Sunapee, N.H., in June last, and was attended by ten students. The work was in direct charge of Instructors K. S. Sweet and G. L. Hosmer, assisted by Messrs. Russell, Thurber, and Delano of the class of 1900. Professor Barton also attended the school for a short time and made several geological trips with the students. The work was of the same character as that usually performed, consisting of base-line measurement, triangulation, plane table and other topographical work, together with hydraulic measurements in rating meters and gauging the flow of streams and practice in taking soundings.

**Course II., Mechanical Engineering.** — The new option in Heating and Ventilation in the Mechanical Engineering course has now been in effect for one year. In this option, besides the work in heating and ventilation, the students attend a short course in the Biological Department upon sanitary hygiene, and a course in the Physical Department upon electric motors. The course in Heating and Ventilation is given by Associate Professor Woodbridge, assisted by Mr. Charles F. Park, Instructor in Mechanical Engineering. Six students of the class of 1901 and one graduate have selected this option.

The department has also been called upon to provide for

a considerable additional amount of work in connection with a new option in the course in Chemistry and with another in the course in Physics. In both cases courses in mechanism and drawing are given, as well as other work in mechanical engineering.

**Course III., Mining Engineering and Metallurgy.** — The large increase in the number of students taking this course led, two years ago, to the installing of a number of small individual plants for concentrating, and one year ago to the division of the class into three sections which receive laboratory instruction in rotation from Professors Richards, Hofman, and Lodge. These changes have now been subjected to a year's trial and have enabled the department not only to handle the increased number of students, but to do so with improved results. By a redistribution of work, all the lectures in mining are given by Professor Richards, and all those in metallurgy by Professor Hofman. On page 23 reference is made to work done in metallography by students in this department, under supervision of the department of Chemistry.

The laboratory is constantly made more efficient by the introduction of new machines and by improved adjustments and appliances adapted to the old machines. By the installation of ten little amalgamation pans, ten students can in a single afternoon try a series of tests. When the results are tabulated, the best mean result is at once apparent, and the evils of excess and deficit are easily pointed out. Several new hydraulic classifiers as well as a small riffle-table have been installed.

The appointment of an assistant for library and museum work is making both these collections of greater value to the students.

The Summer School of Mining was held last June in New Jersey and Eastern Pennsylvania. From Dover visits were made to the Richard mine, where the rich and extensive ore bed and the fine new compressing plant were studied; and

to the Andover and Joseph Wharton Mines of Hibernia, where the students were much interested in studying the Ball-Norton magnetic concentrating plant. A visit was also made to Edison's great magnetic separating plant with all its ingenious labor and power saving devices. The next visit was to Pottsville, Pa., for a geological view of the coal measures. Here the Mahanoy City Colliery and breaker were made special subjects of study. In the valley of the Lehigh visits were made to the mine of brown-iron ore at Ironton, the cement mines and works at Copake. The iron blast furnace at Hokendauqua, the zinc furnaces of the New Jersey Zinc Company, South Bethlehem, and the open hearth furnaces, forging presses, and great gun shops of the Bethlehem Steel Company, were also visited.

**Course IV., Architecture.** — In the option in Landscape Architecture, now in the second year of its existence, there are ten students, five in the second and five in the third year. As yet there appears to be no reason for a change in the course of instruction. We have daily proofs of the unrivalled advantages that we can offer for this study in our close proximity to the Arnold Arboretum, where much of our regular work is done, and to Brookline and other suburbs where many fine estates have been thrown open to our students through the courtesy of their owners.

The option in Architectural Engineering graduated its first class last year, and it is a pleasure to report that good positions were found for all its members. The importance of this field is fully acknowledged, and the number of pupils now pursuing the course proves its attractiveness. Our graduates are more and more realizing the need of a year's uninterrupted study in some one field, and return to take advantage of the opportunities offered by the department for advanced work.

The Rotch prizes, given annually to students in the department, were this year awarded to Mr. G. B. Ford and Mr. J. L. Little, Jr. Both students are taking graduate work.

Mr. Ford and Mr. P. L. Price, a graduate from the option in Architectural Engineering, are candidates for the Master's degree. The Boston Society of Architects has awarded prizes in books of the value of fifty dollars each to Mr. C. H. Stratton and Mr. W. R. Kattelle, both of the class of 1900.

The drawings sent to the Paris Exposition were selected to present a characteristic exhibit of the work done in an American school of architecture. The honor with which they have been distinguished by the French government has been referred to elsewhere. The drawings of Professor Despradelle's "Beacon of Progress," a full description of which was published in the "Technology Review" for October, 1900, have been accorded equal distinction.

The work of the students in the summer school of Architecture has again been the study of the old colonial buildings. The interior of King's Chapel was first measured, and here was given the necessary drill in the systematic plotting of lines and measurements, the use of lead strips in getting the forms of moldings, etc. The work done here proved that many errors had been allowed in the published drawings of the building. From Boston Professor Homer took his class to Providence, where through the courtesy of the Rhode Island School of Design they obtained an excellent room for day and evening work. After ten days spent in making a great number of measured sketches, the class returned to the Institute, and devoted the remaining days to putting the material in hand into accurately made drawings.

**Courses V. and X., Chemistry and Chemical Engineering.** — The course in Chemistry has undergone material modification during the past year. The attention of members of the department has been for some time past called to the need that graduates of this course have felt for some knowledge of the principles of mechanical engineering. Many of them whose work is in technical or manufacturing chemistry are so situated as to be called upon to superintend the care of machinery or mechanical operations. To meet these needs

a series of optional studies has been arranged, with the advice and coöperation of the Department of Mechanical Engineering. While the course was being thus revised, it was thought also worth while to arrange other series of optional studies, extending through the four years, which would, without sacrificing general training, admit of a certain amount of specialization along lines in which there is a demand for graduates from this department. Option 1 is essentially a course in Chemistry with elementary courses in mechanism and valve gears (with drawings), and a course in engines and machines. Option 2 includes almost all the laboratory courses, general and special, and affords training for those who wish to pursue purely chemical lines of technical work. Option 3 affords a preparation for work in municipal or so-called sanitary chemistry. Option 4 specializes along metallurgical lines, in the fourth year of the course. Option 5 presents a course in pure chemistry, which, like the course in pure physics, is intended to prepare students to become teachers, especially in higher institutions, or to undertake research work.

The equipment of the department has been increased by the fitting up of a research laboratory for Professor Crafts.

The number of students taking analytical chemistry is 135. Of these 80 are taking qualitative analysis and 53 are taking quantitative analysis. Of the latter, three are graduate students from other colleges and two are teachers. The class-room instruction in theoretical chemistry has been materially improved by the working out of a systematic series of experiments which are now shown in connection with the lectures. Investigations in metallography have been continued during the past year by students of the fourth year electing this subject for thesis work. Although the microscopic outfit is in excellent condition for research work, yet, if the present demand for theses in this subject should continue, the laboratory facilities for heat measurements must be greatly increased.

The need of a room to be used as a chemical museum is pressing. At present the department can hardly encourage the presentation of chemicals or models of apparatus, as it lacks a suitable place for exhibition or even for storage.

The summer course in organic chemistry was unusually well attended. Of the thirteen students enrolled, seven were regular students of the Chemical course. Compared with the total number of students in the course, this number is small, probably on account of the expense. It is, nevertheless, to be regretted that so few of the better students of the class avail themselves of this opportunity to anticipate a large part of their fourth-year work, and thus to gain much-needed additional time for their theses.

**Courses VI. and VIII., Electrical Engineering and Physics.** — In the course of lectures on general physics, which is given to all regular students of the second year, very considerable modifications have been made during the past few years, in order to present better the recent advances in this science. The rapid enlargement of the whole subject and the fact that the character of these advances is rarely such as to render the older knowledge less important will soon necessitate an extension of the time allotted to it.

A noteworthy addition to the instruction in the course in Electrical Engineering which goes into effect during the present term is a brief series of lectures by Professor Clifford upon the mathematical theory of the propagation of electric waves, a subject which has assumed great practical importance during the past year. This course has been made alternative with that upon railroad signals.

An addition to the work in Electrical Engineering is caused by the establishment of a new option in Heating and Ventilation in the course in Mechanical Engineering, the students in which receive additional instruction in the application of electricity to mechanical purposes. The work has been undertaken by Professor Puffer, and the course on dynamo-electric measurements given to students of the



course in Mechanical Engineering, and the course in Mining Engineering and Metallurgy has been transferred to Mr. W. L. Smith, Instructor in Electrical Engineering.

In the course in Physics an option has been established in Electro-Chemistry. It will include, first, an extended series of exact measurements on electrolytic conduction, transference, polarization, electrolysis, etc.; second, advanced work, including electro-deposition of metals, the electrolytic separation of metals, conductivity of fused electrolytes, electrolysis at very high temperatures, and reductions in the electric-arc furnaces. The option will also include complete efficiency tests of accumulators and of various electrolytic cells. For this work considerable additional equipment will be necessary, and the laboratory will have to be furnished with currents of several hundred amperes for running the electric furnaces. Already the importance of such work has been recognized in several of the polytechnic schools in Germany; but, so far as is known, a laboratory thus equipped for electro-chemical work is unique in this country.

The laboratory of heat measurements has been much hampered by the unexpected increase in the size of the classes, for which both room and teaching force are inadequate. There is an increasing demand for instruction in the accurate measurement of high temperatures and calorific powers. The latest call is for work in connection with the electrical furnace. In view of these demands, the most pressing problems in the branch of physics to which this laboratory is devoted are the study of the methods for maintaining and measuring very high temperatures, and the treatment of the problems in heat which bear upon the development of the modern cold storage systems and methods.

Professor Bartlett, who for the past nine years has done the greater part of the arduous work of examining the laboratory note-books of students in General Physics, has been relieved, and the work has been given to Mr. M. de K. Thompson, Assistant in Physics. Every one knows that the efficiency of

laboratory instruction depends to great extent upon the faithfulness with which this work is done, and that there are few duties which are more tedious. The laboratory owes a great deal to Professor Bartlett's long and painstaking service.

The laboratory of acoustics is so noisy and is so largely devoted to office purposes that its work is rendered very difficult. The optical laboratory is without a suitable room. Indeed, the disadvantages under which the department labors from want of room, and which have been referred to in the President's reports for a number of years, grow more and more serious.

**Course VII, Biology.**— Important changes have been made in the programme of studies in this department (and to some extent in the biological subjects in the courses in chemistry and sanitary engineering) by which more time is given to bacteriology and industrial biology, more time is reserved for thesis work in the final term, and a new subject is introduced. These changes have been made necessary by the rapid growth of bacteriology and its applications to engineering and the arts.

A new course in municipal sanitation is an outgrowth of that in sanitary biology. It includes the study of the sanitary aspects of pavements and dust-nuisances; of street cleaning; of the utilization or disposal of garbage and refuse (ashes, dirt, paper, and other combustible wastes); of the smoke-nuisance; of public parks and playgrounds; of public supplies, such as water, gas, milk, and meat; and of public buildings or institutions, such as theatres, libraries, latrines, markets, baths, gymnasia, prisons, almshouses, etc.

A brief course in the hygiene of heating and ventilation, given by Professor Sedgwick, has been introduced this year in connection with the new option in the department of Mechanical Engineering.

Assistant Professor Hough has continued and extended his important researches on the physiology of muscular work and fatigue, by new and fruitful experiments with the ergo-

graph, and an account of his latest work is just issuing from the press. In the spring he published in the "American Physical Education Review" a valuable paper on the "Flow of Lymph and its Relation to Muscular Exercise," and also as a separate monograph an extended and critical review of the theory and practice of the Swedish system of gymnastics, which has excited much favorable comment, and has recently been incorporated as a special monograph in the Annual Report of the United States Commissioner of Education.

The bacteriological laboratory is so inadequate to the needs of the classes as to constitute a serious drawback to effective work. If the recommendations made last year in the President's report cannot be adopted, temporary relief, at least, should be given by the assignment of more space in the Henry L. Pierce Building.

**Course IX., General Studies: Economics, History, English.** — A special effort has been made during the past year to furnish the students in the third-year class in political economy, which consists of nearly all regular third-year students, with a larger amount of printed matter. The syllabus distributed weekly is now four pages instead of one. The work is also being concentrated upon a smaller number of topics, each of which is of genuine interest to the engineer and the man engaged in practical business. In the development of this plan, and with a view of enlisting on the part of the student a more personal interest, it is proposed to offer options during the second term, permitting the student to select from courses on banking and exchange, finance, railroad economics, the relation of laborers and employers, methods of wage payments, merchant marine, etc.

For the more special work of the General Course, a large number of diagrams have been mounted and the collection of graphic material has been enlarged. The student is also engaged in the plotting of diagrams from day to day and week to week on current financial or commercial phenomena, which are published in the reports of the United States

Treasury Department, or by boards of trade and banking organizations. For example, graphic records have been made of the available cash balance in the United States Treasury, receipts and expenditures of the government, the rate of foreign exchange, the weekly clearing house returns, both of New York and Boston, the exports of wheat and flour, the exports and imports of specie, the movement of money to and from the interior as kept by New York banks.

