

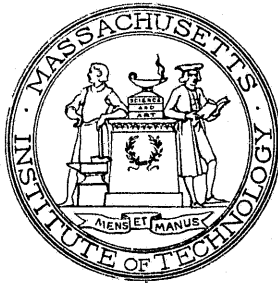
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MASSACHUSETTS
INSTITUTE OF TECHNOLOGY.



ANNUAL REPORT
OF THE
PRESIDENT AND TREASURER,

DECEMBER 8, 1897.



BOSTON:
ROCKWELL AND CHURCHILL PRESS.
1898.

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TO THE CORPORATION OF THE MASSACHUSETTS INSTITUTE OF
TECHNOLOGY:

Not long after President Walker had read to you the report of last year, he was taken from us with tragic suddenness; and you have in mind the final report of the great sum of his life's work which has been made at our memorial meeting. He has left us a house in order; and his own words in speaking to this Corporation of the sudden death of his predecessor may serve as a fitting tribute to himself: "This man whom we honored and loved, to whom we looked up as to master, teacher, father, fell, an unfinished sentence on his lips, instantly dead in our midst. At the time, in the act, it seemed to every spectator a tragedy replete with all the elements of terror and of grief; yet to me, at least, even before that stately and beloved form was laid in the grave, the whole character and bearing of the event had undergone a transformation. I saw that only a scaffolding had fallen, revealing to the view the sublime perfection of a truly finished life."

During the last year death has taken four members from the Corporation, Henry L. Pierce, Lewis William Tappan, Jr., Henry D. Hyde, and William H. Forbes.

Mr. Pierce was a member of the Committee on the Society of Arts from 1885 to 1891, and of the Committee on Literature, History, and Political Economy from 1885 to 1894. Resolutions commemorative of his character and services stand upon our records. His good-will towards this Institute was shown by the part which he took in our councils during the engrossing cares of a very busy and useful private and public life, and also by large donations. At his death the Institute became the recipient, together with Harvard College and three other public institutions, of his residuary estate,

beside a legacy of fifty thousand dollars. This bequest was without restrictions as to use, and the estate under skilful management has proved so large that the general fund bearing interest for the unrestricted use of the school will be doubled.

Mr. Tappan was at first Bursar of the Institute, and upon Mr. Cummings' resignation he became Treasurer. He held during a part of this time the office of Secretary of the Corporation. In 1891 he retired from the office of Secretary; and General Walker, in expressing the regret of the Corporation, says that he had acquired in the several offices filled by him an intimate knowledge of the school, its history, organization, traditions, methods, such as is possessed by no other member of the Corporation. This knowledge of our requirements, together with his zeal and devotedness, made him a most valuable, as he was an indefatigable, aid in advancing the interests of the school.

Col. William Hathaway Forbes became a member of the Corporation in 1893 after the resignation of his father, our early, constant, and liberal benefactor, and long a member of this body. Colonel Forbes' interest in the school was promoted not only by family associations, but also by his own intimate connection with one of the most successful enterprises for the application of science to industry, the Bell Telephone Company. He was also, by his tastes for yachting, well qualified to advise with the department of naval architecture, which was founded during his first year of service in our Corporation.

Failing health has compelled the resignation from the Executive Committee of Mr. John Cummings, who for thirty-four years has served and befriended us with enthusiastic devotion, upon the Executive Committee and as Treasurer; he has given us a large measure of his time and thoughts, and the resolutions passed by this body testify that at the moment of our greatest need he pledged his personal credit to support that of the school. Mr. Cummings stands foremost

among the men who have founded and sustained this Institute during its trial years.

While giving an account of the events of the school year since I assumed the duties of Chairman of the Faculty, January 13, 1897, and those of the Presidency, October 20, 1897, it is fitting to say that a new task has been rendered as little burdensome as possible by the custom of the institution, since its foundation, to entrust many questions of regulation of studies and of policy to the initiative of the Faculty. The members of different sections have always taken a leading part in shaping the growth of their departments, and a habit of hearty coöperation has grown up, which has stood us in good stead in our present emergency.

The maintenance of the total number of students may be considered as a proof of the confidence of the public in the permanent character of our institution.

The entering class is this year 318. In the three preceding years the first-year classes were 332; 320; 320.

The proportion of students who are candidates for a degree has tended to increase slightly during the last few years, and after the elimination during the first year of those who are not qualified to remain in regular standing, the classes of the succeeding years maintain their strength, losing some of their members and recruiting others from the ranks of special students and from other colleges.

The first year is avowedly a trial year, and we have been encouraged by past experience to maintain our policy of examination requirements, which do not exclude pupils from many of the less well-equipped high schools. Young men of good capacity and industry, who have not had the advantage of the best preparatory training, are often fitted during this year to take equal rank with more fortunate comrades, and native ability and the new habits of study acquired may lead them to the foremost places. It may be added that the test of adaptability to the methods of study peculiar to

scientific training sometimes reverses during the first term the verdict of entrance examinations. The methods of the scientific school are often different from those of the preparatory school, and a clever student who has succeeded in his early studies may not have the turn of mind which leads to success in science. The difference between a scholar and an observer is sometimes an insurmountable difference of mental qualities. The quality and quantity of work to be done are continually under revision by the Faculty. The standard of work leading to a degree is fixed by what we deem fair exertion for an intelligent and industrious student. On the one hand we wish in the interest of our graduates to maintain the highest possible value of the diploma, and on the other we seek to bring the requirements within the capacity of the largest number. It is well understood that no one is obliged to overtax his powers in a race for a degree in the regular four-years courses. The same end may be attained in a five-years course, and those who for any reason do not wish to pursue the regular studies can obtain in special courses the kind of education which they elect, under the careful supervision of the Faculty.

Better preparation is continually offering us a more advanced starting point, and progress in scientific methods in some instances is tending to shorten study hours, so that we may hope to raise the standard for our diploma without increasing the amount of work done in the school. The earnest solicitude of the whole instructing staff is directed towards improving the quality of the work.

The crowded condition of our laboratories and drawing-rooms makes it difficult for us to offer to students the inducements we could wish to remain and take the Master's degree. The number last year, eleven, was equal to the total of the three preceding years; and it is to be hoped that this very small beginning marks a movement in the right direction. Great influence is exerted upon his comrades by a student, who has acquired a love for science, who,

before entering upon professional work, gives himself a respite of a year or two to work out under the direction of a professor some more abstruse problems of theory or of practice. Such a man becomes a valuable auxiliary to the teaching force of the school, and the presence of large numbers of graduate students in some of our universities has contributed more than anything else to raise the character of their instruction toward the level of the older institutions of Europe.

These are some of the considerations which have guided us in dealing with educational problems, and they may serve as a preface to the description of the progress which we have made thus far in our methods of instruction.

Each year's report brings new demands for increased space. The drawing-rooms for civil engineering have one-half more students than ever before. The mechanical engineering rooms are overfilled with machinery, and too large a number of students are detailed to each machine. The chemical laboratories are filled to their utmost capacity. The mining department has a new class much larger than ever before. Important researches in biology are postponed for want of space. In other words, without any increase in the total number of students, the growing laboratory requirements of the upper classes make our accommodations each year less adequate. Our teaching continually advances in the direction of a greater subdivision of classes. The work is done under the supervision of instructors by small sections, whose principal business it is to make laboratory experiments, to test machinery at work, or to make drawings representing projects of construction in engineering or architecture. It is in this direction of subdivision and minute supervision that we are seeking to improve the quality of our work, and for this reason more teachers and larger space have to be provided for a given number of students.

I desire also to present to your consideration a new feature of these embarrassing evidences of prosperity, that is, the

probable fluctuations of the demands. The thirteen courses have been successively instituted to correspond with the new fields which science has opened to the arts, and to the demands which new industries are making upon science; and the changes in the numbers of students who are taking different courses are the measure of the popular conception of these demands for skill in some particular branch of technology. To a considerable extent these requirements are rightly understood. They are often guided by the inquiries for suitable assistants from men who have made places for themselves in the industrial world, and who are opening new positions to younger men. We cannot tell whether the success of American engineers in South African mines is one of the threads which draw a number of mining students to a Boston school. We cannot take up such a question from a commercial standpoint; but we do know that such varying demands will be made upon an industrial school, and until we have greatly enlarged our buildings, we shall be put each year to temporary expedients to meet yearly exigencies, and the Treasurer will inform you that such changes involve large expenses.

It will be long before we can hope to leave behind us the anxieties of such problems, and it should be said, moreover, that, although the condition described has often been one of great discomfort, it has never been allowed to impair the efficiency of the school. We are less favored than many neighboring institutions in building-space, but we have always followed the wise policy of keeping in the foremost rank, and in some departments leading the way in supplying the best models and apparatus for teaching and for making investigation. We have run in debt to buy them, and then run still further in debt to build houses to hold them, but we have always had them when the head of a department told the government of the school that they were necessary to the most effective teaching of his science. We now find ourselves working elbow to elbow, with the best tools, but with no room to spare, and with no margin of space to meet

change of demands. Perhaps this state of things, like the discomfort of a crowded theatre, has contributed to keep alive enthusiasm; it certainly has made evident that we were not misapplying the funds so nobly contributed for the support of the school. Each dollar at interest, or invested in land or buildings, has had its educational value, and these things were the best witnesses which we could bring before the Legislature to justify a generous grant of public money — twenty-five thousand dollars per annum donated to us for six years in January, 1895.

During next year, legacies, which do not yet appear as paid in the Treasurer's account, will allow us to put up in the spring the new building described in much detail in General Walker's report of last year, and the only shadow upon our great satisfaction is the thought that he could not live to see realized what he speaks of as "the pleasant dream in which the Executive Committee and Faculty indulged themselves until rudely awakened by the impossibility of securing the necessary funds under the painful industrial and commercial conditions prevailing the past season."

Legacies and Gifts. — The payment of the Pierce bequest will not take place until the first of next year, but we have had a large accession to our funds during the current year. Fifty thousand dollars has been allotted to our Institute by the trustees of the John W. and Belinda L. Randall Charities Corporation, with the condition that the sum shall be set apart and used in a manner commemorative of John W. and Belinda L. Randall. This legacy is a portion of a sum of \$350,000 placed in the hands of the trustees to be donated for charitable and educational purposes, and the donation allotted to the Institute is most gratefully received. The trustees have in this substantial manner recognized our claims as an educational institution worthy of many-sided support.

Mrs. William B. Rogers has continued her welcome contribution to our library fund, presenting us with two hundred

dollars for the purchase of periodicals. Other friends of the Institute have contributed a total sum of nine hundred and twenty-five dollars for various purposes.

THE LIBRARIES.

The total number of accessions is 3,743. Of these, 1,229 were obtained by purchase, 916 by binding periodicals and books received in parts, and 1,598 by gift. Deducting from the total accessions books counted twice, and books removed from the shelves or lost, the total net additions are found to be 2,974 volumes, 533 pamphlets, and 126 maps, making the grand total 3,633. The following table shows the net accessions in each of the libraries of the Institute and the amount expended for the same by the departments, together with the total contents of each on Sept. 30, 1897. To a certain extent the pamphlets are counted twice, for according to the custom established in previous reports a collection of pamphlets bound together in one volume is counted as one in the list of volumes, and at the same time each pamphlet is counted as one in the list of pamphlets. Until the end of the period covered by this report the Libraries of Military Science, Mathematics, and Modern Languages were regarded as part of the General Library, although the books have been kept in separate rooms. Hereafter they will be treated as distinct libraries, and this change is the cause of certain irregularities which will be noticed in the following table:

TABLE OF NET ACCESSIONS, 1896-97, SHOWING COST OF SAME, AND TOTAL CONTENTS OF THE LIBRARIES OF THE INSTITUTE, SEPT. 30, 1897.

LIBRARIES.	NET ACCESSIONS.			Cost Department.	TOTAL CONTENTS.	
	Vol-umes.	Pam-phlets.	Maps.		Volumes.	Pam-phlets and Maps.
Engineering (C.E., M.E., & N.A.)	611	105	93	\$982.53	7,282	3,319
Mining	217	20	..	249.52	1,903	323
Architecture	151	4	..	526.19	2,030	185
Chemistry	391	40	..	509.03	6,956	1,477
Biology	148	23	..	226.23	1,950	374
Physics	311	13	..	701.99	5,696	669
Political Science. (Econ. & Hist.)	587	66	..	491.65	8,560	3,041
English	89	..	..	145.00	2,273	36
Military Science . . . . .	..	..	..	....	98	....
Geology	98	11	33	90.68	1,765	805
Mathematics . . . . .	..	..	..	....	540	113
Modern Languages . . . . .	..	..	..	....	565	....
General Library	347 ¹	251 ¹	..	259.25 ¹	3,798 ²	3,250 ²
Margaret Cheney Room	24	..	..	..	599	13
Totals	2,974	533	126	\$4,182.07	44,015	13,605

¹ Including Military Science, Mathematics, and Modern Languages.

² After deducting Military Science, Mathematics, and Modern Languages.

From this table it will be seen that the libraries of the Institute contained at the end of the fiscal year, in all, 44,015 volumes and 13,605 pamphlets and maps.

The periodicals regularly received form one of the most valuable features in the yearly increase of the libraries. The following table shows the number and probable cost of the publications of this kind which are received regularly, including such official reports as are listed in the published catalogue of periodicals received in the libraries of Boston :

TABLE OF PERIODICALS AND OTHER SERIAL PUBLICATIONS, 1896-97.
SHOWING THE NUMBER AND ESTIMATED COST OF THOSE RECEIVED
FOR EACH DEPARTMENT, AND OF THOSE CHARGED TO EACH
ACCOUNT.

LIBRARIES.	NUMBER RECEIVED.					ESTIMATED COST.			
	Gifts.	Dept. Acct.	Periodical Account.		Totals.	Dept. Acct.	Periodical Account.		Totals.
			T. Q.	Subs.			T. Q.	Subs.	
Engineering (C.E., M.E., & N.A.)	51	14	64	44	173	\$42.41	\$153.60	\$185.58	\$381.59
Mining	12	1	20	22	55	1.79	43.00	76.91	126.70
Architecture	3	...	4	24	31	...	9.60	139.78	149.38
Chemistry	88	10	14	42	154	36.81	33.60	108.95	179.36
Biology	23	6	7	29	65	21.10	16.80	183.29	221.19
Physics	12	1	28	28	69	.85	67.20	135.31	203.86
Political Science (Econ. & Hist.)	55	24	6	74	159	49.91	14.40	212.09	276.40
English .....	...	...	...	8	8	...	...	27.09	27.09
Military Science	2	...	...	2	4	...	...	3.50	3.50
Geology	19	1	9	6	35	...	21.60	29.95	51.55
Mathematics	1	...	2	13	16	...	4.80	46.45	51.25
Modern Languages .....	...	1	1	2	4	6.00	2.40	9.60	18.00
General Library	44	...	14	12	70	...	33.60	26.90	60.50
Lowell School of Design .....	...	...	...	4	4	...	...	11.25	11.25
							\$405.60	\$1,197.15	405.60
Totals	310	58	169	310	847	\$158.87		\$1,602.75	\$1,761.62

The periodical account is charged with the periodicals received in exchange for the Technology Quarterly, as well as with those for which cash subscriptions are paid. For each copy of the Technology Quarterly sent in exchange for the periodicals the Society of Arts is credited with \$2.40 annually, the wholesale price, and the Periodical Account is charged with a like sum, as indicated in the columns "T.Q." in the foregoing table. The table shows that 847 periodicals and other serial publications are received regularly, besides a large number of official reports that have not been counted.

