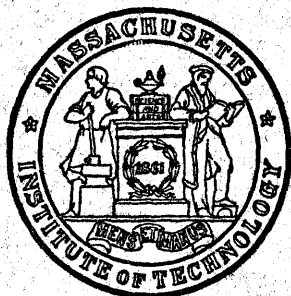


E. B. Rowe

VOLUME 49

NUMBER 2

BULLETIN
OF THE
Massachusetts
Institute of Technology



PRESIDENT'S REPORT

1914

Published by the Massachusetts Institute of Technology, Boston,
in December, January, March, and June.

Entered December 3, 1904, at the Post-office, Boston, Mass., as second-class
matter, under Act of Congress of July 16, 1894.

Volume 49

Number 2

BULLETIN
OF THE
Massachusetts
Institute of Technology
BOSTON



REPORTS
OF THE
PRESIDENT AND TREASURER

PRESENTED AT THE DECEMBER MEETING OF THE CORPORATION

JANUARY, 1914

TABLE OF CONTENTS

THE CORPORATION.	PAGE
Members of the Corporation	5
Committees of the Corporation	6
REPORT OF THE PRESIDENT.	
Changes in the Corporation and Faculty	9
The Students	12
The Alumni	13
Some Events of the Year	14
Some Problems of the Future	19
REPORTS OF ADMINISTRATIVE OFFICERS.	
Report of the Secretary of the Faculty	23
Report of the Dean	24
Report of the Medical Adviser	29
Report of the Librarian	30
Report of the Registrar: Statistics	39
REPORTS OF THE DEPARTMENTS.	
Civil Engineering and Sanitary Engineering	54
Mechanical Engineering	59
Mining Engineering and Metallurgy	63
Architecture	67
Chemistry and Chemical Engineering	73
Research Laboratory of Physical Chemistry	77
Research Laboratory of Applied Chemistry	78
Electrical Engineering	80
Biology and Public Health	84
Sanitary Research Laboratory and Sewage Experiment Station	86
Physics	91
Geology	94
Naval Architecture and Marine Engineering	98
Mathematics	99
Drawing and Descriptive Geometry	101
Modern Languages	104
SOCIETY OF ARTS	105

PUBLICATIONS.	PAGE
The Institute	106
Administrative Officers	106
Civil Engineering	106
Mechanical Engineering	106
Mining Engineering and Metallurgy	107
Chemistry and Chemical Engineering	108
Research Laboratory of Physical Chemistry	108
Electrical Engineering	109
Biology and Public Health, Sanitary Research Laboratories and Sewage Experiment Station	109
Physics	111
Geology	111
Naval Architecture and Marine Engineering	111
Mathematics	111
English	112
Modern Languages	112

REPORT OF THE TREASURER.

Members of the Corporation.

President.

RICHARD C. MACLAURIN.

Secretary.¹

JAMES P. MUNROE.

Treasurer.

FRANCIS R. HART.

Life Members.

WILLIAM ENDICOTT.	EBEN S. DRAPER.
HOWARD A. CARSON.	ROBERT S. PEABODY.
FRANCIS H. WILLIAMS.	ELIHU THOMSON.
JAMES P. TOLMAN.	ELLIOT C. LEE.
HOWARD STOCKTON.	JAMES P. STEARNS.
HIRAM F. MILLS.	LUCIUS TUTTLE.
PERCIVAL LOWELL.	FREDERICK P. FISH.
SAMUEL M. FELTON.	FRANCIS L. HIGGINSON.
DESMOND FITZGERALD.	CHARLES A. STONE.
CHARLES W. HUBBARD.	FRANCIS R. HART.
THOMAS L. LIVERMORE.	T. COLEMAN DU PONT.
GEORGE WIGGLESWORTH.	ARTHUR F. ESTABROOK.
JOHN R. FREEMAN.	JOHN M. LONGYEAR.
WILLIAM H. LINCOLN.	ERNEST W. BOWDITCH.
A. LAWRENCE LOWELL.	EVERETT MORSS.
JAMES P. MUNROE.	THEODORE N. VAIL.
WILLIAM L. PUTNAM.	WILLIAM ENDICOTT, JR.
WILLIAM CAMERON FORBES.	