During the past summer one of the students in the class in anthropology collected data relating to the social and physical characteristics of negroes on a Louisiana plantation. Over three hundred persons were examined and the data tabulated on cards. The material thus obtained will be used for a thesis.

At the request of the Board of Paris Exposition Managers of Massachusetts, and also of the United States Commission of the Paris Exposition, a large number of diagrams were prepared under the supervision of Professor Dewey. A considerable part of this work was done by students of the Institute, and this series of charts, as a rule, received the highest approval of the Exposition Jurors.

Professor Dewey's work on the Financial History of the United States will soon be published in the American Citizen Series, edited by Professor Hart of Harvard University.

A new course on recent history and political conditions in Eastern Asia was given for the first time in the spring term of 1900. Beginning with a general geographical and historical survey, the class studied, from standard authorities, official publications, and current literature, various phases of the Eastern question, — more particularly the expansion of Russia and Russian interests on the Pacific, — recent events in China looking towards railway and industrial development of the country, together with the probable establishment there of spheres of European control, and the commercial and political interests of the United States in these and other

trans-Pacific changes. The class was regularly open, as an option, only to the members of the fourth-year class in the course of General Studies. Hereafter it may perhaps be offered with advantage to students in other courses.

The fact that more attention has of late years been paid to English in the best secondary schools makes in every class a more marked difference between students trained in these schools and those less fortunate. This difficulty is now met by dividing sections according to grade as early in the term as this can be done intelligently and the proficiency of the students judged by actual work. This wide difference in proficiency at entrance makes of highest value the system of assigning special work in English to any student, no matter what his standing otherwise, who shows marked weakness in composition. The system of examination of first-year note-books in chemistry is now arranged on a basis which brings it more closely in touch with the regular work in composition; and all along the line the effort is being made to insure that the written work which students do in their scientific study and outside of formal classes in composition shall not encourage bad literary habits or undo the good of the course in rhetoric. The courses in advanced composition and in literature, given primarily for students in the course in General Studies, are still attended as electives by students from other departments, and in this way English is brought constantly more closely in touch with the strictly technical side of Institute work.

**Course XII, Geology.** — The total membership of the different classes taught in the department during the year was 439.

Professor Crosby has spent about three months among the mines of southwestern Missouri, and he has brought to the Institute a very full and representative collection of the zinc and lead ores and their associated minerals. Probably there is no other collection of the minerals of that region which surpasses this one in completeness and educational value.

**Course XIII, Naval Architecture.** — The department of Naval Architecture has arranged for a short course of lectures on Ordnance and Armor to be given by Professor Philip R. Alger, U. S. N., of the Naval Academy at Annapolis, in February or March.

The drawing room for students of the third and fourth years in the department is now arranged for fifty tables, and the room is lighted by a very satisfactory method proposed by Professor Puffer, and installed under his supervision.

**Mathematics.** — No marked changes have occurred in the work of the Department of Mathematics during the past year. The absence of Professor Wells for the present school year has been elsewhere referred to. It has not been found necessary to make an additional appointment in his place, as members of the staff have been able to take additional work to the extent necessary. It was noted in the last President's Report that the number of sections in calculus had been increased from twelve to fourteen. This year the considerable increase in the size of the entering class has required an increase from sixteen to eighteen sections in algebra. Moreover, the average size of first and second year sections is such as to make a further increase in their number desirable in the near future.

The Runkle Library of Mathematics is proving very helpful to instructors and students, and as time passes is more and more used.

**Modern Languages.** — The efficiency of the Department of Modern Languages has been increased by frequent departmental meetings, by dividing systematically and carefully, between the two terms, the work allotted to every class, and by a greater uniformity of purpose and method in the instruction of all classes and sections.

On account of the increasing demand for instruction in Spanish, there has been for three years no instruction in Italian, which used to alternate with Spanish. In view of this fact Professor Rambeau recommends that there shall be

two options in Spanish every year, an elementary course and a higher one, and that optional instruction in the elements of Italian be also given every year. Moreover, it seems desirable that the Institute should offer to the students of all departments optional advanced courses, not only in French and German, but also in Spanish and Italian.

**Shopwork.** — Professor Schwamb reports that the total registration at the workshops this year is 373; the total number of students, 272, — a marked increase over any previous year. In spite of the fact that a considerable number of students anticipate shopwork in our summer courses, the space available in the machine shop is now taxed to its utmost capacity, and several special students have necessarily been refused admission. A small instruction room for use in connection with the machine shop has proved of much value, and a similar arrangement is recommended for the wood-working and forging.

#### SUMMER COURSES.

The attendance at summer courses this year was as follows:

Mechanical Drawing and Descriptive Geometry. 43. (Prof. Faunce.)  
 Mathematics: Analytic Geometry. 16. (Mr. Carter.)  
 Architecture. (a) Shades and Shadows. 3. (b) Elementary Design. 5. (Mr. Skinner.)  
 Chemistry. (a) General Chemistry. 38. (Mr. Phelan.) (b) Analytical Chemistry. 1. (Dr. Walker.) (c) Organic Analysis. 7. (Dr. Mulliken.) Organic Chemistry. 3. (Dr. Mulliken.)  
 Physics. (a) Mechanics, Light, and Electricity. 20. (Dr. Wendell.) (b) Heat. 19. (Prof. Clifford.) (c) Physical Laboratory. 14. (Dr. Goodwin.)  
 Modern Languages. (a) French. 7. (Mr. Dike.) (b) German. 14. (Dr. Dippold.)  
 Mechanism. 9. (Prof. Merrill.) Mechanical Engineering Drawing. 19. (Mr. Park.)  
 Shopwork. (a) Woodwork. 5. (Mr. Merrick.) (b) Forging. 13. (Mr. Lambirth.) (c) Chipping and Filing. 9. (Mr. Smith.) (d) Machine-Tool Work. 24. (Mr. Smith.)

## THE LIBRARIES.

The total number of additions to the libraries during the year 1899-1900 was 4,520. After deducting books purchased to replace volumes that have been worn out or lost, books counted twice, etc., the total net increase in the size of the library amounts to 3,702 volumes, 497 pamphlets, and 66 maps. The distribution of this increase among the departmental libraries is shown in the following table:

*Table of the Net Accessions for the Year 1899-1900, with the Cost of the Same, and the Total Contents of the Libraries of the Institute, Sept. 30, 1900.*

LIBRARIES.	Net Increase.				Total Contents.		
	Vol-umes.	Pam-phlets.	Maps.	Cost.	Vol-umes.	Pam-phlets and Maps.	
General Library {	General . . . . .	320	158	..	\$122 41 <sup>1</sup>	4,574	3,724
	English . . . . .	136	..	..	173 71	2,671	38
	Modern Languages . . . . .	192	..	5	276 60	834	23
	Military Science . . . . .	8	1	..	4 69	150	7
Totals . . . . .	656	159	5	\$577 41	8,229	3,792	
Architecture . . . . .	191	..	..	438 15	2,639	210	
Biology . . . . .	186	14	..	279 37	2,371	433	
Chemistry . . . . .	388	51	..	599 47	7,944	1,597	
Engineering . . . . .	670	142	60	1,121 00	9,492	3,783	
Geology . . . . .	143	5	..	170 83	2,074	827	
History and Economics . . . . .	653	60	..	519 91	10,157	3,225	
Mathematics . . . . .	129	2	..	230 69	1,035 <sup>2</sup>	176	
Mining . . . . .	264	21	1	394 24	2,589	429	
Physics . . . . .	422	43	..	647 46	6,705	750	
Margaret Cheney Room . . . . .	..	..	..	..	616	13	
Totals . . . . .	3,702	497	66	\$4,978 53	53,851	15,235	

<sup>1</sup> Including books placed in the Secretary's office.

<sup>2</sup> Exclusive of the Runkle Library.

The total number of serial publications of all kinds that we receive regularly now amounts to 871. The distribution of the periodicals and other serial publications among the de-



partmental libraries, and their cost, are shown by the following table:

*Table of Periodicals and other Serial Publications received during the Year 1899-1900.*

LIBRARIES.	Number Received.					Estimated Cost.			
	Gifts.	Paid by Dept.	Periodical Account.		Totals.	Paid by Department.	Periodical Account.		Totals.
			Exch.	Subs.			Exch.	Subs.	
General.....	31	3	20	35	89	\$23 50	\$48 00	\$123 88	\$195 38
Architecture.....	1	3	4	32	40	6 25	9 60	191 17	207 05
Biology.....	20	6	22	38	72	21 10	19 20	223 90	264 20
Geology.....	15	1	8	5	29	2 50	19 20	20 95	42 65
Chemistry.....	26	15	15	43	151	48 16	36 00	217 99	302 15
Engineering.....	39	33	68	53	193	71 75	163 20	219 91	454 86
History and Economics.....	40	36	6	62	138	59 20	14 40	210 34	284 00
Mathematics.....	.....	.....	2	15	17	.....	4 80	56 31	61 11
Mining.....	18	1	21	25	65	179 00	50 40	85 60	137 79
Physics.....	.....	.....	31	29	74	17 41	74 40	144 95	236 76
Lowell School of Design.....	9	5	.....	3	3	.....	.....	10 00	10 00
							\$439 20	\$1,505 00	
								439 20	
Totals.....	251	97	183	340	871	\$251 75		\$1,944 20	\$2,195 95

#### PUBLICATIONS.

The following list comprises the books and papers published by members of the Faculty and Instructing Staff during the past year. The publications are arranged according to departments, and the authors' names according to seniority.

#### *Courses I. and XI. Civil and Sanitary Engineering.*

G. F. Swain: Technical Education at the Massachusetts Institute of Technology. Popular Science Monthly, July, 1900.

C. F. Allen: Railroad Curves and Earthwork.

A. E. Burton: The M. I. T. Eclipse Expedition to Washington, Ga. *Technology Review*, July, 1900.

A. E. Burton, with A. G. Robbins and G. L. Hosmer: The Eclipse Expedition of the Massachusetts Institute of Technology to Washington, Ga. *Technology Quarterly*, September, 1900.

G. L. Hosmer: Summer School of Engineering at Lake Sunapee, June, 1900. *Technology Review*, October, 1900.

*Course II. Mechanical Engineering.*

G. Lanza: *Applied Mechanics*. New edition.

G. Lanza: *Road Tests of Locomotives*. Proceedings of the Central Railroad Club.

C. H. Peabody: *Manual of the Steam Engine Indicator*.

J. Sondericker: *Notes on Graphical Statics*. Revised edition.

E. F. Miller: *Testing the Strength of Materials*. Four articles in *Machinery* for February, March, April, and July, 1900.

E. F. Miller (Editor): *Results of Tests made in the Engineering Laboratories, Number XII*. *Technology Quarterly*, September, 1900.

S. H. Woodbridge: *Car Sanitation*. Report of the Public Health Association for 1899.

S. H. Woodbridge: *Railroad Sanitation*. Proceedings of the New England Railroad Club for November, 1899.

S. H. Woodbridge: *Warming and Ventilation of Mills*. Proceedings of the New England Cotton Manufacturers' Association for April, 1900.

*Course III. Mining Engineering and Metallurgy.*

R. H. Richards: *Review of the Literature on Ore Dressing in 1898*. *The Mineral Industry*, 1899, Vol. VIII., pp. 694-701.

R. H. Richards: *Ore Dressing*. *The Mineral Industry*, 1899, Vol. VIII., pp. 744-779.

H. O. Hofman: *Notes on the Metallurgy of Iron and Steel*. Printed for the use of students at the Institute.

H. O. Hofman: Recent Improvements in Lead Smelting. *The Universal Industry*, 1899, Vol. VIII., pp. 394-410.

H. O. Hofman: The Temperatures at which Certain Ferrous and Calcic Silicates are formed in Fusion, and the Effect upon these Temperatures of the Presence of Certain Metallic Oxides. *Transactions of the American Institute of Mining Engineers*, 1899, Vol. XXIX., pp. 682-721.

R. W. Lodge: Assaying Telluride Ores for Gold. *Technology Quarterly*, 1899, Vol. XII., pp. 171-174.

*Course IV. Architecture.*

E. B. Homer: A Day in Provence. *Technology Review*, January, 1900; and *American Architect*, Nos. 1279 and 1280.

*Courses V. and X. Chemistry and Chemical Engineering.*

H. P. Talbot with M. Henze: Darstellung der geometrisch-isomeren symmetrischen Di-methylaethylene aus der Tiglinsäure und Angelicasäure. *Liebig's Annalen der Chemie*, Vol. CCCXIII., p. 228.

A. A. Noyes with A. A. Blanchard: Lecture Experiments Illustrating the Electrolytic Dissociation Theory and the Laws of the Velocity and Equilibrium of Chemical Change. *Journal of the American Chemical Society*, Vol. XXII., p. 726.

A. A. Noyes: The Exact Relation between Osmotic Pressure and Vapor Pressure. *Zeitschrift für physikalische Chemie*, Vol. XXXV., No. 5; and *Physical Review*, Vol. XII., No. 2.