The expenditures for the year on account of the libraries, exclusive of salaries, may be summarized as follows:

Paid by departments for books and binding,		\$4,182.07
Periodical account, subscriptions	\$1,227.78	
Technology Quarterly for exchanges	476.80	
	<hr/>	1,704.58
Expense account, libraries		218.81
		<hr/>
Total		\$6,105.46

There were sent out during the year 1,246 orders for new books. One hundred and twenty-one duplicate orders were returned to heads of departments, and of these only 23 were reordered. For binding and lettering there were given 1,014 separate orders amounting to 1,484 volumes, costing in the aggregate about \$1,285.68. There were added to the main catalogue 2,416 cards, but in the process of uniting several lists heretofore kept separate, 175 duplicate cards were removed. The total number of cards in the main catalogue is now 39,673. We have received for inspection 253 foreign books, of which 100 were purchased. From the Chemical Library 1,893 books were borrowed for home use. Records were not kept in the other libraries, but the indications are that they were used fully as much as this one.

Of the 1,598 volumes and pamphlets received as gifts, the following books are especially worthy of notice: From Mrs. Henry Draper, of New York, parts of Stegmann's *Architektur der Renaissance in Toscana*; Robida, *Le Cœur de Paris*; Harper's *Pictorial History of the Rebellion*; Piranesi, *Della magnificenza e d'architettura de' Romani, 1761*; Piranesi, *Le antichità Romane*; the second volume of Sachs' *Modern Opera Houses and Theatres*; and *Comptes Rendus de l'Academie des Sciences de Paris*; from His Highness the Maharaja of Jeypore, six volumes of the beautiful Jeypore portfolio of architectural details; from Mrs. William B. Rogers, 8 copies of her *Life and Letters of William Barton Rogers*, and 42 volumes, chiefly from the library of her father, Hon. James Savage; from Prof. Charles Sedgwick Minot, 20 volumes on engineering subjects; from W. O.

Ross, Esq., 32 volumes, chiefly on physics; from Miss Julia Delano, of New Bedford, 6 volumes on the early history of the steam-engine. Professor Bates, Professor Talbot, Professor Gill, and Dr. Whitney have presented the Institute with copies of their published writings.

CHANGES IN THE FACULTY AND THE CORPS OF INSTRUCTION.

Assistant Prof. Arthur A. Noyes, S.B., Ph.D., has been promoted to be Associate Professor of Organic Chemistry.

The Faculty has been reënforced by the following promotions from the corps of instructors: namely, Harry M. Goodwin, S.B., Ph.D., to be Assistant Professor of Physics; Frank A. Laws, S.B., to be Assistant Professor of Electrical Measurements; John O. Sumner, A.B., to be Assistant Professor of History.

Dr. Noyes graduated at the Institute in 1886; continuing his studies for an additional year, he obtained the degree of Master of Science, and became an Assistant in Analytical Chemistry. In 1888 he went to Europe and studied under Ostwald at Leipsic, obtaining his doctorate in 1890. Returning to the Institute in that year, he was appointed Instructor in Analytical Chemistry. The following year he was transferred to the department of Organic Chemistry, where he has served the Institute with distinguished success. In 1894 he was appointed Assistant Professor of Organic Chemistry. The reports of the successive years since his graduation contain the titles of a very interesting series of papers on physico-chemical subjects which he has studied with unwearied industry and success.

Mr. Laws graduated from the Course in Electrical Engineering at the Institute in 1889, and began his duties as Assistant in the Physical Laboratory in the following autumn. His work gradually came to be directed more especially toward electrical testing, in which he showed marked ability. In 1891 he received the appointment of Instructor in Physics,

and in 1894 that of Instructor in Electrical Measurements. Upon the withdrawal of Professor Holman from active participation in the work of the electrical laboratory the immediate care of the instruction in electrical testing devolved upon Mr. Laws, who also assumed the course of lectures upon electrical measuring instruments and methods. These courses have been greatly extended under his direction.

Mr. Laws has published a number of original papers relating to electrical instruments and testing, and the magnetic properties of iron, in the Proceedings of the American Academy, the Technology Quarterly, and elsewhere. He is at present engaged in the preparation of a set of notes on electrical measuring instruments, which, when completed, will fill a gap in this field and be of great service to our students, for whom they are especially designed.

Dr. Goodwin graduated from the Course in Physics at the Institute in 1890, and was appointed Assistant in Physics at that time. In 1892 he received the appointment of Instructor in Physics, and was then granted leave of absence in order that he might prosecute his studies in Germany. He remained there for two years, devoting himself especially to the study of physical chemistry at Leipsic with Professor Ostwald, and was awarded the degree of Ph.D. with the highest honors. On his return at the beginning of the school-year 1894-5 he took charge of the instruction in general physical measurement. Through his efforts this course has been much strengthened. The laboratory of physical chemistry was also established at his instance, and the entire course of instruction in this new and important branch has been planned and carried out by him.

Dr. Goodwin has made various original researches, especially upon physico-chemical subjects, which have been published chiefly in the *Zeitschrift für Physikalische Chemie*, the *Physical Review*, and the *Technology Quarterly*.

Mr. Sumner graduated at Harvard College in the class of 1887. He spent five years in European study and travel,

devoting himself chiefly to mediæval history, literature, and art. The report of 1894 makes mention of Professor Sumner's courses of instruction in the political history of the United States and of England, and the history and literature of the Renaissance and Reformation. The department of architecture has hitherto depended upon outside lecturers for the treatment of the history of painting and sculpture. This instruction is now in the charge of Professor Sumner, and has gained in regularity and importance. He collected, during last summer, in Europe, an excellent series of photographs and slides; these, together with slides prepared by Professor Lawrence, have been used with excellent effect to illustrate the lectures.

Professor Holman's ill health has withdrawn him from active work, although not from participation by his counsels in our plans for the best interests of the school. He has been appointed Professor of Physics Emeritus.

Professor Silas W. Holman graduated from the Institute in 1876, and was immediately thereupon appointed Assistant in the Physical Laboratory, but on account of illness he did not begin his actual duties until a year later. In 1880 he was advanced to the grade of Instructor; in 1882 he received the appointment of Assistant Professor; in 1885 that of Associate Professor, and in 1893 that of Professor of Physics. He has thus been connected with the Institute as a member of its staff of instruction for twenty-one years.

During the whole of his active service Professor Holman has devoted himself most earnestly to the building up of the work of the Physical Laboratory, and in later years more especially to the work in electrical and heat measurements. From the beginning he showed a rare capacity for accurate physical work, and a healthy intolerance of any other than such work on the part of a student. To this was coupled a fine appreciation of the relative value of different methods of solving a physical problem, high experimental skill in carrying out a physical research, and much inventiveness in the

adaptation of special methods to general laboratory use. These qualities, with his steady faithfulness to the highest interests of the Institute, have made his influence of such a character that it cannot be too highly estimated.

Professor Holman's publications all give evidence of the characteristics which have been referred to. The Physical Laboratory Notes printed by the Institute for the use of its students, and especially the part devoted to electrical measurements, stand far apart from other publications of like character in the clear manner in which the particular adaptation of each process is set forth, and the distinct recognition of the limits within which each is applicable. Though not great in bulk, they embody the results of years of teaching, and the experiments are so well selected and arranged that a student gains infinitely more by the performance of a limited number of them, with the scrupulous care which they require of him, than by a much more widely extended course of less carefully planned exercises. Like good judgment and skill in arrangement are found in the volume on "Precision of Measurements," written by him for use of our students, and in a recently published collection of Logarithmic Tables, which has received high commendation both in this country and abroad.

Professor Holman had much skill in research, either when conducted by himself personally or by others under his direction. His thesis at graduation was published, and was immediately recognized as a paper of exceptional merit upon a difficult subject, the Viscosity of Gases. Other papers upon the same subject were published in subsequent years, and are of standard authority. To these he added researches of value upon thermometry, thermo-electricity, and electrical measurement, many of which were laid out as thesis subjects for advanced students in Physics and Electrical Engineering, and carried on under his direction, the last of them even after failing strength had compelled him to abandon the attempt at personal supervision of the experimentation.

From the time of his graduation Professor Holman had been hampered by a lack of robust health, and in later years a more serious impairment became manifest. A year's leave of absence, while helpful, served only to retard the progress of disease, so that he has been obliged gradually to relinquish his duties, and for the past two years has been unable to be present in the laboratory, though still ready to render valuable aid to his colleagues by suggestion and advice.

Professor Currier has been prevented by illness from taking his classes this term, and we miss his devoted services. It is hoped that he will be able to renew them next term. The work has been carried on without interruption, and we have fortunately been able to obtain a course of lectures on Comparative Politics from Professor Macvane, Professor of Ancient and Modern History in Harvard University.

Professor Bates is giving a course of lectures at Harvard University to supply the place of Professor A. S. Hill, now absent. This is not the first time that an interchange of services has taken place between the two institutions, and has proved of great convenience.

Mr. Charles T. Wentworth, A.M., has been appointed Instructor, and is now giving the course of lectures on European History to the second-year class. He was formerly a student of the Institute in Mining Engineering, and has since devoted himself to historical studies at the University of Wisconsin and at Harvard.

Mr. Henry M. Howe, A.M., S.B., Lecturer on Metallurgy, and a high authority on that subject, has accepted a call to the chair of Metallurgy at Columbia University. The good work he did with us for some ten years will be much missed, and the university to which he has gone is to be congratulated upon its acquisition of a professor who is at once so well informed a scholar and has so thorough a practical acquaintance with his special work.

Mr. Harry C. Bradley, S.B., of the class of '91, has been appointed Instructor in Mechanical Drawing and Descriptive Geometry.

The following Assistants of last year in the several departments named have been appointed Instructors: Carl H. Clark, S.B., '95, and Frederick A. Hannah, S.B., '95, in Mechanical Engineering; Charles M. Spofford, S.B., '93, in Civil Engineering.

The following Instructors have terminated their connection with the Institute: George W. Hamblet, on account of the demands of private business; G. Russell Lincoln, for travel and study in Europe; F. H. Robbins, to enter the employ of the Boston Water Board.

The following-named Assistants have been appointed for the current year:

Frederick L. Edmands, S.B., '97, in Mechanical Drawing; Myron L. Fuller, S.B., '96, in Geology; Charles N. Haskins, S.B., '97, and Nathan Hayward, S.B., '97, in Physics; George L. Hosmer and Francis H. Watts, S.B., '97, in Civil Engineering; Elbridge C. Jacobs, S.B., '97, in Mining Engineering; Walter B. Russell, S.B., '97, and James W. Smith, S.B., '97, in Mechanical Engineering; Robert G. Valentine, A.B., in English; Alpheus G. Woodman, S.B., '97, in Sanitary Chemistry; Lewis P. Chapin, Ch.E., in General Chemistry; William F. Hyde, in Forging; Herman W. Marshall, S.B., '97, and Percy G. Stiles, S.B., '97, in Biology.

STATISTICS OF THE CORPS OF INSTRUCTORS.

The Catalogue of 1897-98 shows the number of instructors of all grades to be 132, 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 158. The following table shows the distribution among the several classes of instructors, in comparison with last year:

	1896-97.	1897-98.
Professors	23	23
Associate Professors	7	8
Assistant Professors	21	23
Instructors	52	53
Assistants	24	25
Lecturers	26	26
	—	—
Total	153	158

SCHOLARSHIPS.

As stated in the last Report, the scholarship resources of the Institute have been much increased by recent State legislation and by the bequest of Mrs. Ann White Vose. The available income at present amounts to more than \$14,000, of which \$8,000 is for State scholarships. In spite of this increase, the necessities of applicants on account of the general financial depression have fully kept pace with the increased income. The number of applicants for Institute scholarships for the present year has been 114, while 113 submitted applications for the forty State scholarships. Fifty-seven of these made applications in both places, leaving the total number of applicants considered by the Faculty and the State Board of Education 170. Of these 31 have received scholarships to the amount of full tuition; 79 others have received smaller amounts, averaging somewhat more than one hundred dollars each. The Treasurer receives returns to some extent from former beneficiaries of the Rogers Fund, but it does not appear that repayment is made to the full extent that it should be under the terms of the agreement.

The Students' Coöperative Society has taken this year a larger development than ever before. This society has not been mentioned in former reports, and it deserves a short notice. A body of students have organized themselves for administrative purposes with the kindly intent of facilitating the purchase of books, supplies, etc., within the buildings. Considerable time and attention has been given by the officers to making contracts, purchases, and sales. During vac-

tion preparations were made to have the requisite stock of materials on hand at the beginning of the term.

Two supply rooms have been conducted by the society, one in the Architectural Building and the other in the Engineering Building, both open daily during the term. Up to November 30 the total receipts of the society had amounted to \$2,890.42, and it is estimated that the business for the year will exceed \$5,000. It need scarcely be said that these arduous services are performed without remuneration by officers of the society, and that the incidental expenses for services are thus kept as low as possible. The society has been enabled to assist the scholarship committee of the Faculty this year to the extent of \$650. But for this welcome aid a number of deserving students would have been unable to continue their work at the Institute.

THE Y.M.C.A. ASSOCIATION.

The work of students belonging to this association, which was described in the last report, has been carried on with renewed energy this year. Fifteen hundred handbooks have been issued, so that each new student, or any one expecting to come to the Institute, is supplied with a guide to the headquarters of the association, where he can obtain directions regarding lodging places, as well as information regarding school work, tabular views, recitations, etc. About one hundred students have been directed to lodgings, and care has been exercised in making enquiries about the houses which were recommended, and in keeping informed about them. The annual reception to the new class gave an opportunity for a first general social meeting. Professor Niles made an address. The club-house which is occupied as headquarters and living rooms by the association has been successfully maintained. The house at 466 Massachusetts Avenue is open to the students, and monthly meetings are held there.

ENTRANCE REQUIREMENTS.

In his annual reports for 1894 and 1896 President Walker treated at considerable length the question of higher requirements for entrance, and gave strong reasons why no tasks should be imposed which should tend to raise the average of the age at which students are prepared to enter this school — at present nearly nineteen years. He thought that the high schools should be so equipped and officered as to give the necessary instruction within that limit of age. Our catalogue for this year announces the requirement, for 1898 and after, of one additional subject, which may be elected from among the following: Elementary Latin, Physics, Chemistry, Mechanical Drawing and Shopwork, additional French or German, English or History. It is hoped that the students will come to us with this added study completed within the above average limit of age. The question of additional requirements has been for a long time discussed by the Faculty, and the present requirement is expected to lead to various results of much interest.