Term Members.

Term expires March, 1914.

WALTER B. SNOW.
THEODORE W. ROBINSON.
CHARLES R. RICHARDS.

Term expires March, 1915.

FRANK W. ROLLINS.
EDWIN S. WEBSTER.
EDWARD CUNNINGHAM.

Term expires March, 1916.

ARTHUR WINSLOW.
HENRY HOWARD.
HENRY A. MORSS.

Term expires March, 1917.

EBEN S. STEVENS.
LOUIS A. FERGUSON.
ARTHUR D. LITTLE.

Term Expires March, 1918.

CHARLES T. MAIN.
CASS GILBERT.
CHARLES HAYDEN.

Representatives of the Commonwealth.

HIS EXCELLENCY, EUGENE N. FOSS, *Governor.*
HON. ARTHUR P. RUGG, *Chief Justice of the Supreme Court.*
DAVID SNEDDEN, *Commissioner of Education.*

¹Address correspondence to Professor Allyne L. Merrill, Secretary of the Faculty.

Committees of the Corporation.

Executive Committee.

RICHARD C. MACLAURIN. } *Ex Officio.*
FRANCIS R. HART. }
THOMAS L. LIVERMORE. FREDERICK P. FISH.
CHARLES A. STONE. EVERETT MORSS.
ELIHU THOMSON.

Finance Committee.

FRANCIS R. HART. GEORGE WIGGLESWORTH.
CHARLES W. HUBBARD. JAMES P. STEARNS.
ARTHUR F. ESTABROOK.

Committee on the Society of Arts.

FRANCIS H. WILLIAMS. HIRAM F. MILLS.
HOWARD A. CARSON. WALTER B. SNOW.
HENRY HOWARD.

Auditing Committee.

JAMES P. TOLMAN. WILLIAM L. PUTNAM.
EDWIN S. WEBSTER.

Nominating Committee.

THOMAS L. LIVERMORE. JOHN R. FREEMAN.
GEORGE WIGGLESWORTH. WILLIAM H. LINCOLN.
CHARLES A. STONE.

Trustees of the Museum of Fine Arts.

RICHARD C. MACLAURIN. ROBERT S. PEABODY.
EDWARD J. HOLMES.

Report of the President.

TO THE MEMBERS OF THE CORPORATION:

In accordance with the by-laws I now submit a report on the condition of the Institute, and, following the usual custom, I append reports from other administrative officers with reference to the work of their special departments.

CHANGES IN THE CORPORATION AND FACULTY.

Since the last annual meeting your Corporation has suffered the loss of a member by the death of Mr. J. B. Sewall. Mr. Sewall died in June last at the age of eighty-eight, and throughout the long span of his life he was interested in the cause of education. After a brief service in the Congregational ministry, following his graduation from Bowdoin College in 1848, he became Professor of Greek at Bowdoin and remained there until 1877, when he became head of the Thayer Academy in Braintree. During the period of his connection with your Corporation he took a keen interest in the growth of the Institute, and brought to the deliberations of this body an experience and a point of view of a kind that must always be a benefit to a technological school.

Your Corporation was greatly strengthened during the year by the addition of Messrs. Theodore N. Vail and William Endicott, Jr. The former, as President of one of the greatest public service corporations of the country, is in a position to know how much the welfare and convenience of the community depend on the adequate supply of well-trained experts in applied science. Apart from this he has long shown an active interest in education, and his keenness of insight and breadth of view will be of great

assistance in helping to shape the larger policies of the Institute. Mr. William Endicott, Jr., has been welcomed to your body, not only for his personal qualities and large experience in business, but especially as the bearer of a name that must always be held in honor by those who appreciate how much the Institute owes to the life-long devotion of the present senior member of your Corporation.

The only other changes in your Corporation have been those due to the expiration of the term of service of Messrs. James W. Rollins and Arthur T. Bradlee, both of whom signalized their term of membership by whole-hearted devotion to the interests of the Institute. The new term members elected in March last were Messrs. Gilbert, Hayden and Main, the last of whom has already served most acceptably as a term member of your Corporation.