A. A. Noyes: A Modification of the Usual Method of Determining Transference-Numbers and an Investigation of the Influence of the Concentration on their Values in the case of Some Tri-ionic Salts. *Zeitschrift für physikalische Chemie*, Vol. XXXV., No. 6; and *Physical Review*, Vol. XII., No. 1.

A. A. Noyes, Editor: Review of American Chemical Research for 1900. Reviewers: H. P. Talbot, F. J. Moore, A. G. Woodman, G. W. Rolfe, A. A. Noyes, W. O. Crosby, C.

H. Warren, Henry Fay, H. O. Hofman, J. F. Norris, H. M. Goodwin, E. H. Richards, A. H. Gill, and F. H. Thorp.

A. H. Gill: A Short Handbook of Oil Analysis. Second edition.

A. H. Gill with W. O. Adams: On Hübl's Iodine Method for Oil Analysis. Journal of the American Chemical Society, Vol. XXII., pp. 12-14.

Ellen H. Richards with A. G. Woodman: Water, Air, and Food from a Sanitary Standpoint.

Ellen H. Richards: University Laboratories in Relation to the Investigation of Public Health Problems and to Commercial Work. Transactions of the American Public Health Association, Vol. XXV.

S. P. Mulliken with H. Scudder: The Detection of Methyl Alcohol in Mixtures. American Chemical Journal, Vol. XXIV., p. 444.

J. F. Norris with H. Fay and D. W. Edgerly: The Preparation of Pure Tellurium. American Chemical Journal, Vol. XXIII., p. 105.

J. F. Norris with H. Fay: The Reduction of Selenium Dioxide by Sodium Thiosulphate. American Chemical Journal, Vol. XXIII., p. 119.

J. F. Norris with R. Mommers: The Isomorphism of Selenium and Tellurium. American Chemical Journal, Vol. XXIII., p. 486.

F. J. Moore: Ueber Abspaltung einer Sulfogruppe durch reducirende Agentien. Berichte der Deutschen Chemischen Gesellschaft, XXXIII., p. 2014.

H. Fay with S. Badlam: Heat Treatment and Micro-Structure of Low Carbon Steels. Technology Quarterly, December, 1900.

*Courses VI. and VIII. Electrical Engineering and Physics.*

C. R. Cross: Historical Notes Relating to Musical Pitch in the United States. Proceedings of the American Academy of Arts and Sciences, Vol. XXXV., No. 22, 1900.

W. L. Puffer: Report on "Grounding of the Neutral" to Underwriters' National Electric Association, 1900.

W. L. Puffer: Notes on Dynamic Testing. Third Revised Edition. Printed for use of students in the Institute.

H. E. Clifford: Notes on Heat. Printed for use of students in the Institute.

F. A. Laws: An Apparatus for Recording Alternating Current Waves. Proceedings of the American Academy of Arts and Sciences, Vol. XXXVI., No. 17, 1901.

H. M. Goodwin with F. W. Grover: The Effect of Temperature, of Colloidal Ferric Hydrate, and of a Magnetic Field on the Hydrolysis of Ferric Chloride. Physical Review, Vol. II., p. 193, 1900; and Technology Quarterly, Vol. XIII., p. 327, December, 1900.

W. L. Smith: A Study of Certain Shades and Globes for Electric Lights, Part 1. Technology Quarterly, Vol. XIII., p. 3, September, 1900.

L. Derr: Tests on Railroad Signal Glass. Proceedings of the New England Railroad Club, May, 1900.

L. Derr: Automobile Vehicles. Journal of the Association of Engineering Societies, July, 1900.

C. L. Norton: Tests of Fire Retardent Materials. Technology Quarterly, Vol. XIII., p. 1, June, 1900.

C. L. Norton: The Diffusion of Light through Windows. Report to Associated Factory Mutual Companies of New England. October, 1900.

J. G. Coffin: The Reflection of Light in the Neighborhood of the Critical Angle. Technology Quarterly, Vol. XIII., p. 2, June, 1900.

#### *Course VII. Biology.*

T. Hough: Review of Swedish Gymnastics. Boston. George H. Ellis, Printer. Reprinted in Report of United States Commissioner of Education, 1898-1899.

T. Hough: The Physiological Significance of the Flow of

Lymph and its Relation to Muscular Exercise. American Physical Education Review, Vol. V., No. 2, 1900.

T. Hough: Ergographic Experiments upon Muscular Fatigue and Soreness. Journal of the Boston Society of Medical Sciences, Vol. V., November, 1900.

R. P. Bigelow: A Study of Heredity among the Deaf. (Review of "Marriages of the Deaf in America," by E. A. Fay.) American Naturalist, Vol. XXXIV., No. 398, February, 1900.

R. P. Bigelow: Articles "Allantois," "Area Embryonalis," and "Biology," Wood's Reference Handbook of the Medical Sciences, Vol. I., 1900.

R. P. Bigelow: The Anatomy and Development of *Cassiopea xamachana*. Memoirs of the Boston Society of Natural History, Vol. V., No. 6, August, 1900.

*Course IX. General Studies.*

W. Z. Ripley: Capitalization of Public Service Corporations. Quarterly Journal of Economics, November, 1900.

*Course XII. Geology.*

W. O. Crosby: Geological History of the Nashua Valley during the Tertiary and Quaternary Periods. Technology Quarterly, December, 1899.

W. O. Crosby: Report on the Borings for the East Boston Tunnel. Appendix to Annual Report of the Boston Transit Commission, 1899.

W. O. Crosby: Outline of the Geology of Long Island in its Relation to the Public Water Supplies. Technology Quarterly, June, 1900.

W. O. Crosby: Notes on the Geology of the Sites of the Proposed Dams in the Valleys of the Housatonic and Ten Mile Rivers. Freeman's Report on New York's Water Supply, and Technology Quarterly, June, 1900.

W. O. Crosby: The Origin of Phenocrysts and the Devel-

opment of the Porphyritic Texture in Igneous Rocks. *The American Geologist*, May, 1900.

W. O. Crosby: The Blue Hills Complex. *Occasional Papers of the Boston Society of Natural History*, Vol. IV., Part 3.

G. H. Barton: *Outline of Elementary Lithology*.

M. L. Fuller: The Occurrence and Uses of Mica. *Stone*, Vol. XIX., No. 6, November, 1899.

M. L. Fuller: An Instance of Sub-Aqueous Differential Weathering. *American Geologist*, Vol. XXV., No. 6, June, 1900.

*Department of Mathematics.*

D. P. Bartlett: *General Principles of the Method of Least Squares, with Applications*. Second Edition.

F. S. Woods: Review of Lobachevsky's Geometry. *Bulletin of the American Mathematical Society*, May and July, 1900.

## STATISTICS.

## THE CORPS OF INSTRUCTORS.

The catalogue of this year shows the number of instructors of all grades to be 139, inclusive of those concerned with the mechanic arts, but exclusive of those who are announced as lecturers for the year only. The addition of these raises the total to 181. This year's catalogue will show an increase of five in the number of lecturers and some changes in the grades of professors and instructors. Reference has already been made to the augmentation of the number of the instructing staff; without counting lecturers, the number of instructors to that of students bears the proportion of one to nine and two-tenths. This proportion is a most characteristic figure, and is intimately associated with the quality of the instruction. The following table shows the distribution among the several classes of instructors, in comparison with last year:

	1899-1900.	1900-1901.
Professors . . . . .	24	25
Associate Professors . . . . .	9	11
Assistant Professors . . . . .	21	27
Instructors . . . . .	46	44
Assistants . . . . .	35	32
Lecturers . . . . .	37	42
	<hr/>	<hr/>
Total . . . . .	172	181



## STUDENTS AND GRADUATES.

The registration of this year, as by the catalogue now in press, amounts to 1,277. The following table shows the registration of successive years from the foundation of the Institute:

Year.	No. of Students.	Year.	No. of Students.
1865-66.	72	1883-84.	443
1866-67.	137	1884-85.	579
1867-68.	167	1885-86.	609
1868-69.	172	1886-87.	637
1869-70.	206	1887-88.	720
1870-71.	224	1888-89.	827
1871-72.	261	1889-90.	909
1872-73.	348	1890-91.	937
1873-74.	276	1891-92.	1,011
1874-75.	248	1892-93.	1,060
1875-76.	255	1893-94.	1,157
1876-77.	215	1894-95.	1,183
1877-78.	194	1895-96.	1,187
1878-79.	188	1896-97.	1,198
1879-80.	203	1897-98.	1,198
1880-81.	253	1898-99.	1,171
1881-82.	302	1899-1900.	1,178
1882-83.	368	1900-1901.	1,277

## STUDENTS BY CLASSES.

The aggregate number of students for 1900-1901 is divided among the several classes as follows:

Fellows . . . . .	7
Graduate students, candidates for advanced degrees . . . . .	5
Regular students, Fourth Year . . . . .	193
“ “ Third “ . . . . .	184
“ “ Second “ . . . . .	205
“ “ First “ . . . . .	340
Special students . . . . .	345
	<hr/>
Total . . . . .	1,279
Counted twice . . . . .	2
	<hr/>
	1,277

Assigning the special students to classes, according to the predominant studies pursued by them, we reach the following division of the whole body among the several years:

CLASS.	Regular.	Special.	Total.
Fellows and Graduates of the M.I.T.	10	...	10
Fourth Year . . . . .	193	80	273
Third Year . . . . .	184	110	294
Second Year . . . . .	205	121	326
First Year . . . . .	340	34	374
Total . . . . .	932	345	1,277

## THE COURSES OF INSTRUCTION.

The following table presents the number of the regular students in the second, third, and fourth years, by courses:

YEAR.	Civil Engineering.	Mechanical Engineering.	Mining Engineering and Metallurgy.	Architecture.	Chemistry.	Electrical Engineering.	Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
4th Year Class.	37	35	16	20	20	27	1	2	5	15	4	1	11	193
3d " "	20	45	18	19	14	31	5	1	2	9	8	...	12	184
2d " "	32	47	35	14	16	29	...	1	1	10	5	...	15	205
Total . . .	89	127	69	53	50	87	6	4	8	34	17	1	38	582*

The following table shows the figures of the total line in the foregoing table, in comparison with the corresponding figures for the next ten preceding years:

YEAR.	Civil Engineering.	Mechanical Engineering.	Mining Engineering and Metallurgy.	Architecture.	Chemistry.	Electrical Engineering.	Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
1890 . . .	79	95	18	27	27	105	11	4	13	18	7	3	...	407
1891 . . .	81	104	17	33	23	108	11	5	19	28	9	3	...	441
1892 . . .	76	106	19	37	35	112	9	5	16	34	5	3	...	457
1893 . . .	78	97	22	50	39	141	4	10	19	31	10	2	8	511
1894 . . .	88	111	19	48	50	137	5	9	19	35	13	1	20	556*
1895 . . .	88	118	25	67	59	126	7	11	14	25	10	3	22	575
1896 . . .	99	117	24	65	66	106	7	11	11	34	8	...	25	573
1897 . . .	109	119	33	71	60	90	8	9	10	36	7	1	26	578*
1898 . . .	93	108	52	64	64	94	8	8	12	38	7	1	33	574*
1899 . . .	99	113	60	53	58	84	8	7	11	30	14	1	38	575*
1900 . . .	89	127	69	53	50	87	6	4	8	34	17	1	38	582*

\*Deducting those counted twice.

The following table shows, by classes and by courses, the number of regular students who have registered themselves as electing to distribute the required studies and exercises over the period of five years:

YEAR.	Total.	COURSE.												
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
1st . . .	3	..	..	..	..	..	..	..	..	..	..	..	..	..
2d . . .	2	..	I	..	..	..	I	..	..	..	..	..	..	..
3d . . .	9	2	2	2	..	I	I	..	..	..	..	..	..	I
4th . . .	17	4	4	3	..	..	3	..	..	I	I	I	..	..
5th . . .	4	I	I	1	..	..	I	..	..	..	..	..	..	..
	35	7	8	6	..	I	6	..	..	I	I	I	..	I

CLASSIFICATION OF SPECIAL STUDENTS.

Our special students can, of course, not be classified systematically; but the following table exhibits the number of such students pursuing certain leading lines of study:

Applied Mechanics . . . . .	89	Language . . . . .	144
Architecture . . . . .	40	Mathematics . . . . .	166
Biology . . . . .	39	Mechanical Engineering . . . . .	106
Chemistry . . . . .	111	Mining Engineering . . . . .	18
Civil Engineering . . . . .	57	Naval Architecture . . . . .	13
Drawing . . . . .	135	Physics . . . . .	207
Electrical Engineering . . . . .	25	Political Science . . . . .	75
English . . . . .	105	Sanitary Engineering . . . . .	1
Geology . . . . .	47	Shopwork . . . . .	83
History . . . . .	83		

The following is the number of students, either regular or special, pursuing certain leading branches of study, in each of the four years:

Ala  
Ar  
Cal  
Col  
Con  
Del  
Dis  
Flo  
Geo  
Ha  
Ill  
Ind  
Iow  
Ken  
Low  
Ma  
Ma  
Ma  
Mid  
Mis  
Mo  
Nel  
New  
New  
New  
Nor  
Ohi  
Ore

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.
Mathematics . . . . .	376	288	143	37	844
Chemistry . . . . .	389	67	66	71	593
English . . . . .	336	272	22	8	638
French . . . . .	151	88	49	..	288
Physics . . . . .	..	319	293	181	793
German . . . . .	83	195	151	1	430
Shopwork . . . . .	19	144	54	78	295

RESIDENCE OF STUDENTS.