On the one hand it emphasizes effectively the position long held by the Faculty, that no preparation is adequate which merely enables the candidate to pass the prescribed examinations. On the other hand, since it is not intended to hold examinations in the elective subjects, we are enabled to try an interesting experiment in regard to the use of teachers' certificates. The substitution of certificates for entrance examinations has been very extensively — and in some cases very successfully — employed. At this Institute, and in many other institutions of New England, examinations have been required to the entire exclusion of admission by certificate. The acceptance, in addition to our tests by examination, of teachers' certificates for elective subjects will give the secondary teachers a not unwelcome share in determining the eligibility of candidates, and will not, on the other hand, involve the risks incident to the unqualified adoption of the certificate system.

A series of questions in regard to entrance requirements, issued last year by a committee of the Massachusetts Association of Classical and High School Teachers, offered a welcome opportunity to define our position in regard to entrance requirements. A reply was prepared by a committee and submitted to the Faculty, and after very careful examination was approved and printed. A statement of certain principles determining the attitude and policy of the Institute was added, and the paper was distributed among secondary schools having relations with the Institute. Some of the main points of the statement were as follows:

1st. That it was not the intention of the Institute to make any such change in its requirements as should essentially enlarge the total amount of work of the secondary schools, or in any way to place its requirements above the range of work done by the public high schools.

2d. That the Institute is ready, as heretofore, to coöperate in any practicable plan for securing such a degree of uniformity in the requirements of colleges generally as is consistent with other important interests.

3d. That the object of the entrance requirements of the Institute is the best practicable discrimination between fit and unfit applicants for admission, and not the reconstruction of the secondary school curriculum.

4th. That any material increase in the present average age of entrance would be a serious misfortune.

5th. That it is for the best interest of secondary schools generally that requirements should be within the reach of their four-years courses, even if it is thereby rendered possible for individual applicants from particular schools, by narrowing their courses, to meet the requirements in three years, instead of four.

The reply of the Faculty was cordially received by the Association, and is believed to have commended itself to a large proportion of those most interested.

Another valuable opportunity for promoting closer rela-

tions between the Institute and secondary schools occurred somewhat later in the spring. The statement of our new requirements was presented, for suggestions and criticism, to some twenty representative secondary school teachers, mainly of eastern Massachusetts, and an informal conference with a committee of the Faculty was held at the rooms of the Technology Club. The interest shown, the nearly complete attendance of teachers invited, and the time given by them to thorough discussion of the numerous and important questions raised, were exceedingly gratifying. Important modifications were made in the report of the committee, which has now been adopted by the Faculty and incorporated in the Catalogue for the current year. It is hoped that future conferences of this kind may be held with equal success.

SUMMER SCHOOLS.

Geodesy, Topography, and Hydraulic Engineering. — The summer school for field work in geodesy, topography, and hydraulics was held during the month of June at Machias, Me., the same place where the school of last year was held. This was the ninth summer school of the Civil Engineering Department. It is an optional course, open to the third-year students in Civil Engineering, enabling them to get valuable practice which they would not otherwise obtain. Eight students were in attendance this year, a smaller number than usual, but the weather was favorable, and the amount of work accomplished was larger than in the year previous. Instruction was given by Professors Burton, Porter, and Robbins, assisted by Mr. Henry E. Warren, a graduate of the Institute in the class of '94, and Mr. George L. Hosmer, of the class of '97.

The work, as usual, consisted mainly of field work during a period of about three weeks. Some very interesting experiments were made in connection with the use of the thermophone in determining the coefficient of expansion of the 100 meter steel tape used in base-line measurements.

These experiments were carried on under the direction of Mr. Warren, one of the inventors of the thermophone, and the results will be published in some future number of the Technology Quarterly.

Several of the old Coast Survey stations were reoccupied, signals were erected, and practice was given in measuring and adjusting the angles in a scheme of triangulation. Plane table surveys were made of the adjoining country, and three different scales were used by different parties in order to illustrate the varying methods of work necessitated by changes in the scale of the map. Thus a nine-mile road traverse was made with sketching plane table on a scale of 1 to 30,000; a square mile of territory was mapped on a scale of 1 to 5,000, using contours ten feet apart; and a map of the mills and of the Machias river in the immediate vicinity of the town was made on a scale of 1 to 1,000.

At Howard Bay, on the sea coast, a tide gauge was set up and tidal observations were taken throughout the entire term of the school. The actual tide curves were plotted, and were compared with the computed tides given in the Coast Survey Tables.

Soundings were taken and located by sextant angles, and the soundings were plotted on a plane table survey of Howard Cove on a scale of 400 feet to an inch.

Meteorological observations were made throughout the three weeks, and were recorded in forms issued by the Weather Bureau. Practice was also given to the students in working many of the problems of practical astronomy with the sextant and engineer's transit.

The hydraulic work was essentially the same as last year, and for this reference may be made to the last annual report.

Metallurgy. — The summer school of metallurgy was this year held in the States of New York and Ohio. Visits to mines and to furnaces occur on alternate years; this was the year for furnaces. The party consisted of Professor

Hofman and seven students from the second, third, and fourth year classes of the Department of Mining Engineering, and Metallurgy. The first stop was at Syracuse, N.Y., at which point visits were made to the coke works of the Solvay Process Company, the State Union Salt Works, the Onondaga Pottery Company, the New York Paving Company, and to Church & Co., soda packers. The next stop was at Buffalo, and visits were made to the Buffalo Smelting Company, the Tonawanda Iron and Steel Company, the Buffalo Furnace Company, the Pratt & Letchworth Company, and the Atlas Works of the Standard Oil Company. The party next moved on to Niagara Falls, where they visited the works of the Carborundum Company and the Power Company. At Cleveland visits were made to the Otis Steel Company, the Cleveland Ore Docks, the Union Rolling Mill Company, the United Salt Company, the Brown Hoisting and Conveying Company, and shipyard of the Globe Iron Works. At Lorain the Johnson Company was visited. The thanks of the department and of the Institute are due to the gentlemen in charge of the above works for the kind and sympathetic interest that was taken in the students, to whom the freedom of the works was granted.

Architecture. — The Summer School in Architecture for this year was held in Quebec. Mr. Gardner, with a small party of students, spent three weeks in the town and its suburbs. It was the aim of the school to give the students practice in out-of-door sketching in pencil and water color, in preparation for a future European trip. The old town, with its historical interests, its curious people and customs, its attractive and picturesque bits of simple architecture, proved to be almost as good as a European city itself for such work.

SUMMER COURSES.

The following volunteer courses were given to the number of students indicated. In many cases the instructors, with great self-devotion, gave their courses to a number of students too small to offer adequate remuneration, in several instances to a single student, not wishing to disappoint those who were seeking their instruction :

Programme of Summer Courses.

- I. Mechanical Drawing and Descriptive Geometry. 32. (Prof. Faunce.)
- II. Mathematics: Analytic Geometry. 9. (Mr. Passano.)
- III. Architecture. (a) Shades and Shadows. (b) Elementary Design. 9. (Mr. Gardner.)
- IV. Chemistry. (a) Analytical Chemistry. 27. (Dr. Walker.) (b) Organic Analysis, Reactions, and Preparations. (c) Principles of Organic Chemistry. 10. (Dr. Mulliken.) (d) Water Analysis, and Air Analysis. 1. (Mrs. Richards.)
- V. Biology. (a) General Zoölogy. 2. (b) Bacteriology and the Micro-Organisms of Fermentation. 1. (Mr. Prescott.)
- VI. Physics. (a) Mechanics, Light, and Electricity. 6. (Mr. Drisko.) (b) Heat. 7. (Prof. Clifford.) (c) Physical Measurements. 10. (Dr. Goodwin.) (d) Electrical Testing. 9. (Mr. Laws.)
- VII. Modern Languages. (a) French. 12. (Mr. L. Bernard.) (b) German. 16. (Prof. Vogel.)
- VIII. Mechanism. 4. (Prof. Merrill.)
- IX. Shopwork. (a) Carpentry and Wood Turning. 8. (b) Chipping and Filing. 20. (c) Machine Toolwork. 20. (Mr. R. H. Smith.) (d) Forging. 7. (Mr. Lambirth.)

SUMMER READING.

During the past year the Faculty, in accordance with its established policy of requiring that adequate attention be given by all Institute students to studies of a non-professional character, has voted to supplement the instruction now given in such subjects by the introduction of courses of required reading to be done in the summer vacation, following the first and the second school years.

On account of the very large portion of the student's time which in a technical school is necessarily occupied by his purely professional studies, it is difficult to introduce into the course as large an amount of instruction in literature, history, and general science as would be desirable. And it is believed that the plan of requiring summer reading in general literature is the only feasible one by which the difficulty can be overcome. In the preparation of the list of books, great care was used to select only those which are readable and attractive in character, as well as instructive, in order not to make the requirement an onerous one; for it was thought even more important to awaken interest in reading than to impart information. As far as can be judged at present, the plan has worked satisfactorily during the past summer.

MILITARY SCIENCE AND TACTICS.

This service, under the care of Captain Bigelow, has made continued progress, and besides its evident educational usefulness for citizens who may be called out as soldiers, it has acquired a distinct value as an element of general culture. Unfortunately too large a share of the history of nations is the story of their military exploits, and we must recognize that some knowledge of military science which leads to a better estimate of the genius of commanders and the endurance of armies will fit a student to be a more intelligent reader of history.

In the month of April an optional course in Military Engineering was given for students of Civil Engineering. The time allowed for it was six hours, allotted to class-room work, and a half-day for field-work. Of the former, five hours were given to lectures, and one to the solution of a problem in field fortification on a map. The field-work consisted in the tracing and defilading of a line of parapet and the digging of sections of shelter trenches at the Watertown Arsenal. The attendance on this course numbered 26, which was

more than that of any former year. The success of the work in military engineering during the past two years is due in a large measure to the courtesy of Maj. J. W. Reilly, Ordnance Department, U.S. Army, commanding Watertown Arsenal, who has not only allowed the students the freedom of the grounds, but furnished them the tools for excavation, and material to be expended, and labor to assist them, in the work which they undertook.

At the commencement of the present school year the usual examination was held for the selection of officers and non-commissioned officers. The attendance and the showing made by the candidates were quite satisfactory. The attendance would doubtless have been larger but for the delusion — of which a number of the students were victims — that their previous experience in military schools or organizations would exempt them from military work at the Institute. Care will be taken to warn future students against this error.

The number of students enrolled in the regular course (Course A) is 287, and in the special course (Course B), 14. The enrolment in Course B consists mainly of students who are physically unable to drill. But in both courses students were enrolled and attended the exercises who were entitled to exemption from such exercises, but engaged of their own accord to take them. The number of voluntary students, though of necessity small, was larger than ever before.

An innovation, which is regarded by Captain Bigelow as of cardinal importance and a great improvement, is the appropriation by the Executive Committee of a fixed sum for the support of the military department, to be expended by the head of the department for the following items: care of arms; heating of armory; cleaning of armory; books, maps, slides, etc.; competitive drill, etc.; sundries.

The books acquired by the department during the past three years were placed this fall in the general library, in a rack specially provided for them. They number about 120 volumes, and, together with works of a military character in

the other libraries of the Institute, may be regarded as a good foundation, or nucleus, of a military library.

Captain Bigelow concludes his report with the following words:

“On the 1st of August, 1898, I shall have completed four years of duty at the Institute, and shall, in all probability, be relieved from such duty. I cannot close this communication without expressing my appreciation of the advantages which I have enjoyed as a member of its Faculty, and my gratitude to the professors, instructors, and students for their many kindnesses and uniform courtesy and consideration. I know that I have taken from the Institute more than I have given it, but I shall always be willing to balance the account by any means at my command, and shall ever esteem my four years' tour at the Institute as one of the pleasantest and most profitable periods of my career.”

Courses I. and XI., Civil and Sanitary Engineering. — Some changes have been made in the work of the fourth year, in consequence of the transfer to the third year of the course in applied mechanics.

The changes in Course I. consist in introducing in the first term a course in industrial electricity; in increasing the preparation allowed in the course in astronomy; in adding in the second term a special course in foundations (a subject previously included in the course in structures), and in extending throughout the entire term the course in machinery and motors, previously given in the last term only. The course in Civil Engineering now comprises, besides the usual courses in purely civil engineering subjects, a not inconsiderable amount of instruction in mechanical engineering; namely, the course in mechanism in the second year and the course in steam engineering which extends throughout the fourth year.

In Course XI. the changes made consist in introducing the courses in metallurgy of iron and industrial electricity, together with a short course of thirty hours in shop work, especially devoted to pipe-fitting. This course will be

especially useful to those who desire to become sanitary inspectors.

The Geodetic Laboratory, for which an appropriation was made last year, and to which reference was made in the last annual report, has not yet been erected, for the reason that upon working out the detail plans and specifications and getting bids for the work, the appropriation proved too small. An increased appropriation having been made for the present year, a location has been selected in the Middlesex Fells and permission obtained from the Metropolitan Park Commissioners for the erection of the building. It is expected that it will be ready for use early in the spring.

Mention should here be made of the publication in the Technology Quarterly of the results of Professor Burton's expedition to Greenland last year. The report of Mr. Putnam, of the U.S. Coast and Geodetic Survey, giving the results of the pendulum and magnetic measurements, constitutes an especially interesting memoir, and one whose scientific value has been shown by expressions of approval from the highest sources.

The equipment of the department has been somewhat increased during the past year. A powerful rotary pump with a capacity of 1,000 gallons per minute has been added in place of a smaller one which was worn out. A Milton Smoke Tester for testing the tightness of house drains has been purchased, together with various smaller pieces of apparatus. Emphasis should here be laid on the need of an enlargement of the reservoir used in connection with the hydraulic plant, to which reference was made in the last report. Mention may also be made of some thesis work on the loss of head attending sudden contractions in area of pipes, completing a series of experiments in this direction which have been taken up in several successive years.

Excursions have been made to Worcester, Brockton, and Moon Island, and thanks are due to President Lucius Tuttle, of the Boston & Maine Railroad; General Manager W. H. Barnes, of the Boston & Albany Railroad; Mr. F. H. Snow,

City Engineer of Brockton, and Mr. B. W. Wells, Superintendent of Streets of the City of Boston, for courtesies extended in connection with these excursions and with the general work of the course. In connection with the work in hydraulics, a lecture was given by Mr. A. V. Garratt, Chief Engineer of the Lombard Water Wheel Governor Company, on governing devices for turbines.