Happily, within the year, there have been no changes in the Faculty due to death, but time moves forward inexorably and advancing years have occasioned the retirement of one professor—Professor Pope,—and the impending retirement of another—Professor Woodbridge,—both of whom have been held in the highest respect throughout a long period of service at the Institute. The former of these has retired, and the latter is about to retire, with a pension from the Carnegie Foundation for the Advancement of Teaching. Professor Pope's devotion to the Institute, his enthusiasm for his own specialty (chemistry), and his unusual sympathy for struggling students have combined to make him a teacher whose loss will be greatly felt. Professor Woodbridge has been a pioneer in applying science to the problems of heating and ventilation. His work in that field is but one of many illustrations of the rapid growth in the opportunities for service that are presented to the sons of Technology. Professor Woodbridge was a graduate of the Institute, and, before his day, whatever was done in the field of ventilation was done haphazardly and in an amateurish way. Now there is a large

profession devoting its energies to the solution of problems in ventilation and heating that vitally affect the conditions of our daily lives. While the Faculty has suffered, or is about to suffer, these losses, it has had some gains. In the Department of Architecture, the work formerly carried on by Professor Despradelle, has been entrusted to two professors—Williams and LeMonnier. Assistant Professor Williams, after a distinguished career at the Institute, ripened his experience by several years of study in Paris and Rome, and as an architect in this country. He has the qualities that make for successful teaching and may be expected to make the most of the great opportunity that is now presented to him. Assistant Professor LeMonnier comes to us from Paris, where at the *École des Beaux Arts*, he achieved great academic distinction. The first few months in a new school in a foreign land are necessarily trying months, but M. LeMonnier has already shown the power of adaptation to new conditions and has won the respect of his colleagues and the students by his enthusiasm and devotion to the Department of Architecture. Associate Professor Earle B. Phelps who, after being graduated from the Institute, did much to enlarge the prestige and extend the influence of its vigorous Department of Public Health, resigned the research professorship of Chemical Biology here in order to direct an important research laboratory of the United States government in Washington. His place has been filled by the appointment of Mr. Robert Spurr Weston as Assistant Professor of Public Health Engineering. Professor Weston, who is also a graduate of the Institute, brings to his Alma Mater the advantages of a wide experience as a consulting sanitary engineer. The Faculty has also been strengthened by the promotion from the ranks of instructors of Dr. Edward Mueller (Assistant Professor of Inorganic Chemistry) and Mr. J. W. Howard (Assistant Professor of Topographical Engineering).

Within the Faculty itself, the following well-merited promotions in grade have been made by your Corporation:—
Associate Professor F. A. Laws to Professor of Electrical Engineering.

Assistant Professor Earle B. Phelps to Associate Professor of Research in Chemical Biology.

Assistant Professor S. P. Mulliken to Associate Professor of Organic Chemical Research.

Assistant Professor M. S. Sherrill to Associate Professor of Theoretical Chemistry.

Assistant Professor G. E. Russell to Associate Professor of Hydraulic Engineering.

Assistant Professor L. E. Moore to Associate Professor of Structural Engineering.

Assistant Professor Ervin Kenison to Associate Professor of Drawing and Descriptive Geometry.

Assistant Professor N. R. George, Jr., to Associate Professor of Mathematics.

Assistant Professor L. M. Passano to Associate Professor of Mathematics.

Assistant Professor M. deK. Thompson to Associate Professor of Electro-chemistry.

THE STUDENTS.

As usual, the report of the Registrar contains interesting statistics with reference to the number, origin, distribution, etc., of the students. From this it appears that the number of students on November 1st was 1685, a gain of 74 over that on the corresponding date of last year, which was then the largest in the history of the Institute. This gain is distributed through the four different classes, but is greatest in the freshman class. The gain in different courses is most conspicuous in the cases of Chemistry and Mechanical Engineering. On looking at the distribution of the students, the most striking gain appears to be that in the representation from the Southern Atlantic States whence there has

been an increase of nearly fifty percent, and in the foreign students where the increase has been thirteen percent. It was pointed out in my last report that the Institute had nearly twice as large a proportion of foreigners as any other institution in the country, and if the present tendency be maintained it would appear that Technology is likely to move still further ahead of other institutions as regards the number of men who come from foreign parts to take advantage of the opportunities that are offered.