STATES.	Candidates for Advanced Degrees.					All Regular Students.	Special Students.	Total.	STATES.	Candidates for Advanced Degrees.					All Regular Students.	Special Students.	Total.
	Fourth Year.	Third Year.	Second Year.	First Year.	..					Fourth Year.	Third Year.	Second Year.	First Year.	..			
Alabama.....	..	..	..	..	..	1	1	Pennsylvania....	..	5	6	9	7	27	10	37	
Arkansas.....	..	..	..	1	1	..	1	Rhode Island....	..	2	5	9	6	23	13	35	
California.....	1	..	1	2	4	6	10	South Carolina..	..	..	..	1	1	..	..	1	
Colorado.....	..	2	1	1	4	4	8	South Dakota....	..	..	..	1	1	..	..	1	
Connecticut....	6	6	..	..	26	9	35	Tennessee.....	..	..	1	1	1	..	..	5	
Delaware.....	..	2	..	..	..	2	2	Texas.....	..	..	1	1	1	..	..	4	
Dist. of Columbia	1	2	2	6	11	2	13	Utah.....	1	2	1	2	6	1	1	7	
Florida.....	..	..	..	..	..	0	1	Vermont.....	2	5	..	2	9	6	15		
Georgia.....	..	..	1	1	2	1	3	Virginia.....	..	..	1	1	2	..	..	3	
Hawaiian Islands	1	..	..	..	..	..	1	Washington.....	..	..	1	2	2	..	..	2	
Illinois.....	8	7	6	7	25	11	39	West Virginia...	..	..	..	1	1	..	..	1	
Indiana.....	..	..	4	7	3	7	15	Wisconsin.....	1	3	1	1	6	2	8		
Iowa.....	1	1	1	4	7	3	10	<i>Foreign Countries.</i>									
Kentucky.....	2	..	2	4	7	1	5	Bermuda.....	..	..	..	..	..	1	..	1	
Louisiana.....	1	..	..	..	1	1	2	Denmark.....	1	..	..	..	..	1	..	1	
Maine.....	1	3	5	7	16	6	22	England.....	1	1	..	1	3	..	..	3	
Maryland.....	..	..	..	..	9	4	13	France.....	..	2	1	1	4	..	..	4	
Massachusetts..	9	119	114	123	223	58	191	Germany.....	..	1	1	1	2	..	..	4	
Michigan.....	1	2	2	1	7	6	8	Jamaica.....	..	..	..	..	..	1	..	1	
Minnesota.....	3	2	1	1	7	6	13	Japan.....	..	..	..	..	..	2	..	2	
Missouri.....	1	1	1	4	7	2	5	Mexico.....	2	1	..	1	4	3	7		
Montana.....	..	..	1	2	3	2	4	New Brunswick..	1	1	..	..	2	..	2		
Nebraska.....	..	..	..	2	2	2	4	Nova Scotia.....	..	..	1	1	2	..	2		
Nevada.....	1	..	..	..	1	1	2	Quebec.....	1	..	..	1	2	..	4		
New Hampshire..	4	2	9	3	12	8	26	Russia.....	..	..	..	..	..	1	1		
New Jersey.....	1	3	1	2	7	1	8	Turkey.....	..	2	..	..	2	1	3		
New York.....	13	9	7	23	52	16	68	Total.....	10	193	184	205	340	932	345	1277	
North Carolina..	..	..	..	..	..	2	2										
Ohio.....	7	..	5	7	19	2	27										
Oregon.....	..	..	..	..	..	1	1										

Forty States of the Union, besides the District of Columbia and Hawaiian Islands, are represented on our list of students. Of the total number of 1,277, 779 are from Massachusetts, or 60.9 per cent. of the whole; 133 are from other New Eng-

land States; 366 are from outside New England. Of these, 33 are from foreign countries.

A table showing the number of students in each year, from 1894, coming from each State or Territory, and from each foreign country, may be not without interest and instruction :

	1894.	1895.	1896.	1897.	1898.	1899.	1900.		1894.	1895.	1896.	1897.	1898.	1899.	1900.
<i>States.</i>								<i>States.</i>							
Alabama .....	1	..	1	1	1	..	1	Washington .....	3	1	5	4	7	4	2
Arkansas .....	..	..	1	1	1	..	1	West Virginia...	1	3	..	..	..	..	1
California .....	99	5	9	9	11	9	10	Wisconsin .....	6	7	6	6	8	7	8
Colorado .....	..	7	7	7	8	8	7	Wyoming .....	..	..	1	..	..	..	..
Connecticut.....	29	27	24	30	29	29	35	<i>Foreign Countries.</i>							
Delaware .....	4	5	5	6	6	4	4	Belgium .....	1	..	..	..	..	..	..
Dist. of Columbia	12	10	17	13	8	7	13	Bermuda .....	..	..	..	..	..	..	1
Florida .....	2	1	..	1	1	1	3	Brazil .....	1	1	..	..	..	..	..
Georgia .....	2	2	3	4	4	3	3	Bulgaria .....	..	..	..	..	..	..	..
Hawaiian Islands	..	..	..	..	..	..	1	Cape Breton .....	..	..	..	..	1	..	..
Idaho .....	..	1	1	1	..	..	..	Central America	..	1	..	..	..	..	..
Illinois .....	36	42	45	40	51	36	39	Chile .....	1	1	1	..	..	..	..
Indiana .....	3	2	3	7	3	3	7	Columbia .....	..	..	..	..	..	..	..
Iowa .....	10	12	14	12	7	6	10	Cuba .....	1	3	2	1	1	..	..
Kansas .....	4	4	3	3	3	..	..	Denmark .....	..	..	..	2	1	1	1
Kentucky .....	12	11	12	10	10	4	5	Dutch Guiana...	..	..	..	..	1	1	1
Louisiana .....	3	2	3	3	1	1	2	England .....	..	2	2	2	4	1	3
Maine .....	38	38	27	24	19	25	22	France .....	..	..	1	1	1	1	2
Maryland .....	4	9	9	9	8	8	13	Germany .....	1	..	..	..	1	1	2
Massachusetts .....	708	721	730	739	719	731	779	Guatemala .....	..	..	..	..	..	..	..
Michigan .....	8	8	6	6	9	10	8	Holland .....	2	..	..	..	..	..	..
Minnesota .....	10	5	7	11	11	10	7	Ireland .....	1	..	..	..	..	..	..
Missouri .....	14	9	11	6	10	11	13	Jamaica.....	..	..	..	..	..	1	1
Montana .....	2	1	3	5	2	3	5	Japan .....	1	2	2	..	1	2	2
Nebraska .....	4	2	2	2	1	3	4	Mexico .....	1	1	3	6	7	7	7
Nevada .....	4	2	..	..	..	1	1	New Brunswick	1	1	2	2	3	3	2
New Hampshire...	28	30	26	25	25	29	26	New South Wales	1	1	..	..	..	..	..
New Jersey .....	5	5	13	15	13	12	8	Nova Scotia .....	1	2	1	1	2	..	2
New Mexico .....	1	1	..	..	..	..	..	Ontario .....	4	2	2	..	..	..	..
New York .....	59	64	69	62	68	61	68	Peru .....	..	..	..	..	..	..	..
North Carolina	..	..	1	1	2	2	2	Porto Rico .....	1	1	..	..	..	..	..
Ohio .....	50	37	28	30	23	27	27	Quebec .....	2	2	2	2	1	3	4
Oregon .....	1	1	4	3	3	2	1	Russia.....	..	..	..	..	..	1	1
Pennsylvania .....	37	36	42	41	34	33	37	Scotland .....	1	..	..	..	..	..	..
Rhode Island .....	26	21	26	19	23	32	35	Spain .....	1	1	..	..	..	..	..
South Carolina	3	5	6	4	1	1	1	Trinidad .....	..	..	..	..	..	..	..
South Dakota .....	..	..	..	..	..	..	..	Turkey .....	1	3	1	3	3	3	3
Tennessee .....	1	1	1	3	3	1	2	Venezuela.....	1	1	1	..	..	..	..
Texas .....	6	3	2	2	6	6	7								
Utah .....	2	5	2	3	5	12	15								
Vermont .....	3	5	5	3	2	3	2								
Virginia .....	2	5	3	4	3	2	3								
								Total .....	1183	1187	1198	1198	1171	1178	1277

RESIDENCE OF MASSACHUSETTS STUDENTS.

It has been said that 60.9 per cent. of our students are from Massachusetts. All the counties of the State except Dukes send students to the Institute. One hundred and thirty-four cities and towns are on the lists. The first column of

the following table shows the number of cities and towns in each county sending pupils; the second column gives the aggregate number from each county. It appears that Middlesex sends two hundred and forty-four and Suffolk two hundred and twenty pupils; Essex comes third, with one hundred and ten; Norfolk fourth, with seventy-four.

COUNTY.	No. of Towns.	No. of Students.	COUNTY.	No. of Towns.	No. of Students.
Barnstable . . .	4	5	Middlesex . . .	36	244
Berkshire . . .	3	4	Nantucket . . .	1	1
Bristol . . .	8	19	Norfolk . . .	17	74
Essex . . .	22	110	Plymouth . . .	13	38
Franklin . . .	4	7	Suffolk . . .	4	220
Hampden . . .	6	25	Worcester . . .	15	30
Hampshire . . .	2	2			
			Total . . .	135	779

The following is a list of the towns, forty-two in number, which send four or more students to the Institute:

Boston . . .	200	Salem . . .	11	Haverhill . . .	5
Newton . . .	51	Gloucester . . .	11	Holyoke . . .	5
Cambridge . . .	39	Hyde Park . . .	9	Marlboro . . .	5
Newburyport . . .	25	Malden . . .	9	Medford . . .	5
Lowell . . .	23	Waltham . . .	9	Taunton . . .	5
Brookline . . .	19	Fitchburg . . .	7	Canton . . .	4
Somerville . . .	18	Natick . . .	7	Dedham . . .	4
Lawrence . . .	17	Quincy . . .	7	Framingham . . .	4
Chelsea . . .	16	Wellesley . . .	7	Peabody . . .	4
Springfield . . .	16	Winchester . . .	7	Plymouth . . .	4
Brockton . . .	14	Andover . . .	6	Stoughton . . .	4
Lynn . . .	13	Everett . . .	6	Wakefield . . .	4
Arlington . . .	12	Middleboro . . .	6	Woburn . . .	4
Melrose . . .	11	Milton . . .	6	Worcester . . .	4

The following table exhibits for ten years the distribution of the total number of students among two classes: First, those students whose names are found upon the Catalogue of the year preceding; and secondly, those whose names appear

first upon the Catalogue of the year to which the statement relates :

YEAR.	(1) Total No. of Students.	(2) No. of Students in the Cata- logue of the previous year who remain in the Institute.	(3) No. of New Students entering before issue of Catalogue.	(4) Of those in column (3) the following (3) the number are regular First- year Students.	(5) No. of New Students not of the regular First- year Class.
1891-92	1,011	624	387	258	129
1892-93	1,060	618	442	303	139
1893-94	1,157	701	456	301	155
1894-95	1,183	768	415	271	144
1895-96	1,187	778	409	266	143
1896-97	1,198	758	440	263	177
1897-98	1,198	757	441	277	164
1898-99	1,171	769	402	278	124
1899-1900	1,178	764	414	275	139
1900-1901	1,277	789	488	312	176

#### AGES OF STUDENTS ON ENTRANCE.

The next table exhibits the ages of our students upon entrance, after taking out three who are repeating the first year, and twenty-eight persons of unusual ages. These deductions leave three hundred and nine as the number of students whose ages have been made the subject of computation.

PERIOD OF LIFE.	1899-1900.		1900-1901.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
16 to 16½ years . . . . .	2	..	1	..
16½ to 17 " . . . . .	3	5	4	5
17 to 17½ " . . . . .	16	..	10	..
17½ to 18 " . . . . .	32	48	41	51
18 to 18½ " . . . . .	57	..	53	..
18½ to 19 " . . . . .	52	109	65	118
19 to 19½ " . . . . .	34	..	55	..
19½ to 20 " . . . . .	40	74	30	85
20 to 20½ " . . . . .	28	..	25	..
20½ to 21 " . . . . .	11	39	18	43
21 to 22 " . . . . .	8	8	7	7
	283	283	309	309



The results appear in the table above in comparison with the corresponding results of 1899-1900.