There is pressing demand for more room in order to carry on to the best advantage the work in civil engineering. The second and third year drawing-rooms are crowded beyond their reasonable capacity. In the second year drawing-room there are 96 students, while the greatest number which we have ever had before has been 66. It is imperative that additional space should be provided, unless the number of students in these courses is restricted. In the third year drawing-room there are 56 students. In the fourth year, there are 38 students, of whom three are in Course XI., and one takes but few studies in this year. Of the remaining 34, 20 have chosen the first or general option, and 14 the second or railroad option.

Course II., Mechanical Engineering. — Attention was called in the report of last year to the improvements in the third year work of the course consequent upon the advance of entrance requirements. Time has now been gained in the fourth year by the omission of the lectures on dynamo machinery heretofore given by Professor Cross, consequent upon the introduction among the third-year studies of the courses in industrial electricity and dynamo-electric measuring instruments and methods; and also by the transfer of Political Economy from the fourth to the third year. In consequence of the above changes, and of some other readjustments of studies, the following new or enlarged courses have been introduced:

1. **SHOP MANAGEMENT.** — Professor Schwamb will give a course of ten exercises on this subject in the second term of the fourth year, each exercise requiring two hours' preparation on the part of the student.

2. A course on Foundations will be given to the fourth-year students by Professor Lanza.

3. The time heretofore taken from the options for the lectures on industrial management and dynamo machinery being restored, the work of all three of the options will be correspondingly extended and improved.

4. The course in machine design has been increased by fifteen hours.

THE ENGINEERING LABORATORIES. — The number of students having assignments to regular laboratory exercises in the portions of the engineering laboratories other than the laboratory of applied mechanics was, during the school year '96-97, 239. The nature of the tests, and the number of each kind performed in the regular laboratory work, has been as follows, viz.:

Tests of the transmission of power by belting	44
Tests of the flow of steam through orifices	76
Tests of the triple expansion engine where the heat balance is made	4
Ordinary tests of the triple engine	60
Test of steam-boiler plant, 72 hours long	1
Tests of surface condensers	72
Tests of steam injectors	70
Tests of steam ejectors	70
Tests of steam pumps	52
Calorimeter tests of steam	65
Tests of 36 H.P. gas engine	70
Valve setting of plain slide valve	76
Valve setting of Meyer valve	50
Valve setting of Corliss valve	68
Tests of pulsometer	76
Tests of Pelton water wheel	84
Tests of Swain turbine	66
Tests of rotary pumps	74
Tests of hose nozzles	72
Tests of plunger pumps	76
Tests of pulley blocks	44
Tests of gauges	44
Tests of jackscrews	28
Tests of hot-air engines	76
Tests of planimeters	26
Tests of hydraulic ram	19

Total number of tests in regular work of engineering
laboratories other than laboratory of applied
mechanics 1,463

It may be well to add that the results of the tests are computed by the students performing them, and examined by some of the instructing staff who have previously made the computations themselves.

The difference between the old practice in mechanical engineering and the more scientific training of the modern school is the difference between guessing and testing. The guess often led to an unpleasant surprise in coal consumption at the end of the year, and the loose kind of accounting which makes manufacturing enterprises uncertain. The demand of the present day is for engineers capable of testing accurately each part in the performance of a machine.

APPLIED MECHANICS. — The number of students having assignments to regular work in the laboratory of applied mechanics in '96-97 was 182.

The nature of the tests performed, and their numbers, were as follows, viz.:

Tests of bolted joints in steel plate	8
Tests of wrought-iron pipe columns	20
Tests of crushing strength of cast-iron water-pipe from 6 in. to 48 in. in diameter	31
Tests of timber beams	44
Tests of tensile strength and elasticity of Burden-iron 2 in. in diameter	33
Tests of tensile strength and elasticity of refined iron 1 in. in diameter	16
Tests of torsional strength of compositions	12
Tests of tensile and torsional strength and elasticity of wire of wrought-iron, of steel, and of brass	174
Tests of the tensile strength of various knots and hitches in manila and hemp rope, and of the rope itself	70
Tests of tensile strength of cement and mortar	100
Tests of compressive strength of cement and mortar	100
Miscellaneous tests of iron and steel	27
Other miscellaneous tests	105
Total number of tests made in '96-97 in the regular work of the laboratory of applied mechanics	740

Since the publication of the last president's report there have been issued Nos. VI. and VII. of the "Results of Tests

made in the Engineering Laboratories," No. VI. being a reprint from the Technology Quarterly, Vol. IX., No. 4, December, 1896, and No. VII. a reprint from Vol. X., No. 3, September, 1897, the former containing the results of a number of the tests in steam and hydraulics, including a test of the plant at the Charlestown power-station of the West End Street Railway; together with several steam-boiler tests, and the latter containing the results of tests of timber trusses and headers, together with half-tones of the fractures; and also results of the tests of cast-iron water-pipe.

While the apparatus added to the engineering laboratories a year ago has proved very useful, it should be observed that the increasing demands upon these laboratories, the large amount of thesis work for which the apparatus has to be used, together with the need of constant extension to keep in touch with the outside development of practical engineering work, render it important that we should have additional apparatus. For this additional room is a necessity.

Course III., Mining and Metallurgy. — The second, third, and fourth year classes number respectively 23, 8, and 7. It has been mentioned that Mr. Howe, who has for many years been Lecturer in Metallurgy for our fourth-year students, has left us. We are fortunate in being able to commit this subject to the able teaching of Professor Hofman. In view of the increased work of the department, a new Assistant has been appointed by the Corporation.

The laboratories have been extended and the work made more efficient. The assay laboratory has been enlarged by the addition of twenty-six new desks; five new pulp-balances and four new button-balances have been added. The supply-room has been nearly doubled in storage capacity. In the ore-dressing room the rolls, the Hendy feeder, the centrifugal pumps, and the dust-fan have been thoroughly renovated and connected anew to the power so as to give them greatly increased efficiency. Of new machines that have been purchased or ordered, there may be mentioned a new Woodbury

belt vanner, a Sturtevant roll-jaw crusher, a Harz jig, and a canvas table. Other machines will be added in the near future.

Basing the estimate on the numbers that are now taking the desirable course in the first and second years, the present laboratories and instructing force are not large enough to meet the needs of the immediate future. It would seem that the whole basement of Rogers Building, or some equivalent space, should be placed at the disposal of the department.

The library has grown to such an extent that a new book-case has been added and the whole library rearranged. Two important periodicals have had their files made up so that they are now complete from the first numbers to date; they are the "Freiberger Jahrbuch" and the "Revue Universelle des Mines." A complete set of Karsten's Archiv has been purchased. Three new periodicals have been added; namely, the "Iron Trade Review," the "South African Mining Journal," and the "Journal of the American Foundrymen's Association." Arrangements are being made for obtaining the Proceedings of two engineering societies in South Africa, and of six in Great Britain.

Professor Richards is still engaged upon the preparation of his book upon Ore Dressing, which will soon be ready for the press.

Professor Hofman's revised and enlarged edition of his work on the Metallurgy of Lead is now in press.

Professor Richards, with the aid of Mr. C. E. Locke, has prepared a paper on the Spitzkasten, which was read before the American Institute of Mining Engineers.

Professors Richards and Hofman have each contributed articles to "The Mineral Industry," the former on the Progress in Ore Dressing in 1896, the latter on Recent Improvements in Lead Smelting.

Course IV., Architecture. — During the past year there have been few changes made in the work of the Architectural

Department, but in several respects it has been greatly strengthened. Full-sized models of the Doric and Ionic orders from the theatre of Marcellus, made during the summer from the most accurate drawings obtainable, have been placed in the drawing-room of the second-year students. The shafts are omitted, for lack of height, but anticipating the time when the museum is certain to become an indispensable part of our plan, the models have been so constructed that they can be easily completed. They will then offer an opportunity for study which can only be surpassed in Rome itself. These models serve as our text-books, and are sketched, measured, and drawn out, giving a far better knowledge of scale and construction than can possibly be learned in any other way. It is needless to say that this instruction is carried on with much greater interest to the students. We have only two large models as yet, for we cannot afford to infringe on the area of the drawing-room; but the scheme should be carried to its completion as soon as possible, if the best results are to be obtained.

In Architectural History great improvement has been noticed in the interest and work of the students, due to the increased number of lectures and the concentration of the course in the second and third years. This change in the course scheme has given opportunity for the introduction of the study of the history of painting and sculpture, which has heretofore been carried on in a less systematic manner, whenever we have been able to procure a lecturer on these subjects. A course is now regularly established, in charge of Professor Sumner. It is certain to prove of much value and interest.

This year we have nine students engaged in graduate work. The value of this extra year becomes continually better appreciated, as is shown by the steady increase in numbers from year to year.

The students of the Institute, for the fifth time in succession, won both the competitions of the Beaux Arts Society

of Architects of New York, and, as before, bore off the gold medal and the highest honors.

The two Rotch Scholarships, each amounting to about two hundred dollars, were awarded this year to Mr. T. E. Videto, of South Framingham, and Mr. H. M. Seaver, of West Roxbury. Mr. Videto has returned this year as a candidate for an advanced degree.

The Boston Society of Architects also generously continued its two prizes of the value of fifty dollars each in books. A beautiful edition of Piranesi, the gift of Mrs. Henry Draper, has been added to the library, while Prof. W. R. Ware, of Columbia University, has presented two valuable lithographs, restorations, by Viollet-le-Duc, of a Doric Temple and the Baths of Caracalla.

Mr. Cass Gilbert, of Minneapolis, has most generously presented to the department a set of blue prints of the Brazer Building, in Boston, of which he was the architect, with his written description. Many novel conditions occurred in the planning of this building, and his methods of solving them are exceedingly interesting.

Mr. James M. Hubbard has also presented to the library three volumes of the Palestine Exploration Fund.

The department becomes more hampered each year for want of space and the proper adaptation of it to the present demands of architectural education. The museum is badly needed. The library has become entirely inadequate to allow of the proper care, use, or display of its exceedingly valuable collections. The drawing-rooms are crowded this year to their utmost capacity. The condition of things can be understood from the fact that we have twenty-two more students in the department than last year.

Courses V. and X., Chemistry and Chemical Engineering. — The President has retained the general direction of the Chemical Department and given the lectures upon organic chemistry, but it is hoped that during the coming year a new professorial appointment may be made. Thanks to the great zeal and

activity of the professors and instructing staff, the usual routine of work has been carried on satisfactorily.

The removal to the State House of the service of water analysis for the State Board of Health has permitted a re-arrangement during the summer of the Rooms 36 and 38 of the Walker Building. The former is now devoted entirely to sanitary chemistry and to proximate analysis, and proves hardly sufficient for those purposes, not to speak of a rapidly increasing demand. A new laboratory course in proximate technical analysis has been introduced in place of the option in sanitary chemistry for the fourth-year students. This course, which has been in charge of Dr. Whitney, comprises the examination of a number of industrial products, such as asphalt, rubber, paper, soap, tannin, and fertilizers. Each student is required to look up the processes to be employed, and to present reports on his work before the class, so that an acquaintance with the literature of the several subjects is acquired by the class, and original thought is encouraged and developed. It is believed, moreover, that some practice in this line of work will prove of direct practical value to our chemists. The option has been chosen by a large number of the present fourth-year class. The investigation of the action of soft water upon boilers will be continued throughout the year, as well as that upon the ventilation of public buildings, and, among others, further studies in the purification of water and sewage will be carried out. Dr. Gill now occupies Room 38. The space used for oil and gas analysis has been divided into a small lecture and study room (seating twelve students) and a laboratory. The latter has desks for thirty-six students, accommodating fifteen at one time, and serves during the first term for oil analysis and the second term as a research laboratory for the students in chemical engineering.

The notes in oil analysis have been published under the title "A Short Handbook of Oil Analysis." They enable the instruction to be given much more thoroughly and systematically than before.

The equipment of the gas laboratory has been materially increased by the addition of a Junker calorimeter for determining the heating power of gases.

No important changes have been made during the year in the teaching of general Chemistry. The class numbers 380.

ANALYTICAL CHEMISTRY. — The students taking Analytical Chemistry number 119 in all; they are distributed as follows:

	Second year.	Third year.	Fourth year.
Mining Engineering	2	16	9
Chemistry	29	29	
Biology	4	2	
Physics	2		
Chemical Engineering	12	1	2
Sanitary Engineering		3	
Miscellaneous	8	—	—
Total	57	51	11

This year, for the first time, it was necessary to refuse admission at the opening of the term to a few students whom we should otherwise have been ready to receive, because it was impossible to give them desk-room. Some of these have since been allowed to enter the laboratory, taking the place of students who have, for various causes, dropped the subject; but others could not be admitted at all. It is, of course, too early to state definitely the conditions which will prevail next year, but if the number of students entering the various courses remains the same as for the past two years, it seems improbable that we should be able to accommodate all who are rightfully entitled to desks in the laboratory but for the additional space gained by the erection of the new building. The unusually large number of students entering the Course in Mining Engineering last year (about 30), who will take analytical chemistry for the first time next year, will make a new demand upon our desk-room.

The equipment and instructing force remains unchanged, and the general scheme of instruction has only been modified in some minor details.

ORGANIC CHEMISTRY. — The additional places provided last year have been filled. Thirty students now take Organic Chemistry. The work in the laboratory has been facilitated by the new arrangements. No changes have been made in the instructing staff. The titles of researches on a following page give evidence of the activity of the instructing staff, and show that the students in their last year are brought in contact with teachers who are themselves doing the kind of original work which is the best training for a practical chemist.

Under the charge of Mr. Rolfe twenty-six students have been instructed in sugar analysis, with the use of the most approved model of polariscopic apparatus, and two students, Messrs. Faxon and Hemmings, have used these instruments in original investigations, under Mr. Rolfe's direction.

The class in Industrial Chemistry has increased from thirty-seven to fifty-two. The lectures delivered by Dr. Thorp have been supplemented as usual by outside lectures from chemists in charge of important manufacturing works in the neighborhood of Boston. A lecture on the manufacture of glue and gelatine by Mr. George R. Underwood, of the Upton Glue Works, has this year been added to the list.

Visits were made by the class last year to the following manufactories :

Merrimac Chemical Works, South Wilmington, Mr. A. P. Howard, superintendent.

Curtis Davis Soap Works, Cambridgeport, Mr. E. D. Mellen, manager.

Union Glass Works, Cambridgeport, Mr. J. de Cordova, president.

Malden and Melrose Gas Works, Malden, Mr. T. H. Hintze, superintendent.

The Tileston and Hollingsworth Paper Company, Mattapan, Mr. A. L. Hollingsworth, treasurer, Mr. Mossman, superintendent.

PUBLICATIONS OF THE CHEMICAL DEPARTMENT.

1897.

Theoretical Chemistry.

W. R. Whitney: (1.) The Dilatometric Measurement of the Velocity of the Hydrolysis of Cane Sugar.

(2.) An Electrical Thermostat.