THE ALUMNI.

Your Corporation has no control over the alumni and no responsibility for their doings, but, in so far as their activities affect the present condition or future welfare of the Institute itself, some reference to those activities may not be out of place in this report. It is difficult to exaggerate the value of the support of the alumni in furthering the interests of their Alma Mater, and there is nothing in the educational system of America that so impresses the foreign observer as the extent and the character of the interest of the alumni in the institutions with which they are connected. There is nothing really comparable with this in any other country. Here in many cases alumni concern is more than an interest, it is a passion. The collective consciousness of the alumni of Technology developed somewhat slowly, but it is abundantly manifest to-day, and, fortunately, shows itself in ways that are highly beneficial to the Institute. It is not merely that Alumni Associations are springing up everywhere, although this can scarcely fail, in an indirect way, to advance the interests of Technology. What is especially gratifying is the fact that the alumni in large numbers are ready to make great sacrifices of time, of thought and of money in helping forward their Alma Mater. This spirit shows itself at every great gathering of the alumni and can not fail to be stimulated by the activities of the Technology Clubs Associated which was organized and set

in motion under such favorable conditions in New York early in this year. As specific evidences of the spirit to which I have referred, I would direct your attention to the work of four committees of the Alumni—The Alumni Fund Committee, The Student Housing Committee, The Walker Memorial Committee, and The Committee on Business and Engineering Administration. The work of the last three has led to the production of most lucid and able reports that can not fail to influence the policy of your Corporation and help it to solve some of the most important problems with which it is confronted. The work of the Fund Committee has not yet been described in a final report, for that Committee is still in the midst of its activities. The fact, however, that it has already secured more than half a million dollars as contributions to the funds of the Institute is convincing evidence that its work has been effective and can not fail to earn the gratitude of your Corporation—gratitude that will, in this case, be more than a mere lively sense of benefits still to come.

SOME EVENTS OF THE YEAR.

Of the events of the year, the one that stands out most conspicuously is the definite settlement of the plans for our new buildings following the appointment early in the year of Mr. William W. Bosworth as Architect, associated with Professor Knox Taylor, as Consulting Architect. Both of these architects are alumni of the Institute and are devoting themselves to the problems presented in the spirit of alumni. As in all matters of taste, there are likely to be differences of opinion with regard to the architectural forms that have been adopted in the solution of our problems. I believe, however, that the simplicity and the dignity of the style chosen will make an appeal to discerning minds; but whether this be so or not, I think there can be no doubt that the plan is one that lends itself admirably to the problems in hand,

especially to the difficult and fundamentally important problem of future expansion.

The strictly architectural problems presented by our new buildings appear from some points of view less important than the engineering problems. In the solution of these latter problems, the Institute has been especially fortunate in securing the coöperation of a number of specialists in foundations, structural design, heating and ventilation and the like, all of them alumni of Technology ready to give their Alma Mater the benefit of their experience on most favorable terms. I feel that we are peculiarly fortunate in having secured the services of the Stone & Webster Engineering Corporation as Construction Engineers. This selection was strongly recommended by a special committee of your Corporation—Messrs. Vail, duPont and Wigglesworth—and it is a constant pleasure to see how efficiently the officers of the Engineering Corporation are handling every detail of the complex problem that is presented.

Interest in the physical development of the Institute must not divert our attention from the great educational problems with which it is always confronted. The educational work of the year has been carried on as enthusiastically and effectively as ever by the Faculty, in spite of the extra load imposed upon them by the consideration of plans for new buildings. Not only has the regular work been carried forward, but provision has been made for new growth. Within the year there has been set up a new course in Industrial Physics as one of the options in Course VIII. This new course is intended to meet the increasing demand in various branches of industry for men with a sound knowledge of physics who have been trained to apply that knowledge to the problems of industrial life. It is a course that can not fail to be attractive to a considerable number of ambitious youth who realize the possibilities for useful service that such a course will open to them. In the Department of Electrical Engineering, an important forward

step has been taken by the setting up of an organization within the Department for carrying on research in this great branch of applied science. This establishment of a properly staffed laboratory for the conduct of such research has been made possible by the support of the American Telephone and Telegraph Company and of other corporations and public spirited individuals.