From the foregoing it appears that the average age on entrance is eighteen years and ten months.

In this connection are presented the ages, at graduation, of the class leaving us in June. The one hundred and seventy-eight members of the class were distributed among the different periods of life as follows:

Under 20½ . . . . .	3
Between 20½ and 21 . . . . .	8
“ 21 “ 21½ . . . . .	16
“ 21½ “ 22 . . . . .	25
“ 22 “ 23 . . . . .	57
“ 23 “ 24 . . . . .	31
“ 24 and over . . . . .	38
	178
Total . . . . .	178

The special students this year constitute twenty-seven per cent. of the whole body, as against twenty-six per cent. last year and twenty-seven per cent. the year before.

#### GRADUATES OF OTHER COLLEGES.

The number of students who are graduates of this and other institutions is ninety-eight. Of these seven are our own graduates, five being candidates for advanced degrees.

Ninety-one are graduates of other institutions, pursuing courses of study with us either as regular or as special students. Twenty-two are graduates of Harvard University; three each of Amherst and Yale Colleges, and five of Brown University; two each of McGill and Vermont Universities, Davidson, Grove City, Neuchâtel, Mt. Holyoke, Southwestern, Presbyterian Colleges, and Worcester Polytechnic Institute; one each of Alabama, California, Chicago, Columbia, Denison, Japan, Lehigh, Leland Stanford Jr., Michigan, Nebraska, New York, Ohio State, Princeton, University of the South, Syracuse, Virginia, and Washington Universities; one each of Acadia,

Augustana, Bates, Beloit, Boston, Bowdoin, Bryn Mawr, Delaware, DePauw, Gallaudet, Monmouth, Randolph, Macon, Robert, St. Joseph, St. Xavier's, Smith, South Kentucky, Villanova, Washington and Lee, and Williams Colleges; one each of Harvard Medical School, and Virginia Military Institute.

#### WOMEN AS STUDENTS AT THE INSTITUTE.

The number of women pursuing courses with us is forty-four. Of these, four are graduates of colleges. Of the total number, three are regular students of the fourth year; four of the third year; six of the second year; eight of the first year. Twenty-three are special students. Of the thirteen regular students of the upper classes, four take Course IV., Architecture; two, Course V., Chemistry; three, Course VII., Biology; three, Course VIII., Physics; one, Course IX., General Studies. Of the special students, fourteen devote themselves to Biology, four to Chemistry, one to General Studies, one to Physics, one to Naval Architecture, and one to Geology.

#### STATISTICS OF EXAMINATIONS.

Of the 1,277 students of the present year, 788 were not connected with the school in 1899-1900. Of these, 310 were admitted as regular students of the first year upon the basis of their entrance examinations. The 177 remaining comprise (1) those who had previously been connected with the Institute, and have resumed their places in the school; (2) those who were admitted provisionally without examination; (3) those who were admitted by examination as regular second-year or as special students; (4) those who were admitted on the presentation of diplomas or certificates from other institutions of college grade. In addition to the 310 who were thus admitted to the first year on examination, and have taken their place in the school, 104 were admitted on examination, but have not entered the school.

In the case of the 310 persons who were admitted on examination, and have joined the school, the results of the examinations, embracing both those of June and those of September, were as follows:

Admitted clear . . . . .	237
“ on one condition . . . . .	51
“ on two conditions . . . . .	18
“ on more than two conditions . . . . .	4
	<hr/>
	310

Sixty-one applicants were rejected.

#### EXAMINATIONS AT DISTANT POINTS.

In addition to the entrance examinations held at Boston in July and September, examinations were conducted in July at Belmont, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Exeter (N.H.), Kansas City (Mo.), Louisville, Manlius (N.Y.), Newport, New York, Philadelphia, Pittsburgh, Portland (Me.), Pottstown, Poughkeepsie, St. Louis, Springfield (Mass.), and Washington.

The following table exhibits the number of persons who have graduated within each of the several courses since the foundation of the school:

YEAR.	Civil Engineering.	Mechanical Engineering.	Mining Engineering.	Architecture.	Chemistry.	Metallurgy.	Electrical Engineering.	Natural History or Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
1868	6	1	6	..	..	..	..	..	..	1	..	..	..	..	14
1869	2	2	..	..	1	..	..	..	..	..	..	..	..	..	5
1870	4	2	2	..	1	..	..	..	..	1	..	..	..	..	10
1871	8	2	5	..	2	..	..	..	..	..	..	..	..	..	17
1872	3	1	5	..	5	..	..	..	..	..	..	..	..	..	12
1873	12	2	3	1	7	..	..	..	..	1	..	..	..	..	26
1874	10	4	1	1	1	..	..	..	..	2	..	..	..	..	18
1875	10	7	6	1	1	..	..	..	1	2	..	..	..	..	28
1876	12	8	7	..	5	1	..	2	3	4	..	..	..	..	42
1877	12	6	8	4	2	..	..	..	..	..	..	..	..	..	32
1878	8	2	2	3	3	..	..	..	..	1	..	..	..	..	19
1879	6	8	3	1	3	..	..	1	1	..	..	..	..	..	23
1880	3	..	3	..	1	..	..	..	..	1	..	..	..	..	8
1881	3	5	6	3	8	..	..	1	2	..	..	..	..	..	28
1882	2	5	3	3	6	..	..	1	1	1	..	..	..	..	24
1883	3	7	5	1	3	..	..	..	..	..	..	..	..	..	19
1884	5	6	13	..	12	..	..	..	..	..	..	..	..	..	36
1885	4	7	8	2	4	..	2	..	..	1	..	..	..	..	28
1886	9	23	7	1	7	..	10	1	..	1	..	..	..	..	59
1887	10	17	8	1	9	..	8	1	1	3	..	..	..	..	58
1888	11	25	4	5	10	..	17	3	1	1	..	..	..	..	77
1889	14	24	5	3	8	..	17	1	1	2	..	..	..	..	75
1890	25	28	3	5	13	..	18	3	2	6	..	..	..	..	103
1891	18	26	4	4	11	..	23	3	3	1	7	..	1	..	103
1892	22	26	4	13	7	..	36	6	1	7	4	6	1	..	133
1893	35	30	5	2	8	..	41	2	..	6	8	..	2	..	129
1894	21	31	4	14	11	..	33	1	3	5	12	3	..	..	138
1895	25	30	3	15	14	..	33	..	2	4	11	4	..	5	144*
1896	25	34	10	24	17	..	48	3	3	7	7	4	3	5	189*
1897	25	40	7	16	20	..	33	2	3	7	12	4	1	9	179
1898	32	41	7	29	26	..	33	3	4	6	9	3	..	7	200
1899	30	38	9	22	21	..	32	2	2	1	9	1	..	8	173*
1900	31	33	20	21	16	..	22	3	3	5	11	4	..	9	183†
Totals	436	521	188	197	260	1	405	39	35	79	90	29	8	43	2,332
Deduct names counted twice.....															12
Net total.....															2,320

\* Deducting names counted twice.

† Including seven persons awarded degrees on the date of this report.

## THE SOCIETY OF ARTS.

## REPORT OF THE SECRETARY.

*To the President of the Institute:*

SIR: On behalf of the Executive Committee, I have the honor to present the annual report of the Society of Arts for the year May 11, 1899, to May 10, 1900.

The first meeting of the Society of Arts for the present year was held on Oct. 12, 1899. Fourteen meetings have been held, the average attendance being ninety persons. The following papers have been read: "Some Practical Applications of Storage Batteries," by Mr. J. S. Woodbridge; "Visual Signals," by Mr. H. C. Spaulding; "Use of Kites to Obtain Meteorological Data," by Prof. A. Lawrence Rotch; "New Cellulose Industries," by Mr. A. D. Little; "Exhibition of Building Stones and Minerals collected by the Geological Department of the Massachusetts Institute of Technology in Association with the Commissioners of Massachusetts and the United States for the Paris Exposition," by Professors Niles, Crosby, and Mr. Fuller; "The Character and Extent of Food and Drug Adulterations in Massachusetts, and the Systems of Inspection of the State Board of Health," by Mr. Albert E. Leach; "A New Dynamo-Static Machine," by Prof. Elihu Thomson; "An Architect's Tour through the Riviera and Central France," by Prof. E. B. Homer; "Massachusetts Roads, Old and New," by Mr. William E. McClintock; "Water Storage on the Gila River, Arizona," by Mr. F. H. Newell; "The Boston Elevated Railway System," by Gen. W. A. Bancroft; "Recent Changes of Opinion in England in Favor of the Bacterial Purification of Sewage," by Prof. L. P. Kinnicutt; "Lecture Room Models for illustrating the Modern Methods for Electric Transmission

of Power," by Prof. W. L. Puffer; "Steel, Gray, and Gun Iron Castings; Their Uses and Relative Values," by Prof. W. W. Bird.

At the first meeting of the year the resignation of the Secretary, Mr. Arthur T. Hopkins, was accepted, and Dr. Wendell elected to the position.

During the year there have been a number of changes in membership. Mr. William Jackson, City Engineer of Boston, has been elected to Life Membership, making the number of such members 47; of the Associate Members, 2 have died, 8 have resigned; 22 new members have, however, been elected, making the present membership 339.

In the death of Professor Silas W. Holman the Society lost one of its most distinguished members, and the Institute of Technology one of its most eminent teachers. While his health lasted he evinced a most active interest in the welfare of the Society, as its Secretary from 1881 to 1883, and by his many contributions to the "Quarterly." A sketch of his life will be found in the "Technology Review" for July, 1900.

The publication of the "Technology Quarterly" has been continued under the same management as last year. Since the last annual report, twenty papers have been published in the "Quarterly," of which six were read before the Society, the rest being presented only by title. Besides these, the Proceedings of the Society, and the Review of American Chemical Research, contributed by members of the Chemical Department, have appeared in each number. Mr. Axson's article on "Nitrates as a Product of Combustion" is the first of a new series of contributions from the Laboratory of Sanitary Chemistry. Two of the articles embody the results of notable pieces of work done by members of the Faculty. One, on the "Geological History of the Nashua Valley during the Tertiary and Quaternary Periods," by Professor W. O. Crosby, gives the scientific results of an extended investigation carried on under the auspices of the Metropolitan Water Commission. The other is by Professor Hofman on "The

Temperatures at which Certain Ferrous and Calcic Silicates are formed in Fusion, and the Effect upon these Temperatures of the Presence of Certain Metallic Oxides," a subject of great practical importance in metallurgy. The research was carried on under a grant from the C. M. Warren Fund of the American Academy of Arts and Sciences.

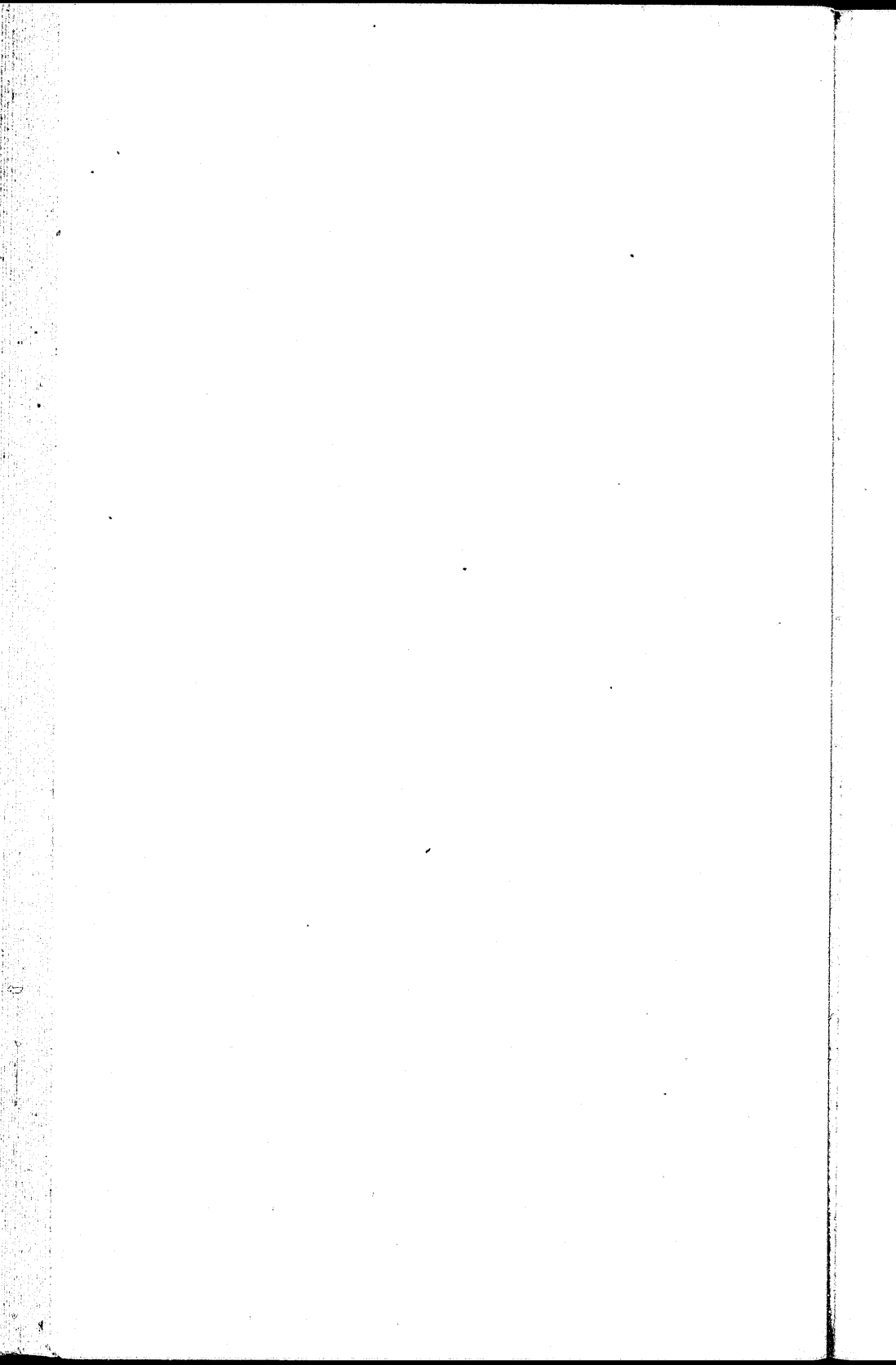
At the last meeting of the year, the thirty-eighth annual meeting, Messrs. George W. Blodgett, Desmond FitzGerald, Edmund H. Hewins, and Charles T. Main were reelected members of the Executive Committee, and Mr. G. V. Wendell was reelected Secretary for the year 1900-1901. Mr. James P. Munroe was elected to serve on the Executive Committee in place of Mr. Frank W. Hodgdon, resigned.