(3.) With A. A. Noyes: The Rate of Solution of Solid Substances in their own Solution.

A. A. Noyes: Bemerkung über die kinetische Theorie der Lösungen.

A. A. Noyes and R. S. Wason: The Velocity of the Reaction between Ferrous Chloride, Potassium Chlorate, and Hydrochloric Acid.

A. A. Noyes and C. G. Abbot: (1.) Bestimmung des osmotischen Druckes mittelst Dampfdruckmessungen.

(2.) On the Relation between the Osmotic Pressure and the Vapor Pressure of Solutions.

A. A. Noyes and W. R. Whitney: Ueber die Auflösungs-geschwindigkeit von festen Stoffen in ihren eigenen Lösun-gen.

Analytical Chemistry.

A. A. Noyes: A Detailed Course of Qualitative Chemical Analysis. Third edition.

A. H. Gill: A Shorthand Book of Oil Analysis.

A. A. Noyes: Synthesis of Hexamethylene-Glycol Diethyl Ether and other Ethers from Trimethylene Glycol.

A. A. Noyes and S. P. Mulliken: Laboratory Experi-ments on the Class Reactions and Identification of Organic Substances. Second edition.

J. F. Norris: Action of the Halogens on the Aliphatic Amines and the Preparation of Perhalides from Them.

Sanitary Chemistry.

E. H. Richards:

- (1.) Domestic Science, What it Is and How to study It.
- (2.) Foods and Diet, Comparative Value.
- (3.) A New Color Standard for Use in Water Analysis.
- (4.) Notes on the Evidences of Dissociation in Dilute Soap Solutions.

Courses VI. and VIII., Electrical Engineering and Physics. —

In these as in other courses the effects of the increased entrance requirements in mathematics have been advantageously felt during the past year, and will be still more evident during the present year, when they will affect the whole four years of the course. In the scheme for the fourth year of the Course in Electrical Engineering the time gained allows of a very large additional amount of practice in the study and testing of dynamo-electric machinery in the laboratory of electrical engineering — a need which has been strongly felt by the department for several years past, on account of the rapid introduction of entirely novel forms of such machinery. It has also been possible to make some extension in the time given to general electrical measurements and testing.

In part for the same reason, and in part because of the general advance in the level of the instruction in the third year, it has become possible in the fourth year to devote a larger number of exercises than hitherto to the principles of the design of dynamo-electric machinery. The course of instruction in designing dynamos was assigned last year to Mr. Louis Derr, Instructor in Physics. The results were highly satisfactory, and Mr. Derr will take charge of the enlarged course to be given this year. Thus the constant supervision of an instructor has replaced outside professional services. His work will be supplemented by a brief course of lectures by Mr. John B. Blood, M.I.T., '90, who has had large experience in dynamo design in connection with the General Electric Company.

In the Course in Physics (VIII.) there has been considerable readjustment of studies. The subject of the theory and methods of telegraphy, hitherto taken in connection with Course VI., was quite technical, and it has therefore been removed from Course VIII. and replaced by a course in photometry by Professor Clifford, transferred from the fourth year and at the same time extended. A brief course upon the kinetic theory of gases by Professor Goodwin will be inserted in the fourth year.

Other important changes allow the option of the simultaneous study of analytical chemistry and advanced mathematics in the third year, first term; and the requirement of Fourier's Series throughout the fourth year, of all candidates for a degree, the study of analytical mechanics in the fourth year becoming an option, with organic chemistry as an alternative. This arrangement has been desired for some time, but for certain reasons has not hitherto been possible.

It should also be mentioned that the instruction in general Physical Measurement has been materially extended for the students in the Course in Chemistry. Also it has been found possible to begin this work at the middle of the second year instead of a term later, so that this is now the case with the Courses in Chemistry, Physics, Electrical Engineering, and General Studies. This earlier start in accurate physical measurement is very desirable for several reasons. The work in the laboratory is thereby brought into closer relation to the lectures, the students pursuing it are less distracted by purely professional work, and the time in the later years is open for more advanced physical work when desired.

As in previous years the course has been much extended by the aid of the profession. During the past year, courses of lectures have been given by Mr. George W. Blodgett, Electrician of the Boston & Albany Railroad, on the Application of Electricity to Railway Signalling; Mr. Hammond V. Hayes, Electrical Engineer of the American Bell Telephone Company, on Telephone Engineering; Mr. Louis Bell, on the Electrical

Transmission of Power and the Application of Electricity to Railway Transportation; Mr. Hollis French, on Electrical Engineering Practice and Specifications; Mr. Howard C. Forbes, on the Design and Testing of Electric Light and Power Plants; Mr. Odin B. Roberts, on the Nature and Function of Patents for Inventions; and single lectures have been given by Mr. C. J. H. Woodbury, of the American Bell Telephone Company, on Electricity in its Relation to Fire Risks; Mr. Ernest A. LeSueur, on the Industrial Applications of Electro-Chemistry; Mr. S. Everett Doane, of the General Electric Company, on the Manufacture of Incandescent Lamps; and Professor Elihu Thomson, on Recent Lines of Development in Applied Electricity.

The equipment of the department has been greatly augmented during the last year. Especially noteworthy is the separate plant of combined dynamo-machines and steam-engine for testing, referred to in the President's report of last year as in process of erection. This is proving of the utmost advantage, not only in the work of the Course in Electrical Engineering, but to students of Mechanical Engineering as well. The installation is satisfactory in all respects. Some fear had been felt lest the room immediately above should be rendered noisy, but so smoothly does the machinery run that its action is not noticed.

Various important pieces of physical apparatus have also been added. Of these there should be particularly mentioned a cathetometer, with two telescopes, manufactured by the "Société Genevoise." This magnificent instrument was purchased from the fund bequeathed to the Institute by Mrs. Katharine Bigelow Lowell, and appropriated by the Executive Committee to the purchase of physical instruments. The cathetometer bears an inscription to this effect.

The increased interest which the discovery of the Röntgen rays has excited in the general subject of the passage of electricity through high vacua has led us to enlarge our collection of apparatus illustrative of this branch of physics, so

ists, engineers, or architects are liable to be brought unexpectedly face to face with sanitary problems. A large part of the civic or municipal engineering of the day is based upon the modern requirements of sanitation, and the Institute is fortunate in being able through its biological department to present adequately, yet concisely, to its students in other departments the fundamental facts, theories, and practice of sanitary science.

The new course in Industrial Biology begun last year has proved eminently successful, and credit in this connection is due to Mr. S. C. Prescott, Instructor in Biology, who, under the direction of Professor Sedgwick, has given largely of his time and thought to its development. The rapid growth of discovery in this direction makes it likely that more time will soon have to be given to the subject. The contributions to our knowledge of micro-organisms and sterilizing processes in the canning industry, begun last year by Messrs. Prescott and Underwood, have since been repeated in part by the Canadian Government, with confirmatory results. A preliminary account of the more recent researches of Messrs. Prescott and Underwood (upon the efficiency of the processes employed in the canning of sweet corn) had just been issued from our laboratory.

All these and similar contributions to applied biology, however, in the last analysis, rest upon the sure foundation of pure science; and it is therefore gratifying to note that the work in comparative physiology, under Assistant Professor Hough; in comparative anatomy and zoölogy, under Dr. Weyse; and in botany, under Mr. Prescott, continues to be of high efficiency. Assistant Professor Hough has published during the year an important paper on the physiology of inhibition. A valuable series of lectures by Dr. Bigelow, on theoretical biology, of which he has recently published a syllabus, is also worthy of mention.

Through the continued kindness of Mrs. William B. Rogers this department was again presented during the last year, as

has been the case for several years, with two annual scholarships in the Marine Biological Laboratory at Wood's Hole. These were held with great advantage by Messrs. C.-E. A. Winslow, of the fourth year, and C. W. Perley, a recent graduate of the department.

It is hoped that the project, described at length in the last report, can be carried out this year; and that the natural development of this department will no longer suffer from want of space for research laboratories. The thesis work of the fourth-year students and the original work of instructors and graduates or special students are most fruitful sources of scientific inspiration, and contribute essentially to maintain the enthusiastic feeling which marks the growth of a department. Increased accommodations are also called for on the ground of the public usefulness of biological experiments.

Course IX., General Studies. — English, History, Economics. — Professor Bates has now in operation the plan arranged in conjunction with President Walker for the oversight of the English of students above the first-year grade. It is a singular fact that men who do good work in first-year composition seem to regard the need of care in writing as entirely done when they have once passed their examinations. Men whose first-term themes are really excellent sometimes fall into slovenly and incorrect habits of expression, so that their later written work is inexcusably bad. These students are now looked after, and are kept reminded of the fact that they are expected to live up to the standard which enabled them to pass in the first place.

The work in composition in the first year is also improved. The addition of an assistant to the staff of the department allows an increase of thoroughness, and makes possible a much greater amount of personal consultation.

An important gain has been made in adding advanced composition, formerly an option in the fourth year, to the required third-year studies of the Course. This has the advantage of giving to the students in the course a more

that it is probably unexcelled in this country. Various new vacuum tubes of our own devising have been added to it.

Through the kindness of Mr. George W. Blodgett the department has received the loan of a complete set of quadruplex telegraphic instruments, which has proved most useful in illustrating the lectures on that subject. We are also, as in previous years, greatly indebted to the American Bell Telephone Company for the use of much valuable apparatus.

The work of the laboratory of electrical testing is greatly facilitated by the new method employed for the support of the sensitive galvanometers. The Julius suspension, adopted by Professor Laws after a tentative trial of some months, has been found very satisfactory. The jarring of even the heaviest vehicles is without very serious effect, and ordinary disturbances of this kind are scarcely noticed.

The equipment of the laboratory of heat measurements has been increased by the construction, under the direction of Mr. C. L. Norton, of a comparator for thermometers, which, added to what we already possessed, renders our apparatus for comparing and examining standard thermometers exceedingly complete. The construction of two new coal calorimeters, one of the type of the Berthelot bomb, the other a simple and more easily manipulated form of calorimeter, permits of more complete examination of the efficiency of fuels than has hitherto been possible anywhere. The laboratory has further acquired a Heraeus thermo-electric pyrometer for measuring melting points, furnace and flue temperatures, and general technical work in heat measurements.

Regarding the difficulties under which the department labors on account of lack of room, there is nothing to be said beyond what was stated in the President's report of last year. The pressure has not diminished, but, realizing the impossibility of immediate remedy, the instructing force has used its best endeavors to so distribute the work as to relieve the

congestion as far as possible. This has often necessitated a frequent repetition of exercises, with corresponding draught on the time and strength of the instructors. In the laboratories of heat measurements and physical chemistry the crowding has been most extreme, but the work of this character has been satisfactorily, though not easily, carried through as laid out in the programme. But it has not yet been possible to extend it as might be done under more propitious circumstances as to accommodations.

Course VII., Biology. — Professor Sedgwick reports that the more elementary class-work is efficient and satisfactory, but states that the opportunities for advanced work and investigation are totally inadequate. He urges that provision be made at the earliest possible moment for a considerable increase in laboratory accommodations, especially for research, in his department. To show how pressing this need is he further states that an important and eminently practical investigation, which he has long had in view, upon the microscope structure of the various textile fibres, particularly hemp and sisal, is now ready to be set on foot as soon as space can be found in which to carry on the work. Room is also urgently required for experiments on the effect of certain processes in dyeing, upon the microscopic structure of the fibres treated; for further investigations upon milk and water; for experiments affecting the arts of canning and food preserving, as well as for certain special researches in pure bacteriology.

The notable growth of the work of this department along practical sanitary and industrial lines, which was dwelt upon at some length in the last report of the President, continues and is bearing fruit. Nowhere in America, perhaps, are the fundamental principles of sanitation and their application to the great public supplies — water, milk, and gas — more carefully considered or more intelligently taught. This is important not only to the public welfare of the community at large, but also to those of our own graduates who as chem-

ists, engineers, or architects are liable to be brought unexpectedly face to face with sanitary problems. A large part of the civic or municipal engineering of the day is based upon the modern requirements of sanitation, and the Institute is fortunate in being able through its biological department to present adequately, yet concisely, to its students in other departments the fundamental facts, theories, and practice of sanitary science.

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complete training in composition; it has also made room for the introduction of a course in argumentation as an option in the fourth year. Coming in the first half of the year, this course is an excellent preparation for thesis work.

The work in Literature has not undergone much change during the year, except that in the second year the course has been to some extent modified in connection with the required summer reading. There is in the fourth year of the Course an increase of written work in connection with eighteenth and nineteenth century literature.

In Economics there has been but little change. The department, however, has been called upon to give a course to the fourth-year students in Electrical Engineering, on Economics of Corporations. The more detailed studies of Dr. Ripley on the Racial Geography of Europe, delivered last spring in the Lowell course, are now being published in the "Popular Science Monthly." Prof. Dewey has been appointed to serve as a member of the Boston Department of Municipal Statistics.

Course XII, Geology.— During the year several quite material changes in the succession of studies have been necessitated by the desire to modify certain courses in other departments. There have been but two options in the Course in Geology, and those were confined to the first term of the fourth year, but in the present schedule two options are offered in the second year and three in the succeeding years. By this arrangement students may devote certain portions of their time to an increased amount of either chemistry, comparative anatomy, or surveying.

Mr. M. L. Fuller, a graduate of the Institute of '96, who was last year engaged upon the Geological Survey of Michigan, is now an Assistant in this department.

There have been important additions to the collections and appliances for teaching. A most valuable accession has been made of a good series of large physical and geological wall-maps.

A large number of the Reports and Atlases of the Geological Survey of Pennsylvania, by Henry D. Rogers, have been given to the department by Mrs. H. D. Rogers and Miss Mary Otis Rogers, for distribution among other institutions. Correspondence has been conducted with fifty colleges and universities, and sets of the volumes have been furnished to thirty-six of them. The correspondence, the selection and transmission of these, has required a large amount of work, but it has promoted our friendly relations with other institutions.

Course XIII., Naval Architecture. — Few changes have been made in this Course since its commencement. The students are now given the accepted theory of their profession, mainly from notes especially arranged to conform to the methods of instruction of the school, and to use to best advantage the knowledge acquired in the engineering courses.

The preparation of such notes and the work of instruction in this subject are greatly facilitated by the sound training of the students in physics, applied mechanics, and steam engineering, which allows of a brief and comprehensive statement of many subjects which are ordinarily treated at length in works on shipbuilding and naval architecture.

Mr. Swan, who has returned after a year's study on leave of absence abroad, is now using his experience there to improve and extend the instruction given by him in drawing, ship calculations, ship construction, and design.

It is hoped that the new building will afford space for a drawing-room with large tables specially adapted to the requirements of naval designing. The need is greatly felt in this department of a room for storing safely and arranging for use drawing instruments and models such as those which have served for important work in the study of resistance and stability.