Within the year, an important step has been taken in the direction of making adequate provision for developing the science of aëronautics. In earlier years something had been done by way of a beginning, but the time seemed ripe for putting things on a more permanent basis. Through the active interest of the Secretary of the Navy, Mr. Jerome C. Hunsaker, of the Corps of Naval Constructors, has been detailed for service at this Institute. Mr. Hunsaker, who is a graduate of the Institute, has been attached to the Department of Naval Architecture and is to devote his main energies to coöperating with other members of the Institute's staff in developing courses of instruction that are designed to train aëronautical engineers and in promoting research in that branch of applied science. Immediately after his appointment here, he was despatched to Europe to visit the principal aëroplane and airship factories and aëronautical laboratories in England, France and Germany. He has recently returned with much information as to what is being done abroad and with a keen desire to stimulate advancement in this country. Mere descriptive lectures dealing with aërial flight in a general and popular manner would be out of place in the curricula of the Institute, although they might be appropriate to the activities of the Society of Arts. An aëronautical engineer can not be trained by such lectures. What he needs is carefully planned courses in the theory and practice of air-craft design. These courses may be offered as new options in existing courses or otherwise, but, in any case, to be worthy of the Institute, they must be at least as rigorous and exacting as any of the existing profes-

sional courses. To make this possible in a way worthy of the Institute's traditions, it will be necessary to have a properly equipped laboratory for experimentation and research in certain subjects not dealt with in the existing laboratories of the Institute, and it is hoped that means will be found to supply this need in the immediate future. Ten years ago this country was the leader in the art of flying. It has not, however, followed up this advantage by a systematic attack on the difficulties that have to be overcome if further progress is to be expected. It is now far behind the Old World in the equipment of laboratories with men and machinery necessary for thoroughgoing research and the Institute of Technology must do its part in making good this deficiency.

Another matter that has been occupying the attention of the Faculty during the year and is still under consideration by that body is the question of establishing a Course of Engineering Administration. This question was raised in very definite form by a report already referred to—the report of a Committee of the Alumni Council on a Course in Business Engineering. There has been a growing tendency for many years to encourage the attempts of the schools to pay special attention to the needs of the prospective man of business. This movement has been checked to some extent by the feeling among business men that aptitude for business is not a thing that can be acquired in the schools. It must be recognized, however, that objections of this kind have been made to every suggestion of giving professional training in a school. Men have said that it is impossible in this way to train doctors, or lawyers, or engineers, and that the only training worth anything is the training of experience. After so much discussion a clearer view should prevail. It is, of course, true that no one can be made successful either as a doctor or a lawyer or an engineer or a business man by training in a school if nature has not given him the necessary aptitude. The

only real question, however, is "Can the school help a man who has this aptitude, or would the time that he might devote to studies and pursuits designed to help him be better devoted to something else?" The conviction that something might be done to train the man of business has led in recent years to the establishment of schools of business or of commerce in many of our colleges and universities. There have been men who have advocated the establishment of such a school within this Institute, holding that the scientific spirit and the scientific method of attack that it is the special function of Technology to instil into the minds of its students would be a powerful aid to many business men. Whether this be so or not, there can be no doubt whatever that as business is organized to-day and especially as it is likely to be organized in the future, there must be many business men to whom a sound knowledge of certain basic facts and fundamental principles of engineering are indispensable. The report of the Committee to which I have referred concentrates attention on men of this class and recommends the establishment of a course specially designed to train men to be competent managers of businesses that have much to do with engineering problems. This is an important field that has scarcely been cultivated at all elsewhere and one that it seems eminently appropriate for the Institute to enter.