Respectfully submitted,

GEORGE V. WENDELL,

*Secretary.*

DECEMBER 1, 1900.





TREASURER'S REPORT.

## STATEMENT OF THE TREASURER.

THE Treasurer submits the annual statement of the financial affairs of the Institute for the year ending Sept. 29, 1900.

Under the will of the late Robert C. Billings the Institute received \$92,500 free from all conditions. The sum bequeathed was \$100,000, but the succession tax reduced it to the above amount.

It will be remembered that in the last report acknowledgment was made of a gift of \$50,000 from Augustus Lowell, Esquire, to constitute "The Teachers' Fund." Since Mr. Lowell's death, his executors have, in conformity with his wishes, added \$50,000 more to the previous gift. This wise and generous bequest is an added proof of Mr. Lowell's great interest in the Institute, an interest to which it is most deeply indebted not only for generous financial aid, but for constant care and devotion in watching its interests, and helping to guide its development.

There has also been received from the estate of Henry L. Pierce the sum of \$15,000, from the Trustees of the J. W. and Belinda Randall Charity \$8,452.36, from the estate of Mrs. Julia B. H. James \$17,154.21, and from that of Miss Susan E. Dorr \$2,061.55, all of which sums are in addition to large amounts previously received from the same sources. Besides these sums a gift of \$500 came from a friend of the Institute, and Francis Blake, Esquire, kindly contributed \$100 toward the cost of a telescope.

One transaction of very especial importance to the future of the Institute has been completed during the past year, viz., the purchase of some fifty-two thousand feet of land bounded by Trinity place, Stanhope street, and Clarendon street extended and immediately adjoining other land owned by the Institute on Clarendon street and Trinity place. The change in the location of the Boston & Providence Railroad tracks offered this opportunity, and it is believed that the purchase is a very wise one in view of the future needs of the Institute. The immediate result, however, of sinking so large a sum of money in unproductive real estate is to diminish our annual income, and we start the new year with a smaller amount of interest-bearing property than we had a year ago. The total amount, however, of the Institute property, both real and personal, has been increased during the year by a net amount of \$219,853.07, after deducting the sum of \$8,593.54, which is the excess of expenses over income. In addition to the gifts above referred to, there has been a profit on securities sold during the year of \$40,446.51.

In the items of salaries and department supplies there has been a decided increase during the year, but the charges for repairs and general expenses are much smaller than in the previous year. It will be noted that the annual deficit in current expense account is more than \$11,000 less than in 1899.

While the Institute's property has of late years increased rapidly, it must be borne in mind that a very large proportion of its funds are held for scholarship or kindred purposes, so that of the total income from securities and rents more than one-quarter is so used. In addition to this there are twenty free State scholarships and twenty more for which the State has paid annually \$4,000.

SECURITIES SOLD OR PAID, W. B. ROGERS MEMORAL FUND.

\$2,000 Ottawa, Oswego & Fox River R.R. 8s . 1900 2,000.00

RECEIVED.

\$3,000 Chi., Mil. & St. Paul R.R. 7s. }  
transferred from General Funds } . . . 1905 3,613.18

SECURITIES SOLD OR PAID, GENERAL ACCOUNT.

\$1,000	Bur. & Mo. River (Neb.) R.R. 6s., non-ex.	1918	1,000.00
1,000	Chi., Burlington & Quincy R.R. 4s. . . . .	1922	1,000.00
3,000	Chi., Mil. & St. Paul R.R. 7s. } transferred to Rogers Fund }	. . . . . 1905	3,613.18
4,000	Chi., Bur. & Northern R.R. 5s. . . . .	1926	4,200.00
31,000	Walter Baker Co. Lt'd. 4½s. . . . .	1903	31,000.00
250,000	New York Revenue 3½s. . . . .	1899	250,000.00
26 Sh.	Boston & Albany R.R. . . . .		6,226.50
194 "	Morris & Essex R.R. . . . .		17,945.00
40 "	New York & Harlem R.R. . . . .		8,060.00
85 "	Pittsburgh, Fort Wayne & C. R.R. . . . .		15,895.00
100 "	N. Y., New Haven & Hartford R.R. . . . .		21,211.25
50 "	Boston & Maine R.R., common . . . . .		9,750.00
25 "	Boston & Providence R.R. . . . .		7,490.00
50 "	Fitchburg R.R., Pf. . . . .		6,100.00
90 "	Pullman's Palace Car Co. . . . .		17,010.00
59 "	Everett Mills . . . . .		5,815.00
6 "	Manchester Mills . . . . .		600.00
1 "	Merrimack Manf. Co. . . . .		1,150.00
158 "	Pennsylvania Coal Co. . . . .		32,390.00
40 "	Cambridge Gas Light Co. . . . .		9,600.00
10 "	National Union Bank . . . . .		1,358.75
5 "	First Nat. Bank of Baltimore . . . . .		825.00
50 "	American Bell Telephone Co. . . . .		15,600.00
55 "	New England Tel. & Tel. Co. . . . .		7,475.00
40	Rights The Molsons Bank, Montreal . . . . .		70.00
			\$475,384.68

SECURITIES BOUGHT OR RECEIVED AS LEGACIES, GENERAL ACCOUNT.

\$25,000	Chi. Terminal & Transfer Co. 1st 4s. . . . .	1947	24,520.00
95,000	Illinois Steel Co. Non-conv. 5s. . . . .	1913	95,296.25
50,000	Long Island R.R. 4s. . . . .	1949	46,637.50
7,000	K. C., Clinton and Springfield R.R. 5s. . . . .	1925	6,289.21
8,500	K.C., Mem. & Birmingham R.R. 4s. . . . .	1934	8,287.50
13,000	K. C., St. Jo. & Council Bluffs R.R. 7s. . . . .	1907	15,210.00
50,000	Kansas City Stock Yards 5s. . . . .	1910	57,664.90
25,000	Atchison, Top. & St. Fé R.R. 4s. . . . .	1995	25,281.25
50,000	Rio Grande & Western R.R. 4s. . . . .	1939	49,180.00
50,000	Oregon R.R. & Navigation Co. 4s. . . . .	1946	51,375.00
50,000	Union Pacific R.R. 4s. . . . .	1947	52,000.00
100,000	Chi. & West Michigan R.R. 5s. . . . .	1921	102,205.00
100,000	American Tel. & Tel. Co. 4s. . . . .	1929	99,875.00
50,000	New England Tel & Tel. Co. 4s. . . . .	1930	50,625.00
50,000	Chi. Junc. & Union Stock Yards 4s. . . . .	1940	49,250.00
			\$733,696.61

GEORGE WIGGLESWORTH, TREASURER, *in account with*  
GENERAL STATEMENT OF RECEIPTS AND DISBURSEMENTS

*Dr.*

Cash balance, Sept. 30, 1899 . . . . .		61,746.50
From Augustus Lowell for Lowell Courses . . . . .	6,000.00	
“ “ “ “ C. Kastner's salary . . . . .	2,500.00	
“ “ “ “ School of Design . . . . .	500.00	
		<u>9,000.00</u>

RECEIPTS FOR CURRENT EXPENSES.

Income of funds for salaries . . . . .	4,304.00	
“ “ “ “ scholarships (students' fees) . . . . .	7,775.00	
“ “ “ “ Joy “ . . . . .	200.00	
“ “ “ “ Swett “ . . . . .	400.00	
“ “ “ “ Savage “ . . . . .	400.00	
“ “ “ “ W. B. Rogers . . . . .	525.00	
“ “ “ “ Library . . . . .	480.00	
“ “ “ “ general purposes . . . . .	14,876.18	
“ “ Rogers Memorial Fund . . . . .	10,900.48	
“ “ Charlotte B. Richardson Fund . . . . .	1,495.15	
“ “ Rotch Prize Funds . . . . .	400.00	
“ “ Rotch Architectural Fund . . . . .	1,000.00	
“ “ Edward Austin Fund, Scholarships . . . . .	8,215.00	
“ “ “ “ Awards . . . . .	4,169.36	
“ “ Teachers' Fund . . . . .	1,000.00	
Letter Box Fund . . . . . [1899, 31.00]	125.00	
Students' fees . . . . .	200,744.93	
State Scholarships . . . . .	4,000.00	
United States Act of 1862 . . . . .	2,188.59	
United States Act of 1890 . . . . .	8,333.34	
Gift of State of Massachusetts . . . . .	25,000.00	
Laboratory supplies and breakages . . . . .	10,829.84	
Rents, per Table (page 68) . . . . .	12,575.10	
Gifts . . . . .	600.00	
Interest . . . . .	22,882.78	
Boston University . . . . .	1,150.00	
Sale printed Lecture Notes . . . . .	2,562.72	
		<u>347,132.47</u>

GIFTS AND BEQUESTS FOR SPECIAL PURPOSES.

Increase Scholarship Funds . . . . .	785.57	
“ Teachers' Fund [add'l 50,000.00] . . . . .	51,000.00	
“ Edward Austin Fund . . . . .	1,215.64	
“ Susan E. Dorr Fund [add'l 2,061.55] . . . . .	2,388.32	
		<u>55,389.53</u>

GIFTS AND BEQUESTS FOR GENERAL PURPOSES.

Henry L. Pierce Legacy, additional . . . . .	15,000.00	
James Fund, additional . . . . .	17,154.21	
J. W. and Belinda Randall Fund, additional, . . . . .	8,452.36	
Robert C. Billings Legacy . . . . .	92,500.00	
		<u>133,106.57</u>
SECURITIES SOLD OR PAID. GENERAL FUND, page 59.		475,384.68
“ “ “ Rogers Memorial Fund . . . . .		2,000.00

SUNDRIES.

Income credited to Bond Premium Acct. . . . .	3,356.15	
Income credited to Rogers Bond Premium Acct. . . . .	712.52	
Boston Art Students' Association, on acc't . . . . .	666.67	
Students' Notes paid and charged off . . . . .	415.00	
Notes Receivable . . . . .	316,500.00	
		<u>321,650.34</u>
		<u>\$1,405,410.09</u>

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.  
FOR THE YEAR ENDING SEPT. 29, 1900.

Cr.