Last winter a set of progressive speed trials was made on the police boat "Guardian," by permission of the Board of Police Commissioners, over a well-defined course in the

harbor. The analysis and discussion of the results of these trials formed the subject-matter of the thesis presented at graduation by one of the class that was graduated last June, and have since been embodied in a paper presented to the American Society of Naval Architects and Marine Engineers.

Instruction was given in mould-loft work at the Navy Yard, as has been done for several years, through the courtesy of the Secretary of the Navy and of officers in the Navy Department. It is hoped that this valuable work may form a fixed feature of the Course.

Mathematics. — The work of the department has been conducted during the year without essential change. The advance in 1895 in entrance requirements has now reached its full effect, however, in the transference from the fourth year to the third year of the course in differential equations.

The department library is now provided with the more important periodicals, and with an adequate collection of models. An increase in the supply of important works of reference is, however, much desired. All the elective courses have been taken during the year, and a more advanced course in elliptic functions is now conducted by Professor Woods.

Modern Languages. — The department necessarily depends immediately upon the standard of the entrance requirements for the extent to which its teaching can be developed, so that no important change is to be expected until further advance is made in the preparation of the entrance class. So far as the modern languages are destined to be used to afford free access to foreign text-books, such as is frequently required in many professional studies, the excellence of our teaching is continually put to the test with satisfactory results. It is found in the different departments that the students in their third and fourth years read French and German sufficiently well for the consultation of text-books.

Professor van Daell recommends that uniformity in the teaching of the different sections shall be secured by the employment at frequent periods of written tests identical in all

sections. The use of a part of the time of an assistant would be required for the examination of papers.

There have been no considerable accessions to the library. The allowance for the purchase of books is used chiefly for the most useful books of reference.

STATISTICS OF CLASSES.

THE ENTERING CLASS.

The registration of this year, as by the Catalogue now in press, amounts to 1,198, exactly the same as twelve months ago.

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

STUDENTS BY CLASSES.

The aggregate number of students for 1897-98 is divided among the several classes as follows:

Graduate student, candidates for advanced degrees	9
Regular students, Fourth Year	203
“ “ Third “	178
“ “ Second “	197
“ “ First “	279
Special students	332
Total	1,198

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.
Graduates of the M.I.T.	9		9
Fourth Year	203	72	275
Third Year	178	91	269
Second Year	197	130	327
First Year	279	39	318
Total	866	332	1,198

STATISTICS OF EXAMINATIONS.

Of the 1,198 students of the present year, 441 were not connected with the school in 1896-97. Of these, 259 were admitted as regular students of the first year upon the basis of their entrance examinations. The 182 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 special students; (4) those who were admitted on the presentation of diplomas or certificates from other institutions of college grade. In addition to the 259 who were thus admitted to the Institute on examination, and have taken their place in the school, 91 were admitted on examination, but have not entered the school. The number of this last class, always large, has this year been increased even over that of last year by the continued depression in business.

In the case of the 259 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	192
“ on one condition	34
“ on two conditions	23
“ on more than two conditions	10
	259

Fifty 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 (Cal.), Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Easthampton (Mass.), Exeter (N.H.), Indianapolis, Kingston (Pa.), Lawrenceville (N.J.), Lead (So. Dak.), Louisville, New York, Philadelphia, Pittsburgh, Portland (Me.), Pottstown (Pa.), Poughkeepsie, Southborough (Mass.), St. Paul, Utica (N.Y.), Washington.

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	Oregon.....	..	1	..	..	..	1	2	3	
Arkansas.....	1	1	Pennsylvania.....	..	5	5	6	10	26	15	41	
California.....	..	1	1	3	1	6	3	Rhode Island.....	..	3	5	2	3	13	6	19	
Colorado.....	..	1	3	..	2	6	2	South Carolina.....	..	..	1	1	1	2	2	4
Connecticut.....	..	7	5	2	14	26	4	Tennessee.....	..	1	1	..	1	3	3	3	
Delaware.....	1	..	..	..	..	..	30	Texas.....	..	1	..	..	..	1	1	2
Dist. of Columbia.....	..	1	3	..	3	7	6	Utah.....	..	..	2	..	..	2	1	3
Florida.....	1	1	13	Vermont.....	..	..	2	3	2	7	4	11	
Georgia.....	1	..	..	3	1	Virginia.....	..	1	2	..	..	3	1	4	
Idaho.....	1	..	..	3	1	Washington.....	..	..	..	1	1	2	2	4	
Illinois.....	1	5	7	12	4	29	11	West Virginia.....	..	..	..	..	..	1	1	1
Indiana.....	..	1	1	2	4	3	7	Wisconsin.....	..	..	2	..	1	3	3	6
Iowa.....	..	1	4	2	1	8	4	<i>Foreign Countries.</i>									
Kansas.....	..	3	..	..	..	2	1	Cuba.....	..	..	1	..	..	1	..	1
Kentucky.....	..	3	3	1	2	8	2	Denmark.....	..	..	..	..	2	2	..	2
Louisiana.....	1	1	10	England.....	..	..	1	1	..	2	..	2	
Maine.....	..	6	4	6	3	19	5	France.....	..	..	1	..	..	1	..	1
Maryland.....	..	1	2	..	2	5	3	Mexico.....	..	..	..	3	3	3	3	6
Massachusetts.....	7	133	102	133	176	551	188	New Brunswick.....	..	..	2	..	..	2	..	2
Michigan.....	..	1	2	1	1	5	5	Nova Scotia.....	..	..	1	..	..	1	..	1
Minnesota.....	1	..	4	5	3	Quebec.....	..	1	..	..	..	1	1	2	
Missouri.....	2	1	1	4	2	Turkey.....	..	..	1	..	..	1	2	3	
Montana.....	..	1	..	..	3	4	1									
Nebraska.....	3	4	1										
New Hampshire.....	..	5	3	5	5	18	7										
New Jersey.....	..	4	3	1	2	9	6										
New York.....	..	12	5	8	15	40	22										
North Carolina.....	1	..	1	1										
Ohio.....	..	4	2	4	10	20	10										
								Total.....	9	203	178	197	279	866	332	1198	

Forty States of the Union, besides the District of Columbia, are represented on our list of students. Of the total number of 1,198, 739 are from Massachusetts, or 61.6 per cent. of the whole; 109 are from other New England States; 350 are from outside New England. Of these 20 are from foreign countries.

A table showing the number of students in each year, from 1891, coming from each State or Territory, and from each foreign country, may not be without interest and instruction:

	1891.	1892.	1893.	1894.	1895.	1896.	1897.		1891.	1892.	1893.	1894.	1895.	1896.	1897.
<i>States.</i>									<i>States.</i>						
Alabama	2	4	2	1	..	1	1	Washington	3	3	1	3	1	5	4
Arkansas	3	2	1	..	..	1	1	West Virginia ...	2	2	1	1	3	2	1
California.....	10	14	15	9	8	9	9	Wisconsin	7	9	11	6	6	6	6
Colorado.....	7	7	5	8	7	7	8	Wyoming .....	..	..	..	..	..	1	..
Connecticut.....	30	27	30	29	27	24	30								
Delaware.....	..	2	4	4	3	5	6	<i>Foreign</i>							
Dist. of Columbia	4	4	4	3	2	16	17	<i>Countries.</i>							
Florida.....	3	3	3	2	1	..	13	Belgium .....	..	1	1	1	..	..	..
Georgia.....	2	2	1	3	2	1	4	Brazil.....	4	..	..	1	1	..	..
Idaho.....	..	3	3	1	..	3	1	Bulgaria.....	1	1	1	..	..	..	..
Illinois.....	32	40	39	36	42	45	40	Central America.	1	1	1	..	..	..	..
Indiana.....	5	5	6	3	2	3	3	Chile.....	..	..	..	1	1	..	..
Iowa.....	10	10	13	10	12	14	12	Columbia	2	..	..	..	..	..	..
Kansas.....	2	1	4	4	4	3	3	Cuba.....	..	..	..	1	1	1	1
Kentucky.....	3	2	7	11	12	11	12	Denmark.....	..	..	1	1	3	2	1
Louisiana.....	5	7	3	3	3	..	1	England.....	1	1	1	..	2	2	2
Maine.....	27	39	30	38	38	27	24	France.....	1	1	1	..	..	1	1
Maryland.....	7	7	4	4	4	9	8	Germany.....	..	..	2	1	..	..	..
Massachusetts.....	565	603	665	707	721	730	739	Guatemala.....	..	1	..	..	..	..	..
Michigan.....	13	16	7	5	8	6	8	Hawaiian Islands	4	2	2	..	..	..	..
Minnesota.....	13	13	11	9	5	7	7	Holland.....	2	2	2	2	..	..	..
Missouri.....	12	13	17	14	9	11	6	Ireland.....	..	1	1	1	..	..	..
Montana.....	..	..	2	2	1	3	5	Japan.....	3	1	1	1	2	2	..
Nebraska.....	1	4	3	4	2	2	2	Mexico.....	1	1	1	1	1	3	6
Nevada.....	3	3	2	2	..	..	..	New Brunswick.	2	1	1	1	1	2	2
New Hampshire.....	24	29	32	27	30	26	25	New South Wales	1	1	1	1	1	..	..
New Jersey.....	16	11	6	5	5	13	15	Nova Scotia.....	1	..	..	1	2	1	1
New Mexico.....	1	2	2	1	..	..	..	Ontario.....	2	2	4	4	2	2	..
New York.....	40	50	52	59	64	69	62	Peru.....	1	..	..	..	..	..	..
North Carolina ..	1	1	..	..	1	1	1	Porto Rico.....	1	..	..	1	1	..	..
Ohio.....	33	39	45	50	37	28	30	Quebec.....	4	5	5	2	2	2	2
Oregon.....	1	2	1	1	1	4	3	Scotland.....	2	1	2	1	..	..	..
Pennsylvania.....	26	25	31	37	36	42	41	Spain.....	..	1	1	1	1	..	..
Rhode Island.....	26	24	33	25	21	20	19	Trinidad.....	1	..	..	..	..	..	..
South Carolina.....	4	1	3	3	5	6	4	Turkey.....	2	1	..	1	3	1	3
Tennessee.....	4	1	1	1	1	1	3	Venezuela.....	1	..	1	1	1	1	..
Texas.....	2	5	6	6	3	2	2								
Utah.....	..	1	2	2	2	5	3								
Vermont.....	5	4	5	3	5	7	11								
Virginia.....	6	4	3	2	5	3	4								
									Total	1011	1060	1157	1183	1187	1198

RESIDENCE OF MASSACHUSETTS STUDENTS.

It has been said that 61.6 per cent. of our students are from Massachusetts. All the counties of the State send students to the Institute. One hundred and twenty-four cities and towns are borne 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-eight and Suffolk two hundred twenty-four pupils; Essex comes third, with ninety; Norfolk, fourth, with sixty-seven.

COUNTY.	No. of Towns.	No. of Students.	COUNTY.	No. of Towns.	No. of Students.
Barnstable . . .	4	6	Hampshire . . .	2	2
Berkshire . . .	6	8	Middlesex . . .	32	248
Bristol . . .	5	28	Nantucket . . .	1	1
Dukes . . .	1	1	Norfolk . . .	15	67
Essex . . .	25	90	Plymouth . . .	11	25
Franklin . . .	2	2	Suffolk . . .	3	224
Hampden . . .	4	12	Worcester . . .	13	25
			Total . . .	124	739

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

Boston . .	210	New Bedford,	9	Springfield .	6
Newton . .	48	Salem . . .	9	Wellesley . .	6
Cambridge .	42	Brockton . .	8	Fitchburg . .	5
Brookline .	25	Concord . .	8	Natick . . .	5
Newburyport	22	Gloucester .	8	Peabody . . .	5
Malden . .	21	Melrose . . .	8	Haverhill . .	4
Somerville .	19	Winchester .	8	Milton . . .	4
Lowell . .	16	Framingham .	7	Plymouth . .	4
Hyde Park .	13	Taunton . . .	7	Reading . . .	4
Lynn . . .	12	Waltham . .	7	Weston . . .	4
Chelsea . .	11	Worcester . .	7	Woburn . . .	4
Arlington .	10	Fall River . .	6		
Medford . .	10	Lawrence . .	6		

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 number are regular First- year Students.	(5) No. of New Students not of the regular First- year Class.
1888-89	827	465	362	245	117
1889-90	909	557	352	255	97
1890-91	937	572	365	234	131
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

AGES OF STUDENTS ON ENTRANCE.

The next table exhibits the ages of our students upon entrance, after taking out two who are repeating the first year, and sixteen persons of unusual ages. These deductions

PERIOD OF LIFE.	1896-97.		1897-98.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
16 to 16½ years . . .	2	..	1	..
16½ to 17 " . . .	3	5	1	2
17 to 17½ " . . .	19	..	16	..
17½ to 18 " . . .	40	59	33	49
18 to 18½ " . . .	52	..	45	..
18½ to 19 " . . .	44	96	39	84
19 to 19½ " . . .	41	..	58	..
19½ to 20 " . . .	28	69	25	83
20 to 20½ " . . .	23	..	25	..
20½ to 21 " . . .	9	32	9	34
21 to 22 " . . .	11	11	9	9
	272	272	261	261

leave two hundred and sixty-one as the number of students whose ages have been the subject of computation.

The results appear in the table above in comparison with the corresponding results of 1896-97.

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

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

Between 20	and 20½	. . . . .	1
"	20½	" 21	. . . . . 11
"	21	" 21½	. . . . . 18
"	21½	" 22	. . . . . 26
"	22	" 23	. . . . . 59
"	23	" 24	. . . . . 36
"	24	and over	. . . . . 25
Total			176

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

GRADUATES OF OTHER COLLEGES.

The number of students who are graduates of this and other institutions is seventy-two. Of these, ten are our own graduates, nine being candidates for advanced degrees ; sixty-two are graduates of other institutions, pursuing courses of study with us, either as regular or as special students. Fourteen are graduates of Harvard University ; five of Yale University ; four of Williams College ; three each of Georgetown University, Amherst College, and Smith College ; two each of Johns Hopkins University, De Pauw University, and University of Chicago, while the following institutions are represented on our list by a single graduate each : Rochester, Minnesota, Oregon, Vermont, Princeton, Brown, Iowa State, Colby, Ohio State, and Indianapolis Universities ; Carleton,

Hampden-Sidney, Central Turkey, Monmouth, Dickinson, Gonzaga, Wellesley, Boston, Tufts, Hamilton, Simpson, South Kentucky, Trinity Colleges; Colegio de Carreras.

The graduates of the Institute who are candidates for advanced degrees are Messrs. George Vincent Wendell, of the class of '92, the holder of the Savage Fellowship, in Physics, William David Coolidge, of the class of '96, the holder of the Swett Fellowship, in Physics, both studying abroad; Mr. Albert Ernest Smyser and Mr. James Swett Smyser, of the class of '96; Messrs. John Arthur Collins, Jr., Irénée du Pont, Frank Warren Everett, Edmund Sewall Manson, Jr., Theodore Ernest Videto, all of the class of '97.