An accomplishment of the year that is of great prospective significance is the establishment of a School for Health Officers to be carried on by the Institute in coöperation with Harvard University. Technology was a pioneer in this field and could, doubtless, have continued to do splendid work for the benefit of society without any assistance from other institutions. It is only necessary, however, to examine the courses that are now offered by the joint school to see that the Institute has been greatly strengthened by the association with Harvard and to be impressed by the extraordinary wealth of opportunity that is now

presented to the students in this School,—a wealth of opportunity that neither institution acting independently could have afforded. The significance of the association lies mainly in the emphasis that it lays on the all-important fact that it is the primary duty of every educational institution to free itself from selfish points of view and to look exclusively at the good of the students that it can influence. It is significant, too, as proving that two entirely independent institutions can carry on a joint effort that calls for intimate association, and carry it on without friction or difficulty, provided only that each has a single eye to the welfare of the students, and through them to the good of society.

SOME PROBLEMS OF THE FUTURE.

One of the main sources of interest to any one connected with a successful institution such as this is that the institution is never at rest. Old problems are constantly being presented in a new form and new problems are arising continually. I should presume too long upon your patience were I to enter into a discussion of all the various problems that lie immediately ahead of us, but some of these problems are so pressing as to call for immediate mention and attention. One of these is the problem of dealing with the present property of the Institute so as to facilitate our movement to the new site. We have much valuable property in this neighborhood and naturally we should try to dispose of it so as to use the proceeds for carrying on the great educational work that lies before us. The importance of that work grows steadily as the years advance and there can be no doubt that the field of applied science that we have made peculiarly our own is going to be one of the most important, if not the most important, in the domain of education in the generations to come. It is a costly field to cultivate, and must become more costly, and we shall need all the financial support that we can get for

cultivating it properly. Our land and buildings in Trinity Place can doubtless be disposed of in the not distant future on reasonable terms, but as yet we are not in the position to answer the question "What are we to do with our Boylston Street property?" I need not take up your time by recounting the history of our acquisition of this property or by attempting to explain the uncertainties that surround our rights in that property to-day. At last there are signs of the coming day when we shall know exactly where we stand in this matter, for our petition to have all the matters in dispute cleared up authoritatively is now before the courts. Meanwhile, it might be prudent even before a decision be reached to give some thought to the question of what policy we should pursue in case of certain eventualities.

A problem equally pressing, if not more pressing, is the problem of making provision for the students, and to a certain extent for the Faculty on our new site. Within a short time we shall have two thousand men on that site, and we should do something to house them, and, if possible, provide them with meals and with facilities for social intercourse. The valuable reports from the Student Housing Committee and the Walker Memorial Committee already referred to embody practical suggestions as to how these problems should be solved, the only thing that stands in the way of such solution being the lack of the necessary means.

Another important problem of a different character is that presented by the steady growth in the number of our students. There have been some fluctuations in growth since the Institute began, but the forward movement has long been evident and it is apparent that we are now in the midst of a period of unusually rapid growth—a growth that is likely to be stimulated rather than retarded by our movement to a new site. What should be our policy with reference to increasing numbers? May we not be within

measurable distance of a time when it will be necessary to impose artificial restrictions on our growth lest we become too large for effective management?

Finally, there is the old problem of satisfying the growing demands on the financial resources of the Institute. This is a matter which is perennial in presidential reports and I appreciate the danger of making it stale by constant repetition. I feel, however, that at the present juncture we are face to face with an unusual danger. After a long period of very lean years, the Institute is at last coming into its own in the matter of financial aid, and coming into it so rapidly that the community may imagine that all its needs must now be satisfied. Under these circumstances, it is important that every member of your Corporation should realize the facts. In moving to a new site we have embarked on a policy of *trust in the future*. The successful carrying out of the plans to which we are committed demands the expenditure of many millions. It is true that some millions have been given, but much that has come to the Institute in recent years is ear-marked for special purposes that either do not assist at all or assist only indirectly in the fulfilment of the plans to which I have referred. We have scarcely enough money in sight to complete the educational buildings. When they are completed, they must be equipped and maintained, and the maintenance charges will necessarily be much higher than those of the relatively small plant that we have to-day. In addition to that, there are certain indispensable adjuncts of the educational buildings for which up to the present nothing has been forthcoming. Our buildings must be lighted and heated and this will call for a well-equipped power house that will cost a very large sum. Dining-rooms of some kind should be provided for the students and the Faculty, an athletic field and gymnasium are practically indispensable; and a dormitory system is urgently needed. In addition to this the grounds must be laid out, simply no doubt, but none

the less consistently with the dignity of the institution. We have scarcely anything as yet for any of these purposes. While all this is to be done we must not be permitted to halt our policy of paying better salaries and thereby securing the services of the best teachers that are available.