Paid for Lowell Courses . . . . .	6,000.00	
“ “ Charles Kastner's salary . . . . .	2,500.00	
“ “ Expense Lowell School of Design . . . . .	500.00	
	<hr/>	9,000.00

## EXPENSES.

Salaries, per Table (page 68) . . . . .	249,072.05	
“ paid from Gifts . . . . .	500.00	
Fellowship paid from Swett Fund . . . . .	400.00	
“ “ “ Savage “ . . . . .	400.00	
Edward Austin Fund, Awards . . . . .	4,169.36	
Teachers' Fund . . . . .	1,000.00	
Prizes, Rotch Funds . . . . .	400.00	
Repairs, per Table (page 69) . . . . .	12,406.00	
General Expenses, per Table (page 69) . . . . .	16,707.40	
Fire Insurance . . . . .	2,338.61	
Fuel . . . . .	7,339.11	
Water . . . . .	2,161.90	
Gas . . . . .	2,187.65	
Electricity . . . . .	1,627.55	
Printing and Advertising . . . . .	3,987.28	
“ Lecture Notes . . . . .	4,626.85	
“ Annual Catalogues and Reports . . . . .	2,434.93	
Rents paid Boston & Albany R. R. Co. . . . .	180.00	
“ “ Natural History Society . . . . .	200.00	
Laboratory Supplies and Libraries, per Table (page 68) . . . . .	41,487.55	
Society of Arts . . . . .	127.84	
Interest paid A. Lowell, Trustee . . . . .	1,000.00	
Paris Exposition . . . . .	971.93	
	<hr/>	355,726.01

[Expenses more than Income, \$8,593.54]

## SECURITIES BOUGHT OR RECEIVED AS LEGACIES.

General Account (page 59) . . . . .	733,696.61
Rogers Memorial Fund . . . . .	3,613.18
Henry L. Pierce Building, Trinity Place, on acct. . . . .	1,421.59
Boiler and Power House, Trinity Place, on acct. Lot No. 3 Trinity Place . . . . .	4,575.00
	<hr/>
	259,050.00

## SUNDRIES.

Letter-Box 1899, used . . . . .	31.00
Students' Notes charged off . . . . .	365.00
“ deposits paid . . . . .	100.00
	<hr/>
Cash balance, Sept. 29, 1900 . . . . .	496.00
	<hr/>
	37,831.70
	<hr/>
	\$1,405,410.09

The following account exhibits the property held by the Institute, as per Treasurer's books, Sept. 29, 1900 :

INVESTMENT OF THE W. B. ROGERS MEMORIAL FUND.

\$30,000.00	Burlington & Mo. River R.R. 4s. . . . .	1910	25,787.50
27,000.00	Kansas City Belt R.R. 6s. . . . .	1916	27,000.00
6,000.00	New York & New England R.R. 6s. . . . .	1905	6,000.00
3,800.00	Republican Valley R.R. 6s. . . . .	1919	3,800.00
4,000.00	Cin., Ind., St. Louis & Chicago R.R. 6s. . . . .	1920	4,000.00
2,000.00	Kansas City, Fort Scott & Gulf R.R. 7s. . . . .	1908	2,000.00
1,000.00	Lincoln & Northwestern R.R. 7s. . . . .	1910	1,000.00
1,000.00	Atchison & Nebraska R.R. 7s. . . . .	1908	1,000.00
35,000.00	Fort Street Union Depot 4½s. . . . .	1941	34,825.00
24,000.00	Rome, Watertown & Ogdensburg R.R. 5s. . . . .	1922	24,000.00
37,500.00	Detroit, G. Rapids & Western R.R. 4s. . . . .	1946	37,500.00
25,000.00	Atchison, Top. & St. Fé R.R. 4s . . . . .	1995	24,470.00
7,000.00	Chesapeake & Ohio R.R. 5s . . . . .	1939	7,000.00
38,000.00	Chi. Junc. & Union Stock Yards 5s. . . . .	1915	38,000.00
3,000.00	Chi., Mil. & St. Paul R.R. 7s. . . . .	1905	3,000.00
	Advances to Bond Premium account.		10,842.50

Bonds . . . . . 250,225.00

INVESTMENTS, GENERAL ACCOUNT.

\$10,000.00	Bur. & Mo. River (Neb.) R.R. 6s., non-exempt . . . . .	1918	10,000.00
2,000.00	Bur. & Mo. River (Neb.) R.R. 6s., exempt . . . . .	1918	2,000.00
5,000.00	Chicago, Burlington & Quincy R.R. 4s. . . . .	1922	4,100.00
2,000.00	Kansas City, Fort Scott & Gulf R.R. 7s. . . . .	1908	2,000.00
3,000.00	Hannibal & St. Joseph R.R. 6s. . . . .	1911	3,000.00
6,000.00	West End Street Ry. 5s . . . . .	1902	6,000.00
35,000.00	Fitchburg R.R. 5s. . . . .	1903	35,000.00
65,000.00	Boston & Maine R.R. 4½s. . . . .	1944	65,000.00
26,000.00	Am. Dock & Improvement Co. 5s. . . . .	1921	26,000.00
3,000.00	Illinois Central R.R. 4s. . . . .	1951	3,000.00
26,000.00	New York & New England R.R. 6s. . . . .	1905	26,000.00
8,000.00	Chi. Junc. & Union Stock Yards 5s . . . . .	1915	8,000.00
5,000.00	Dominion Coal Co. 1st. 6s. . . . .	1913	5,000.00
2,000.00	New England Tel. & Tel. Co. 6s. . . . .	1907	2,000.00
2,000.00	New York & New England R.R. 7s., . . . . .	1905	2,000.00
100,000.00	West End Street Ry. 4s . . . . .	1917	100,000.00
50,000.00	Utah & Northern R.R. 1st. 7s. . . . .	1908	50,000.00
90,000.00	Walter Baker Co. Ltd. 4½s . . . . .	1903	90,000.00
50,000.00	Chi. Terminal & Transfer Co. 1st 4s. . . . .	1947	47,507.50
120,000.00	Illinois Steel Co., non-conv. 5s . . . . .	1913	119,586.25
43,000.00	Chesapeake & Ohio R.R. 5s . . . . .	1939	43,000.00
50,000.00	Chi. Junc. & Union S. Yards inc. 5s. . . . .	1907	50,000.00
50,000.00	Long Island R.R. 4s. . . . .	1949	46,637.50
7,000.00	K.C., Clinton & Springfield R.R. 5s. . . . .	1925	6,289.21
8,500.00	K. C., Mem. & Birmingham R.R. 4s. . . . .	1934	8,287.50
13,000.00	K. C., St. Jo. & Council Bluffs R.R. 7s. . . . .	1907	13,000.00
50,000.00	Kansas City Stock Yards 5s. . . . .	1910	50,000.00
25,000.00	Atchison, Top. & St. Fé R.R. 4s. . . . .	1995	25,000.00
50,000.00	Rio Grande & Western R.R. 4s. . . . .	1939	49,180.00
50,000.00	Oregon R.R. & Navigation Co. 4s. . . . .	1946	50,000.00
50,000.00	Union Pacific R.R. 4s. . . . .	1947	50,000.00
100,000.00	Chic. & West Michigan R.R. 5s. . . . .	1921	100,000.00
100,000.00	American Tel. & Tel. Co. 4s. . . . .	1929	99,875.00
50,000.00	New England Tel. & Tel. Co. 4s. . . . .	1930	50,000.00
50,000.00	Chi. Junc. & Union Stock Yards 4s. . . . .	1940	49,250.00
	Advances to Bond Premium account,		38,777.25

Bonds . . . . . 1,335,490.21

Amount carried up . . . . . \$1,585,715.21

*Amount brought up* . . . . . \$1,585,715.21

**STOCKS.**

SHARES.

172 Boston & Albany R.R.	par	100	34,456.50	
50 Chi., Milwaukee & St. Paul R.R. Pf.	"	100	7,000.00	
12 Cocheco Manufacturing Co.	"	500	6,000.00	
56 Hamilton Woollen Co.	"	100	5,390.00	
31 Great Falls Manufacturing Co.	"	100	3,472.00	
2 Dwight Manufacturing Co.	"	500	1,600.00	
17 Pepperell Manufacturing Co.	"	100	2,789.50	
10 Lowell Bleachery	"	100	975.00	
27 Essex Co.	"	50	3,780.00	
55 Old Boston National Bank	"	100	5,510.50	
15 Merchants' National Bank	"	100	2,220.00	
25 New England National Bank	"	100	3,875.00	
25 Atlantic National Bank	"	100	2,875.00	
25 National Bank of the Republic	"	100	3,625.00	
40 The Molsons Bank, Montreal	"	50	2,930.00	
37 Nat. Mechanics Bank, Baltimore	"	10	706.70	
64 Boston Real Estate Trust	"	1000	68,909.64	
1 Boston Ground Rent Trust	"	1000	900.00	
				157,014.84

INVESTMENT OF THE JOY SCHOLARSHIP FUND.

Massachusetts Hospital Life Insurance Co.	5,000.00	
Deposits in Savings Banks . . . . .	4,123.70	
		9,123.70

INVESTMENT SWETT SCHOLARSHIP FUND.

Massachusetts Hospital Life Insurance Co. . . . .	10,000.00
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*Amount carried up* . . . . . \$1,761,853.75

*Amount brought up* . . . . . 1,761,853.75

**REAL ESTATE.**

Rogers Building . . . . .	200,000.00	
Walker " . . . . .	150,000.00	
Land on Garrison Street . . . . .	50,840.00	
Workshops " " . . . . .	30,000.00	
	<u>80,840.00</u>	
Land on Trinity Place . . . . .	76,315.69	
Engineering B'ld'g A, Trinity Place, . . . . .	90,000.00	
	<u>166,315.69</u>	
Gymnasium Building . . . . .	7,967.85	
Engineering Building B . . . . .	57,857.10	
Lot No. 2, Trinity Place . . . . .	137,241.60	
Lot No. 3, Trinity Place . . . . .	259,050.00	
Henry L. Pierce Building, Trinity Place . . . . .	154,297.05	
Boiler and Power House, Trinity Place . . . . .	26,916.74	
Clarendon St. Land and Building . . . . .	142,762.94	
House No. 34 Commonwealth Ave. . . . .	30,000.00	
Real Estate, Massachusetts Ave. Cambridge . . . . .	16,154.38	
	<u>1,429,403.35</u>	
Equipment, Engineering Building . . . . .	16,555.24	
" Workshops . . . . .	20,628.56	
	<u>37,183.80</u>	

**SUNDRIES.**

Notes Receivable . . . . .	62,000.00	
Boston Art Students' Association . . . . .	10,333.32	
Students' Notes . . . . .	835.50	
Cash Balance, Sept. 29, 1900 . . . . .	37,831.70	
	<u>111,000.52</u>	
	<u>\$3,339,441.42</u>	

The foregoing property represents the following Funds and Balances, and is answerable for the same.

The income of the following is used for the general purposes of the Institute :

William Barton Rogers Memorial Fund . . . . .	250,225.00
Richard Perkins Fund . . . . .	50,000.00
George Bucknam Dorr Fund . . . . .	49,573.47
Martha Ann Edwards " . . . . .	30,000.00
Nathaniel C. Nash " . . . . .	10,000.00
Sidney Bartlett " . . . . .	10,000.00
Robert E. Rogers " . . . . .	7,680.77
Albion K. P. Welch " . . . . .	5,000.00
Stanton Blake " . . . . .	5,000.00
McGregor " . . . . .	2,500.00
Katharine B. Lowell " . . . . .	5,000.00
Samuel E. Sawyer " . . . . .	4,610.87
John, W. and Belinda Randall Fund . . . . .	83,452.36
James Fund . . . . .	163,654.21
	<u>676,696.68</u>

*Amount carried up* . . . . . \$576,696.68



Amount brought up . . . . . 676,696.68

The income of the following is used towards paying salaries:

Nathaniel Thayer, for Professorship of Physics	25,000.00	
Jas. Hayward, for Professorship of Engineering	18,800.00	
William P. Mason " " Geology	18,800.00	
Henry B. Rogers, for General Salaries	25,000.00	
George A. Gardner, " " . . . . .	20,000.00	
		107,600.00

#### SCHOLARSHIP TRUSTS.

Richard Perkins Fund . . . . .	53,238.21	
James Savage Fund . . . . .	13,825.69	
Susan H. Swett Fund . . . . .	10,182.95	
William Barton Rogers Fund . . . . .	10,640.62	
Joy Fund . . . . .	9,123.70	
Elisha Thatcher Loring Fund . . . . .	5,342.57	
Charles Lewis Flint Fund . . . . .	5,264.09	
Thomas Sherwin Fund . . . . .	5,000.00	
Farnsworth Fund . . . . .	5,000.00	
James H. Mirrlees Fund . . . . .	2,815.67	
William F. Huntington Fund . . . . .	5,216.66	
T. Sterry Hunt Fund . . . . .	3,225.32	
Elisha Atkins Fund . . . . .	5,000.00	
Nichols Fund . . . . .	5,000.00	
Ann White Vose Fund . . . . .	60,755.89	
Ann White Dickinson Fund . . . . .	40,618.19	
Dalton Grad. Chem. Fund . . . . .	5,983.21	
Willard B. Perkins Fund . . . . .	6,576.13	
		252,808.90

#### OTHER TRUSTS.

Charlotte Billings Richardson Industrial Chemistry Fund . . . . .	37,378.78	
Susan Upham Fund . . . . .	1,297.64	
Susan E. Dorr Fund . . . . .	9,526.92	
William Hall Kerr Library Fund . . . . .	2,000.00	
Charles Lewis Flint Library Fund . . . . .	5,000.00	
Rotch Architectural Library Fund . . . . .	5,000.00	
Rotch Architectural Fund . . . . .	25,000.00	
Rotch Prize Fund . . . . .	5,200.00	
Rotch "Special" Prize Fund . . . . .	5,200.00	
Edward Austin Fund . . . . .	341,215.64	
Teachers' Fund . . . . .	101,000.00	
Letter-box Fund, balance . . . . .	51.12	