WOMEN AS STUDENTS AT THE INSTITUTE.

The number of women pursuing courses with us is sixty-nine. Of these, five are graduates of colleges. Of the total number, five are regular students of the fourth year; one of the third year; five of the second year; five of the first year. Fifty-three are special students. Of the eleven regular students of the upper classes, three take Course IV., Architecture; four, Course V., Chemistry; two, Course VII., Biology; two, Course VIII., Physics. Of the special students, thirty devote themselves to Biology, five to Chemistry, three to Architecture, six to General Studies, three to Physics, three to Geology, one to Mathematics, and two to Sanitary Engineering.

THE COURSES OF INSTRUCTION.

The following table presents the numbers 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.	32	41	7	29	23	40	3	6	4	10	2	..	7	203*
3d " "	40	38	8	20	19	30	2	1	1	11	1	..	11	178*
2d " "	37	40	23	22	18	20	3	2	5	15	4	1	8	197*
Total . . .	109	119	38	71	60	90	8	9	10	36	7	1	26	578*

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.
1887	50	89	16	18	23	61	5	6	14	..	..	..	..	282
1888	71	100	12	21	28	74	4	5	12	11	..	..	..	338
1889	79	99	14	30	29	91	9	5	12	14	6	..	..	388
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	2	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	38	71	60	90	8	9	10	36	7	1	26	578*

* Deducting those counted twice.

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	..	..	..	..	1	..	..	..	..	5
1870	4	2	2	..	1	..	..	..	..	1	..	..	..	..	10
1871	8	2	5	..	2	..	..	..	..	..	..	..	..	..	17
1872	3	1	5	..	3	..	..	..	..	..	..	..	..	..	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	5	3	6	..	..	1	1	1	..	..	..	..	24
1883	3	7	5	1	3	..	..	..	..	..	..	..	..	..	19
1884	5	6	13	..	12	..	..	..	..	..	..	..	..	..	36
1885	4	6	8	2	4	..	2	..	..	1	..	..	..	..	27
1886	9	23	7	1	7	..	10	1	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	15	23	5	3	13	..	17	1	1	2	..	..	..	..	75
1890	25	27	3	5	13	..	18	3	2	6	..	..	..	..	102
1891	18	26	4	6	11	..	23	3	3	1	7	..	1	..	103
1892	22	26	4	13	7	..	36	6	1	7	4	6	..	..	133
1893	25	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	..	..	144*
1896	25	34	10	24	16	..	48	3	3	7	7	4	3	5	188*
1897	25	40	7	16	20	..	33	2	3	7	12	4	1	9	179
Totals	344	406	152	125	196	1	319	31	26	67	61	21	8	19	1,773
Deduct names counted twice															11
Net total															1,762

* Deducting names 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 . . .	4	..	..	..	..	..	..	..	..	..	..	..	..	..
2d . . .	7	..	3	..	1	..	1	1	..	1	..	..	..	..
3d . . .	6	1	3	..	2	..	..	..	..	..	..	..	..	..
4th . . .	10	2	3	..	1	1	2	..	..	..	..	..	..	1
5th . . .	10	..	1	1	1	..	3	..	1	1	1	..	..	1
	37	3	10	1	5	1	6	1	1	2	1	0	0	2

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	65	Language	172
Architecture	60	Mathematics	147
Biology	51	Mechanical Engineering	77
Chemistry	134	Mining Engineering	12
Civil Engineering	46	Naval Architecture	2
Drawing	158	Physics	168
Electrical Engineering	15	Political Science	61
English	133	Sanitary Engineering	6
Geology	46	Shopwork	74
History	100		

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

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.
Mathematics. . . .	308	308	115	47	778
Chemistry	371	55	83	55	564
English	299	274	13	6	592
French	162	84	50	....	296
Physics . . . .	....	287	278	227	792
German	81	208	149	5	443
Shopwork	11	110	50	67	238

THE SOCIETY OF ARTS.

REPORT OF THE SECRETARY.

To the President of the Institute:

SIR: On behalf of the Executive Committee of the Society of Arts, I beg to submit the Annual Report of the proceedings of the Society for the year 1896-97, as required by the By-laws.

At the adjourned annual meeting held May 27, 1897, Messrs. George W. Blodgett, Desmond FitzGerald, Thomas Doane, Edmund H. Hewins, and Frank W. Hodgdon were duly elected members of the Executive Committee, and Dr. Robert P. Bigelow was re-elected secretary for the ensuing year. The Executive Committee presented the following report, which was accepted and placed on record:

With the close of this thirty-fifth year of its existence, the Society of Arts has passed its five hundredth meeting. During the present year there have been held fourteen meetings, at which sixteen papers have been read. One meeting was a special one, held jointly with the Boston Society of Civil Engineers, to listen to a paper on the "Tampico Harbor Works" by the eminent engineer, Mr. E. L. Corthell. Three notable papers have been presented showing the summer work of the Institute. One of these was by Professor Homer, on the "Summer School of Architecture in Europe." The other two were by Professors Burton and Barton on the results obtained by the "Boston Party on the Sixth Peary Expedition to Greenland." All three of these papers will be published in the current volume of the "Technology Quarterly," and in addition to these an exceptionally valuable article on the "Pendulum and Magnetic Observations" has been contributed by Mr. Putnam, a member of the Boston

party. Another paper that deserves special mention, both because of its intrinsic value and because it embodied the results of original work done by a member of the Society, and largely in the laboratories of the Institute, is the one read by Dr. Williams on "Some Applications of the Röntgen Rays."

The endeavor has been made to publish the papers presented before the Society, as far as possible, in the "Technology Quarterly," but some papers have been crowded out or have been much delayed, owing to lack of space. As it is, the size of the last two numbers of the "Quarterly" has been much greater than the finances of the Society will warrant, and future numbers will have to be much smaller, even if that necessitates the omission of valuable contributions. The Results of Tests made in the Engineering Laboratories are regarded as an especially valuable feature of the "Quarterly," and although a source of very considerable expense, it is hoped that it will be possible to continue their publication.

The most momentous event in the history of the Society during the year is the death of President Walker, which has been felt more keenly, perhaps, by the members of the Executive Committee than by the other members of the Society, for their duties brought them into closer personal relations with him, and they have been better able to observe the thoughtful interest and wide knowledge of affairs that General Walker brought to the aid of the Committee in its efforts to guide the course of the Society.

At the time of the previous annual meeting the Society had 67 life members. Seven of these have died during the year, leaving 60 as the present number. The number of associate members a year ago was 289. Three have died and 9 have resigned. This loss is more than offset by the addition of 34 new members; making the present number of associate members 311.

The life members who have died during the year are Thomas T. Bouvé, George O. Carpenter, William O. Grover, Henry D. Hyde, G. F. H. Markoe, O. W. Peabody, John

Ruggles, and George W. Wales; the associate members are Henry A. Craigin, James H. Stanwood, and Francis A. Walker.

Respectfully submitted,

ROBERT P. BIGELOW,
Secretary.

DEC. 4, 1897.

THE TECHNOLOGY CLUB.

In the report of last year, reference was made by President Walker to the recently formed Technology Club, although, as he stated, it does not come strictly within the cognizance of the Corporation. The experience of the year has demonstrated, however, even beyond the expectations of the promoters of this Club, the usefulness to the Institute of such a meeting-place for the members of its governing and teaching bodies and its past students. Not simply through the ordinary intercourse of club life, but more especially by the frequent social meetings and class dinners that have been held in the club-house, an extraordinary interest in the work of the Institute has been aroused among its past members, and very active forces for the promotion of its welfare have been set in motion.

The use of the rooms of the Club for various minor purposes of the School is, in itself, of much value to us; and by its policy of admitting a number of undergraduates to full membership, the Club is contributing in no slight degree to the promotion of good order and of high ideals within the student body.

For these and other reasons I am convinced that the Technology Club, while not an integral part of our organization, should receive the cordial support of all who are concerned in promoting the welfare of the Institute.

A number of classes that had never come together since their graduation have organized, and have reunited their

scattered members, with the result that many to whom the Institute of Technology had been but a name have become its zealous and intelligent supporters.

The Association of Class Secretaries.— In connection with the Technology Club an important step has been taken in the organization of the Association of Class Secretaries. This association includes the secretaries of the various graduate classes, and has added also to its membership representatives of the Alumni Association, of the Technology Club, of the undergraduates, and the Secretary of the Institute.

The object of the society is "to promote class spirit and the welfare of the Institute, and to systematize all matter pertaining to class organization and record."

In pursuance of these objects it has through committees prepared careful plans for the systematic conduct of the business of alumni classes, and has effected the formation of organizations where none had existed before, and has revived the interest of others which had been long dormant.

TREASURER'S REPORT.

STATEMENT OF THE TREASURER.

THE treasurer submits the annual statement of the financial affairs of the Institute for the year ending September 30, 1897.

The amount paid for salaries increased about six thousand dollars, and there was also an increase in the repair account to the amount of about two thousand dollars.

Savings have been made in the payments for fuel, supplies, and some other matters to the amount of about seven thousand dollars.

The net result is that the income, including the twenty-five thousand dollars received from the State of Massachusetts, has just about equalled the expenses — there being a deficit of only four hundred and twenty-five dollars and four cents.

From the John W. and Belinda Randall Charities Corporation there have been received fifty thousand dollars.

Seven thousand four hundred and eighty-five dollars and ninety-one cents have been added to the Ann White Vose Scholarship Fund by a final payment from her estate.

Similarly a supplementary payment of nine hundred and twenty-three dollars and thirty-three cents has been received from the estate of the late Susan E. Dorr; and one of one hundred and ninety-six dollars and twenty-one cents from that of the late Samuel E. Sawyer.

Mrs. Wm. B. Rogers has kindly given two hundred dollars for periodicals; and other gifts, amounting in all to nine hundred and twenty-five dollars, have come from other friends of the Institute.

The debt has been reduced during the last year from one hundred and fifty thousand dollars to one hundred and twenty thousand.

SECURITIES EXCHANGED, W. B. ROGERS MEMORIAL FUND.

\$50,000 Saginaw & Western R.R. 6s. 50,000.00

RECEIVED.

\$37,500 Detroit, Grand Rapids & Western R.R. 4s., 1946 37,500.00
 255 shares " " " " " " " " Pf'd 12,500.00

SECURITIES SOLD OR PAID, GENERAL ACCOUNT.

16 Rights Boston Real Estate Trust 100.00
 \$1,000 Bur. & Missouri R.R. 6s., 1918 1,000.00

SECURITIES BOUGHT OR RECEIVED AS LEGACIES, GENERAL ACCOUNT.

\$1,000 Bur. & Missouri R.R. 6s., 1918, non-exempt 1,077.50
 1 share Boston Ground Rent Trust 900.00

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

Dr.

Cash balance Sept. 30, 1896		22,323.15
From Augustus Lowell for Lowell Courses	5,700.00	
" " " " C. Kastner's salary	2,500 00	
" " " " School of Design	500 00	
		8,700.00

RECEIPTS FOR CURRENT EXPENSES.

Income of funds for salaries	3,942.00	
" " " " scholarships (students' fees)	6,400.00	
" " " " Joy "	200.00	
" " " " Swett "	400 00	
" " " " Savage "	400.00	
" " " " Library	540.00	
" " " " general purposes	9,196.43	
" " Rogers Memorial Fund	9,814.00	
" " Charlotte B. Richardson Fund	1,682.04	
" " Rotch Prize Funds	450.00	
Letter Box Fund used 1896 [59.75]	175.00	
Biological Instrument Fund used 1896	356 50	
Mathematical Department Fund used 1896	250.00	
Students' fees	215,045.00	
State Scholarships	4,000.00	
State Agricultural Fund	5,896.00	
State Endowment Fund	7,666.67	
Gift of State of Massachusetts	25,000.00	
Laboratory supplies and breakages	9,902.17	
Rents, per Table (page 84)	15,274.23	
Gifts	1,125.00	
Interest	5,020.58	
Boston University	1,150.00	
Sale printed Lecture Notes	2,753.28	
		326,638.90

GIFTS AND BEQUESTS FOR SPECIAL PURPOSES.

Increase Richard Perkins Fund	103.50	
" James Savage Fund	178.38	
" Susan Upham Fund	53.66	
" Dalton Graduate Chem. Fund	229.05	
" T. Sterry Hunt Fund	138.72	
" James H. Mirrlees Fund	120.41	
" W. B. Rogers Fund [additional 52]	277.93	
Susan E. Dorr Fund [" 923.33]	1,085.15	
Ann White Vose Fund [" 7,485.91]	7,949.80	
		10,136 60

GIFTS AND BEQUESTS FOR GENERAL PURPOSES.

Samuel E. Sawyer Legacy, additional	196.21	
John W. & Belinda Randall Fund	50,000.00	
		50,196.21

SECURITIES SOLD OR PAID. GENERAL FUND, page 75

SUNDRIES.		
Income credited to Bond Premium Acc't	495.40	
Income credited to Rogers Bond Premium Acc't	500 00	
Boston Art Students' Asso. on acc't	666.67	
Students' notes paid	937.50	
		2,599.57

\$421,694.43.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.
FOR THE YEAR ENDING SEPTEMBER 30, 1897.

	<i>Cr.</i>	
Paid for Lowell Courses		5,700.00
“ “ Charles Kastner's salary		2,500.00
“ “ Expense Lowell School of Design		500.00
		8,700.00

EXPENSES.

Salaries, per Table (page 84)	222,744.42	
“ paid from Gifts	500.00	
Fellowship paid from Swett Fund	400.00	
“ “ “ Savage “	400.00	
Prizes, Rotch Funds	450.00	
Repairs, per Table (page 85)	11,232.57	
General Expenses, per Table (page 85)	14,122.07	
Fuel	6,600.48	
Water	2,020.40	
Gas	2,241.35	
Electricity	1,111.27	
Printing and Advertising	2,463.42	
“ Lecture Notes	1,697.38	
“ Annual Catalogues and Reports	2,790.53	
Rents paid Boston & Albany R. R. Co.	180.00	
“ “ Natural History Society	200.00	
Laboratory Supplies and Libraries, per Table (page 84)	34,885.28	
Society of Arts	2,164.60	
Interest allowed on funds not in Bonds and Stocks, at 4½ per cent	6,662.05	
Interest paid A. Lowell, Trustee	1,000.00	
“ “ on Mortgage Notes	4,630.00	
Mech. Eng. & Applied Mechanics Department Improvements	2,657.89	
Physical Department Improvements	4,310.58	
Architectural “ “	993.15	
Mathematical Department	250.00	
Biological Instrument Department	356.50	
		327,063.94

[Expenses more than Income, \$425.04]

SECURITIES BOUGHT OR RECEIVED AS LEGAL- ACIES. GENERAL ACCOUNT, page 75	1,977.50
Projected Building, Trinity Place, plans	74.07

SUNDRIES.