In such circumstances it should be evident that the Institute needs the strongest support to-day if she is to go forward as she should. There can, of course, be no thought of backward movement or of rest.

RICHARD C. MACLAURIN.

Reports of Administrative Officers.

REPORT OF THE SECRETARY OF THE FACULTY.

The schedule of studies for the new option in the Course in Physics, known as Industrial Physics, has been approved by the Faculty, and has become operative for second-year students this year.

Summer work in Chemistry (Qualitative Analysis) for students in the Courses in Chemistry and Chemical Engineering was required for the first time during the past summer. This work is taken in the summer between the first and second years, and the students of the present second-year class who are enrolled in the above Courses are now working in accordance with the new schedules which were contingent upon this required summer work.

A special committee has had under consideration the question of the amount and character of the English to be required of foreign students, and the Faculty has approved the following recommendation of this committee: "That non-English speaking aliens who in the opinion of the English Department are not fitted to do the regular composition work of the first year, but who satisfactorily complete the elementary course in English given to foreign speaking students, shall in their second year be given a course in continuation of this elementary course which shall occupy the same length of time as the present Sophomore course in English Literature, but be adapted to the needs and the ability of the class. The satisfactory completion of these two courses shall be accepted in the case of such students, as fulfilling the English requirement of the first and second years."

The Institute Calendar has been very carefully considered

by a special committee of the Faculty, and, on their recommendation, certain modifications of the present calendar have been adopted, to go into effect in September, 1915. These changes provide that in each term there shall be ninety full working days, exclusive of the examination periods. As in the present calendar, a vacation of six days is provided at Christmas; one of six days between the first and second terms following the mid-year examination period; and a recess of four days including the 19th of April. The mid-year examination period is lengthened by one and one-half days. As a result of the changes, the school year in general will begin three days earlier in September than in accordance with the present calendar, and Commencement Day will come four days later.

In June, 1913, the Faculty recommended one student for the degree of Doctor of Philosophy; twenty for the degree of Master of Science; and two hundred and sixty-eight for the degree of Bachelor of Science.

Two hundred and twenty-one students who had attended other colleges for one year or longer, were admitted to the Institute in February and October, 1913. Of these one hundred and twenty-eight have already graduated from their previous college.

ALLYNE L. MERRILL,
Secretary.

REPORT OF THE DEAN.

With the removal of the Institute to the Cambridge site the problem of fraternity life assumes new importance. It will, therefore, be interesting to review the situation as it now exists at the Institute.

Although chapters of fraternities were established at the Institute of Technology as early as 1873 it was not until 1885 that their influence began to be felt among the students generally. In the very earliest days fraternities were not

looked upon with much favor by the Faculty or administrative officers but no official action was taken with reference to them; in fact, the Faculty of the Institute has never taken any steps tending to influence or regulate student life outside of the laboratories and recitation rooms.

The fraternities were the outgrowth of a real need felt by the undergraduate himself, and the growth of the fraternity system at the Institute has been practically unassisted and unhampered by Faculty action since its beginning. At first there was a tendency for the student to regard his fraternity as a club house which gave him greater license and freedom than any hotel or boarding-house. It soon began to dawn upon him, however, that the exigencies of work at the Institute were gradually reducing the membership of his fraternity; indeed its very existence seemed to be threatened. The result was that rules of conduct were introduced, restrictions were imposed upon the younger men by their seniors, and the fraternity as a whole began to assume the responsibilities and duties usually delegated to college proctors. As the years went on, the Alumni increasing in numbers, were aroused to a serious interest in the welfare of their different chapters. They helped them in material ways and by advice; they enabled the undergraduates to choose houses suited to their needs, and to either purchase them or rent them on long leases. Some of the Alumni later became members of the Instructing Staff and were still welcomed by the undergraduates to the fraternity houses and several of the chapters elected older professors as honorary members of their chapters, thus securing interest and helpful assistance in the conduct of their affairs.