#### MISCELLANEOUS.

Notes Payable . . . . .	20,000.00	
Students' Deposits . . . . .	200.00	
John Foster Legacy, 1898 . . . . .	10,000.00	
Henry L. Pierce Legacy, 1898 . . . . .	795,000.00	
John W. Carter Legacy, 1898 . . . . .	6,250.00	
Robert C. Billings Legacy . . . . .	92,500.00	
M. I. T. Stock Account . . . . .	840,515.74	
		1,764,465.74
		<u>\$3,339,441.42</u>

## COMPARATIVE STATEMENT OF FUNDS, ETC.

	Sept. 30, 1899.	Sept. 29, 1900.
Trusts for general purposes . . . . .	651,090.11	676,606.68
"    "    Salaries . . . . .	107,600.00	107,600.00
"    "    Scholarships . . . . .	252,025.16	252,808.50
"    "    Library . . . . .	7,000.00	7,000.00
Charlotte B. Richardson Ind. Chem. Fund . . . . .	37,378.78	37,378.78
Susan Upham Fund . . . . .	1,295.81	1,297.64
Susan E. Dorr Fund . . . . .	7,138.60	9,526.92
Rotch Architectural Library Fund . . . . .	5,000.00	5,000.00
Rotch Architectural Fund . . . . .	25,000.00	25,000.00
Rotch Prize Fund . . . . .	5,200.00	5,200.00
Rotch "Special" Prize Fund . . . . .	5,200.00	5,200.00
John Foster Legacy . . . . .	10,000.00	10,000.00
Henry L. Pierce Legacy . . . . .	780,000.00	795,000.00
John W. Carter " . . . . .	6,250.00	6,250.00
Robert C. Billings " . . . . .	. . . . .	92,500.00
Edward Austin Fund . . . . .	340,000.00	341,215.64
Teachers' Fund . . . . .	50,000.00	101,000.00
Letter-box Fund . . . . .	82.12	51.12
Students' Deposits . . . . .	300.00	200.00
Notes Payable . . . . .	20,000.00	20,000.00
M. I. T. Stock Account . . . . .	809,027.77	840,515.74
	<u>\$3,119,588.35</u>	<u>\$3,339,441.42</u>
Increase,		
Consisting of:		
Bequests for Special Purposes, etc. (See page 58) . . . . .	55,389.53	
Gifts and Bequests for General Purposes. (See page 58) . . . . .	133,106.57	
Net gain on Securities sold . . . . .	40,446.51	
		228,942.61
Less Funds of 1899, used . . . . .	31.00	
"    Students' Deposits paid . . . . .	100.00	
"    Students' Notes charged off . . . . .	365.00	
"    Expenses more than Income . . . . .	8,593.54	
	<u>8,089.54</u>	
		<u>\$219,853.07</u>

**INCOME FROM GENERAL INVESTMENTS, AND APPLICATION THEREOF.**

<table style="width: 100%; border-collapse: collapse;"> <tr><td>Applied to Salaries . . . . .</td><td style="text-align: right;">4,304.00</td></tr> <tr><td>“ “ Scholarships . . . . .</td><td style="text-align: right;">8,175.00</td></tr> <tr><td>“ “ “ James Savage Fund . . . . .</td><td style="text-align: right;">400.00</td></tr> <tr><td>“ “ Charlotte B. Richardson Fund . . . . .</td><td style="text-align: right;">1,495.15</td></tr> <tr><td>“ “ Teachers’ Fund . . . . .</td><td style="text-align: right;">2,000.00</td></tr> <tr><td>“ “ Edward Austin Fund . . . . .</td><td style="text-align: right;">13,600.00</td></tr> <tr><td>“ “ Rotch Prize Funds . . . . .</td><td style="text-align: right;">400.00</td></tr> <tr><td>“ “ Rotch Architectural Fund . . . . .</td><td style="text-align: right;">1,000.00</td></tr> <tr><td>“ “ Library . . . . .</td><td style="text-align: right;">480.00</td></tr> <tr><td>“ “ General Purposes . . . . .</td><td style="text-align: right;">14,876.18</td></tr> <tr><td>“ “ Increase of Funds . . . . .</td><td style="text-align: right;">1,112.34</td></tr> <tr><td>“ “ Advances to Bond Premiums . . . . .</td><td style="text-align: right;">3,356.15</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;"><u>\$51,198.82</u></td></tr> </table>	Applied to Salaries . . . . .	4,304.00	“ “ Scholarships . . . . .	8,175.00	“ “ “ James Savage Fund . . . . .	400.00	“ “ Charlotte B. Richardson Fund . . . . .	1,495.15	“ “ Teachers’ Fund . . . . .	2,000.00	“ “ Edward Austin Fund . . . . .	13,600.00	“ “ Rotch Prize Funds . . . . .	400.00	“ “ Rotch Architectural Fund . . . . .	1,000.00	“ “ Library . . . . .	480.00	“ “ General Purposes . . . . .	14,876.18	“ “ Increase of Funds . . . . .	1,112.34	“ “ Advances to Bond Premiums . . . . .	3,356.15		<u>\$51,198.82</u>	<table style="width: 100%; border-collapse: collapse;"> <tr><td>From Dividends, Bank Stocks . . . . .</td><td style="text-align: right;">1,108.35</td></tr> <tr><td>“ State Tax returned on Bank Stocks . . . . .</td><td style="text-align: right;">251.85</td></tr> <tr><td>“ Bonds . . . . .</td><td style="text-align: right;">39,696.13</td></tr> <tr><td>“ Dividends, Railroad Stocks . . . . .</td><td style="text-align: right;">3,995.18</td></tr> <tr><td>“ “ Coal and Gas Stocks . . . . .</td><td style="text-align: right;">786.54</td></tr> <tr><td>“ “ Manufacturing Stocks . . . . .</td><td style="text-align: right;">1,872.75</td></tr> <tr><td>“ Telephone Stocks . . . . .</td><td style="text-align: right;">573.02</td></tr> <tr><td>“ Real Estate Stocks . . . . .</td><td style="text-align: right;">2,915.00</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;"><u>\$51,198.82</u></td></tr> </table>	From Dividends, Bank Stocks . . . . .	1,108.35	“ State Tax returned on Bank Stocks . . . . .	251.85	“ Bonds . . . . .	39,696.13	“ Dividends, Railroad Stocks . . . . .	3,995.18	“ “ Coal and Gas Stocks . . . . .	786.54	“ “ Manufacturing Stocks . . . . .	1,872.75	“ Telephone Stocks . . . . .	573.02	“ Real Estate Stocks . . . . .	2,915.00		<u>\$51,198.82</u>
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“ Telephone Stocks . . . . .	573.02																																												
“ Real Estate Stocks . . . . .	2,915.00																																												
	<u>\$51,198.82</u>																																												

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**INCOME FROM WILLIAM BARTON ROGERS MEMORIAL FUND, AND APPLICATION THEREOF.**

<table style="width: 100%; border-collapse: collapse;"> <tr><td>Paid Massachusetts Institute of Technology . . . . .</td><td style="text-align: right;">10,900.48</td></tr> <tr><td>Credited to Advances Bond Premiums . . . . .</td><td style="text-align: right;">712.52</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;"><u>\$11,613.00</u></td></tr> </table>	Paid Massachusetts Institute of Technology . . . . .	10,900.48	Credited to Advances Bond Premiums . . . . .	712.52		<u>\$11,613.00</u>	<table style="width: 100%; border-collapse: collapse;"> <tr><td>Received Income from Railroad Bonds . . . . .</td><td style="text-align: right;">11,613.00</td></tr> <tr><td></td><td style="text-align: right; border-top: 1px solid black;"><u>\$11,613.00</u></td></tr> </table>	Received Income from Railroad Bonds . . . . .	11,613.00		<u>\$11,613.00</u>
Paid Massachusetts Institute of Technology . . . . .	10,900.48										
Credited to Advances Bond Premiums . . . . .	712.52										
	<u>\$11,613.00</u>										
Received Income from Railroad Bonds . . . . .	11,613.00										
	<u>\$11,613.00</u>										

**DETAILS OF SOME ITEMS IN TREASURER'S CASH  
ACCOUNT.**

**Rents.**

Huntington Hall, for Lowell Lectures . . . . .	3,500.00	
Lowell School of Design . . . . .	1,800.00	
Land and Building, Clarendon St., on account .	5,000.00	
34 Commonwealth Avenue . . . . .	1,689.75	
Less Annuity under Will, 1,000.00		
" Tax, etc. . . . .	411.58	
	<u>1,411.58</u>	
		248.17
Use of Rooms and Gymnasium . . . . .		2,071.60
		<u>12,619.77</u>
Less Tax and Repairs, Cambridge, net . . . . .		44.67
		<u>12,575.10</u>

**Department Supplies.**

Chemistry . . . . .	11,246.60	
Physics . . . . .	6,624.20	
Mining . . . . .	5,685.80	
Civil Engineering . . . . .	2,903.52	
Mechanical Engineering . . . . .	2,757.03	
Workshops . . . . .	2,436.72	
Architecture . . . . .	2,162.14	
Periodicals . . . . .	1,912.34	
English . . . . .	1,337.14	
Biology . . . . .	1,101.89	
Applied Mechanics . . . . .	995.48	
Naval Architecture . . . . .	844.63	
Geology . . . . .	843.19	
Modern Languages . . . . .	227.03	
Mathematics . . . . .	224.58	
Military . . . . .	90.29	
Drawing . . . . .	34.97	
		<u>41,487.55</u>

**Salaries.**

Instruction . . . . .	198,838.30	
Administration . . . . .	23,350.65	
Labor . . . . .	26,883.10	
		<u>249,072.05</u>

## General Expenses.

Electrical Wiring, Lamps, etc. . . . .		3,666.56	
Postage . . . . .		2,512.55	
Paving Trinity Place . . . . .		1,645.32	
Stationery and Office Supplies . . . . .		1,170.80	
Janitors' Supplies . . . . .		1,168.69	
Diplomas and Commissions . . . . .		608.28	
Sprinklers, General Fire Extinguisher Co. . . . .		604.00	
Entrance Examinations . . . . .		603.46	
Heating and Ventilating Engineering Buildings A and B . . . . .		600.00	
Washing . . . . .		585.02	
Sundries . . . . .		568.35	
Express . . . . .		541.94	
Engine Room Supplies:			
Oil . . . . .	161.47		
Sundries . . . . .	88.64		
Waste . . . . .	68.19		
			318.30
Ice . . . . .			279.12
Furniture . . . . .			271.22
Window Shades . . . . .			227.75
Examination Books . . . . .			212.50
Books, Supplies, etc., for General Library . . . . .			205.76
Removing Ashes . . . . .			163.50
Gymnasium . . . . .			160.80
Graduation Exercises . . . . .			151.75
Deposit Vaults . . . . .			150.00
Telephone Service . . . . .			101.15
Street Watering . . . . .			86.80
Glass . . . . .			72.67
Lowell School of Design . . . . .			31.11
			<u>16,707.40</u>
<b>Repairs.</b>			
Department Improvements:			
Chemistry . . . . .	1,016.76		
Workshops . . . . .	628.50		
Civil Engineering . . . . .	461.51		
Physical . . . . .	442.33		
Naval Architecture . . . . .	374.85		
Architecture . . . . .	296.98		
Mechanical Engineering . . . . .	233.86		
Mining . . . . .	177.62		
Geology . . . . .	133.37		
Biology . . . . .	77.98		
English . . . . .	59.03		
Applied Mechanics . . . . .	48.38		
Drawing . . . . .	28.25		
Modern Languages . . . . .	22.04		
Mathematics . . . . .	3.75		
			4,005.21
Walker Building . . . . .			2,635.20
Engineering Building . . . . .			1,460.56
Rogers Building . . . . .			1,379.76
Sundries . . . . .			1,254.16
Steam Fitting . . . . .			700.00
Pierce Building . . . . .			566.97
Boiler and Power House . . . . .			281.83
Gymnasium . . . . .			122.31
			<u>12,406.00</u>

BOSTON, December 7, 1900.

An examination of the accounts of the Treasurer of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY for the year ending September 29, 1900, has been made by Mr. E. A. Stone, an accountant employed by this committee. We have also verified the evidences of personal property held by the Institute.

The report of Mr. Stone is hereto annexed.

JAMES P. TOLMAN, } *Members of the*  
WILLIAM L. PUTNAM, } *Auditing Committee.*

BOSTON, December 7, 1900.

*To the Auditing Committee of the*

*Massachusetts Institute of Technology:*

GENTLEMEN: I have carefully examined the accounts of the Treasurer for the year ending September 29, 1900, and find everything to be correct. Said examination included: (1) A verification of the sums received during the year from all sources, embracing the interest on all investments; the changes in the same; the interest from deposits in banks and trust companies; and the students' fees. (2) The verification of the list of students with the Secretary's record of the same. (3) The vouchers for all sums paid out, and also the weekly pay-roll. The bank balances are correct and the items of the Trial Balance agree with the Ledger Balances.

Very respectfully yours,

EDWIN A. STONE,

*Accountant.*