Notes Payable	30,000.00	
Notes Receivable	17,000.00	
Students' Deposits	250.00	
Funds of 1896, used	666.25	
		47,916.25
Cash balance, Sept. 30, 1897		35,962.67
		\$421,694.43

The following account exhibits the property held by the Institute, as per Treasurer's books, Sept. 30, 1897:—

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
16,000.00	Kansas City, Clinton & Springfield R.R. 5s.	1925	16,000.00
6,000.00	New York & New England R.R. 6s.	1905	6,000.00
5,400.00	Republican Valley R.R. 6s.	1919	5,400.00
4,000.00	Cin., Ind., St. Louis & Chicago R.R. 6s.	1920	4,000.00
2,000.00	Ottawa, Oswego & Fox River R.R. 8s.	1900	2,000.00
2,000.00	Kansas City, Fort Scott & Gulf R.R. 7s.	1908	2,000.00
3,000.00	Kansas City, Memphis & Birmingham R.R.		
	1,000 General Mortgage 4s.	1934	
	2,000 Income 5s.	1934	
			<hr/> 2,221.40
1,000.00	Lincoln & Northwestern R.R. 7s.	1910	1,000.00
1,000.00	Atchison & Nebraska R.R. 7s.	1908	1,000.00
42,000.00	Chicago, Burlington & Quincy R.R. Conv. 5s.	1903	40,820.00
35,000.00	Fort Street Union Depot 4s.	1941	34,825.00
24,000.00	Rome, Watertown & Ogdensburg R.R. 5s.	1922	24,000.00
37,500.00	Detroit, Grand Rapids & Western R.R. 4s.	1946	37,500.00
	255 Shares Detroit, Grand Rapids & Western Pfd., par 100		12,500.00
	Advance to Bond Premium account		7,900.00
			<hr/> 249,953.90
INVESTMENT OF THE JOY SCHOLARSHIP FUND.			
	Massachusetts Hospital Life Insurance Co.		5,000.00
	Deposits in Savings Banks		4,123.70
			<hr/> 9,123.70
INVESTMENT SWETT SCHOLARSHIP FUND.			
	Massachusetts Hospital Life Insurance Co.		10,000.00
INVESTMENTS, GENERAL ACCOUNT.			
\$14,000.00	Bur. & Mo. River (Neb.) R.R. 6s., non-exempt	1918	14,000.00
2,000.00	Bur. & Mo. River (Neb.) R.R. 6s., exempt	1918	2,000.00
6,000.00	Chicago, Burlington & Quincy R.R. 4s.	1922	5,100.00
3,000.00	Milwaukee & St. Paul R.R. 7 3-10	1898	3,000.00
4,000.00	Chicago, Burlington & Northern R.R. 5s.	1926	4,000.00
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
15,000.00	Chicago, Burlington & Quincy R.R. Conv. 5s.	1903	15,000.00
6,000.00	West End Street Ry. 5s.	1902	6,000.00
2,000.00	Brookline Gas Light Co. 5s.	1913	2,000.00
35,000.00	Fitchburg R.R. 5s.	1903	35,000.00
65,000.00	Boston & Maine R.R. 4s.	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
5,000.00	New York & New England R.R. 6s.	1905	5,000.00
	Advances to Bond Premium account		5,121.94
			<hr/> 195,221.94
	Bonds		
			<hr/> \$464,299.54
	<i>Amount carried up</i>		

Amount brought up 464,299.54

STOCKS.

SHARES.

148	Boston & Albany R.R.	par	100	29,933.00
194	Morris & Essex R.R.	"	50	14,690.00
40	New York & Harlem R.R.	"	50	5,000.00
85	Pittsburg, Fort Wayne & C. R.R.	"	100	12,880.00
50	N.Y., New Haven & Hartford R.R.	"	100	8,000.00
12	Cocheco Manufacturing Co.	"	500	6,000.00
56	Hamilton Woollen Co.	"	100	5,390.00
59	Everett Mills	"	100	5,310.00
31	Great Falls Manufacturing Co.	"	100	3,472.00
6	Manchester Mills	"	100	660.00
2	Dwight Manufacturing Co.	"	500	1,600.00
1	Merrimack Manufacturing Co.	"	1000	1,015.00
1	Laconia Co.	"	400	605.00
2	Pepperell Manufacturing Co.	"	500	2,300.00
10	Lowell Bleachery	"	100	975.00
27	Essex Co.	"	50	3,780.00
158	Pennsylvania Coal Co.	"	50	23,160.50
15	Consolidated Gas Co., New York	"	100	1,447.50
7	Lowell Gas Light Co.	"	100	1,610.00
40	Cambridge Gas Light Co.	"	100	7,000.00
7	Lawrence Gas Light Co.	"	100	882.00
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
10	National Union Bank	"	100	1,240.00
25	National Bank of the Republic	"	100	3,625.00
40	The Molsons Bank, Montreal	"	50	3,000.00
37	Nat. Mechanics Bank, Baltimore	"	10	706.70
10	First Nat. Bank of Baltimore	"	100	1,293.30
16	Boston Real Estate Trust	"	1000	18,300.00
1	Boston Ground Rent Trust	"	1000	900.00

179,255.50

REAL ESTATE.

Rogers Building	200,000.00
Walker "	150,000.00
Land on Garrison Street	50,840.00
Workshops " "	30,000.00
	<hr/>
	80,840.00
Land on Trinity Place	76,315.69
Engineering B'ld'g, Trinity Place	90,000.00
	<hr/>
	166,315.69
Gymnasium Building	7,967.85
Architects' "	57,857.10
Lot No. 2, Trinity Place	137,241.60
Projected Building, Trinity Place, plans	243.57
Clarendon St. Land and Building	142,762.94
House No. 34 Commonwealth Ave.	30,000.00
Real Estate, Massachusetts Ave., Cambridge	16,154.38
	<hr/>
	989,383.13
Equipment, Engineering Building	16,555.24
" Workshops	20,628.56
	<hr/>
	37,183.80

SUNDRIES.

Notes Receivable	78,500.00
Boston Art Students' Association	12,333.33
Students' Notes	1,845.50
Cash Balance, Sept. 30, 1897	35,962.67
	<hr/>
	128,641.50

128,641.50

\$1,798,763.47

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	50,000.00

479,590.11

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

87,600.00

SCHOLARSHIP TRUSTS.

Richard Perkins Fund	53,278.67
James Savage Fund	13,431.20
Susan H. Swett Fund	10,182.95
William Barton Rogers Fund	10,652.20
Joy Fund	9,123.70
Elisha Thatcher Loring Fund	5,329.39
Charles Lewis Flint Fund	5,253.93
Thomas Sherwin Fund	5,000.00
Farnsworth Fund	5,000.00
James H. Mirrlees Fund	2,796.19
William F. Huntington Fund	5,208.33
T. Sterry Hunt Fund	3,221.46
Elisha Atkins Fund	5,000.00
Nichols Fund	5,000.00
Ann White Vose Fund	61,182.16
Dalton Grad. Chemical Fund	5,319.05

204,979.23

OTHER TRUSTS.

Charlotte Billings Richardson, Industrial Chemistry Fund	37,378.78
Susan Upham Fund	1,246.13
Susan E. Dorr Fund	3,757.80
William Hall Kerr, Library Fund	2,000.00
Biological Instrument Fund	143.50
Charles Lewis Flint, Library Fund	5,000.00
Rotch Arch. Library Fund	5,000.00
Rotch Architectural Fund	25,000.00
Rotch Prize Fund	5,225.00
Rotch "Special" Prize Fund	5,225.00
Letter-box Fund, balance	110.37

MISCELLANEOUS.

Notes Payable	120,000.00
Students' Deposits	250.00
Catherine P. Perkins Legacy, 1893	102,781.40
Henry E. Hutchins Legacy, 1895	2,000.00
Moses Kimball Legacy, 1896	5,000.00
Benjamin P. Cheney Legacy, 1896	10,000.00
Susan G. Coolidge Devise, 1896	14,005.00
M.I.T. Stock Account	681,976.15

936,507.55

\$1,798,763.47

COMPARATIVE STATEMENT OF FUNDS, ETC.

	Sept. 30, 1896.	Sept. 30, 1897.
Trusts for general purposes	429,393.90	479,590.11
" " Salaries	87,600.00	87,600.00
" " Scholarships	195,981.44	204,979.23
" " Library	7,000.00	7,000.00
Charlotte B. Richardson Ind. Chem. Fund	37,378.78	37,378.78
Susan Upham Fund	1,192.47	1,246.13
Susan E. Dorr Fund	2,672.65	3,757.80
Rotch Architectural Library Fund	5,000.00	5,000.00
Rotch Architectural Fund	25,000.00	25,000.00
Rotch Prize Fund	5,225.00	5,225.00
Rotch "Special" Prize Fund	5,225.00	5,225.00
Catherine P. Perkins Legacy	102,781.40	102,781.40
Henry E. Hutchins	2,000.00	2,000.00
Moses Kimball	5,000.00	5,000.00
Benj. P. Cheney	10,000.00	10,000.00
Susan G. Coolidge Devise	14,500.00	14,500.00
Letter-box Fund	170.12	110.37
Biological Instrument Fund	500.00	143.50
Mathematical Department Fund	250.00	
Students' Deposits	500.00	250.00
Notes Payable	150,000.00	120,000.00
M.I.T. Stock Account	682,401.19	681,976.15
	<u>\$1,769,771.95</u>	<u>\$1,798,763.47</u>
Increase		
Consisting of:—		
Requests for Special Purposes, etc. See		
page 76		10,136.60
Gifts and Requests for General Purposes.		
See page 76		<u>50,196.21</u>
		60,332.81
Less Notes Payable Paid	30,000.00	
" Biological Instrument Fund used	356.50	
" Mathematical Department Fund used	250.00	
" Letter-box Fund used	59.75	
" Students' Deposits	250.00	
" Expenses more than Income	425.04	
	<u>31,341.29</u>	
		<u>\$28,991.52</u>

INCOME FROM GENERAL INVESTMENTS, AND APPLICATION THEREOF.

Applied to Salaries	3,942.00	From Dividends, Bank Stocks	1,154.80
“ “ Scholarships	6,400.00	“ State Tax returned on Bank Stocks	237.21
“ “ “ James Savage Fund	400.00	“ Bonds	9,470.17
“ “ Charlotte B. Richardson Fund	1,682.04	“ Dividends, Railroad Stocks	3,098.00
“ “ Rotch Prize Funds	450.00	“ “ Coal and Gas Stocks	2,305.00
“ “ Library	540.00	“ “ Manufacturing Stocks	966.00
“ “ General Purposes	9,196.43	“ Real Estate Stocks	738.00
“ “ Increase of Funds	1,525.36	“ Interest allowed on Funds not in Bonds and Stocks @ 4½%	6,662.05
“ “ Advances to Bond Premiums	495.40		
	<u>\$24,631.23</u>		<u>\$24,631.23</u>

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

Paid Massachusetts Institute of Technology . . . 9,814.00 Credited to Advances Bond Premiums . . . 500.00 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> \$10,314.00		Received Income from Railroad Bonds . . . 10,314.00 <hr style="width: 20%; margin-left: auto; margin-right: 0;"/> \$10,314.00
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**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
Chauncy Hall School, for Gymnasium		150.00
State Board of Health, for use of Laboratories .		375.00
Land and Building, Clarendon St., on account .		8,250.00
34 Commonwealth Avenue, 1 year	2,200.00	
less Annuity under		
Will	1,000.00	
less Tax	<u>357.33</u>	
		<u>1,357.33</u>
		842.67
Use of Rooms and Gymnasium		1,177.75
Mass. Ave., Cambridge		<u>366.66</u>
		16,462.08
less Tax and Repairs, Cambridge		<u>1,187.85</u>
		15,274.23

Department Supplies.

Chemistry	9,286.58
Physics	6,723.37
Mining	1,613.07
Mechanical Engineering	2,789.82
Naval Architecture	571.24
Applied Mechanics	1,766.09
Civil Engineering	2,931.04
Biology	1,242.73
Geology	778.50
Architecture	2,062.25
Drawing	55.16
Mathematics	135.63
English	1,180.26
Workshops	1,767.91
Modern Languages	43.32
Periodicals	1,707.64
Military	<u>230.67</u>
	<u>34,885.28</u>

Salaries.

Instruction	183,337.99
Administration	20,393.24
Labor	<u>19,013.19</u>
	<u>222,744.42</u>

Repairs.**Department Improvements: —**

Chemistry	1,376.11
Mining	541.93
Physics	471.04
Workshops	419.29
Mechanical Engineering	254.64
Civil Engineering	161.95
English	156.40
Architecture	109.18
Biology	92.93
Applied Mechanics	85.89
Geology	30.28
Naval Architecture	22.54
Drawing	17.50
Military	13.37
Mathematics	11.75

Rogers Building	
Sundries	
Walker Building	
Steam Fitting	
Boilers, Tools, etc.	
Architectural and Engineering Buildings	
Gymnasium	

3,764.80
2,423.49
1,278.39
1,249.46
935.65
837.49
580.15
163.14

11,232.57

General Expenses.

Stationery and Office Supplies	1,844.27
Fire Insurance	1,726.96
Postage	1,310.00
Hawley Furnace	1,200.00
Electric Wiring	1,144.39
Washing	759.63
Diplomas	752.85
Entrance Examinations	716.09
Sundries	608.01
Janitor's Supplies: Brushes, Pails, etc.	482.55
Express Charges, Teaming, etc.	414.88
Furniture	378.67
Paints, Varnish, etc.	375.07
Glass	286.48
Examination Books	281.25

Engine Room Supplies: —

Oil	184.08
Cotton Waste	61.03
Sundries	30.24

Ice	275.35
Window Shades	273.54
Vacuum Pump	217.31
Lowell School of Design	212.85
Books, Supplies, etc., for General Library	193.32
Water-Pipe (Street)	158.73
Type-writing Machine	150.00
Gymnasium Supplies	112.86
Telephone & Telegraph Co.	92.68
Union Deposit Vaults	77.33
Western Union Telegraph Co.	50.00
	27.00

14,122.07

BOSTON, December 6, 1897.

An examination of the accounts of the Treasurer of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY for the year ending September 30, 1897, has been made by E. A. Stone, an accountant employed by this committee. Mr. Jackson and Mr. Tolman, the members of the committee on that date, have 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.*

[The absence in California of Mr. Jackson prevents his signing this report.]

BOSTON, December 6, 1897.

To the Auditing Committee of the

Massachusetts Institute of Technology:

GENTLEMEN: I have completed the examination of the Treasurer's accounts for the year ending September 30, 1897, and find them to be correct. I have also verified the bank balances. The trial balance corresponds with the ledger balances, and the same agree with the Treasurer's report, as printed.

Yours truly,

EDWIN A. STONE,

Accountant.