At the present time there are sixteen chapters of the general Greek Letter fraternities at the Institute and four local fraternities. The total membership of all the fraternities at the Institute last year was four hundred and forty-nine.

The fraternity man at the Massachusetts Institute of Technology has already taken a long step towards self-government and responsibility, and he has, to a certain extent, secured graduate and Faculty interest and assistance. I, personally, have no hesitancy in saying that at the present time a new student coming to Boston from a distance without friends or acquaintances in the city, lives a saner and more healthful existence in a fraternity house than in the majority of boarding-houses or bachelor hotels. He at least has secured the close companionship of men of like interests and ambitions, and has been freed from the dangers of a purely selfish and solitary life. He often develops a spirit of loyalty and helpfulness to others, and is forced by general student sentiment to take his share in class and Institute affairs.

The danger of fraternity life arises principally from its clannishness, which can easily develop into snobbishness. This tendency should be counteracted by encouraging and developing in the men a greater desire to take part in the general Institute life, and to do this should be made a point of honor and a proof of loyalty to his fraternity.

At the present time there is a general investigation going on in the college world in regard to the value of fraternity life. This general criticism is going to be helpful, and while I am pleased to state that the chapters at Technology are often referred to with pride at the General Conventions of these fraternities, I do not wish to be understood as stating that our chapters are above criticism. They have faults and as a whole their standard of scholarship is not as high as it should be, but they have helped to develop at the Institute a kind of student government and student responsibility which can be counted upon to help us in the new life on the Cambridge side of the Charles River.

It would seem to me wise to encourage them to live upon the campus; to grant them leases of separate sections of the dormitories; and to allow them the same freedom in

the management of their affairs at the new site that they have now in the City of Boston. Such fraternity units on the campus might well form the basis for similar groups of non-fraternity men.

Personally I feel that we are beginning to develop among the students a real sense of responsibility for their actions and their success in college work and college life. This, to my mind, is one of the most important parts of college training.

Non-fraternity men are in the large majority at the Institute and the balance of power in a popular vote is always with the non-fraternity man. It is, therefore, very encouraging to note the recent popular vote confirming the power of the student's Institute Committee. It is also a hopeful sign of a healthy student life outside the class-room to note the growth and activity of all the different engineering and other course societies, the Cosmopolitan Club and the Technology Christian Association.

The Technology Christian Association, now including some three hundred and seventy men in its membership, has during the past year, in addition to holding its weekly noon meetings at the Union, organized a very complete system of student advisers. Some ninety upper-class men volunteered for this work and were of great assistance in the early days of student registration. The Dean's Office coöperated with the Technology Christian Association in the selection of student advisers, and sent a note to each first-year man giving the name of the student assigned to him as an adviser. This note also stated that on his arrival and upon his request, a Faculty adviser would also be assigned.

Reports of the various Faculty Committees of which the Dean is Chairman, have been made to the Secretary. It may be of interest, however, to note that there were two hundred and seventeen requests for graduates received by the Employment Committee during the past year. This number does not include the requests sent directly to the

heads of the different departments. The Employment Bureau for undergraduates was carried on in the same manner as in the previous year. Ninety-two students were recommended to summer positions by the office and a much larger number secured positions for themselves.

The report of the Committee on Foreign Students shows an increased number of men whose homes are in foreign countries and comments favorably on the recent action of the English department in establishing a special section in first year English for foreigners.

An abstract from the report of the Committee on Physical Training is given as follows:—

“The classes in Physical Training began November 11, 1912, and closed April 18, 1913. During the first term there were 323 first-year men; in the second term 304. Fourteen were excused on account of physical ailments and 13 over 21 years of age were excused on that account. Fifty-nine students took track athletics in place of gymnastic exercise; 19 wrestling; 13 rowing in the second term; 8 basket ball; and 5 hockey. Forty-one men failed to pass the requirements in Physical Training and will have to repeat the work this year. In most cases this failure was due to unexplained absences.”

The Cabot Medals as usual were awarded to the five students who made the greatest improvement in strength, measurements and general gymnastic efficiency as indicated by the physical examinations and as shown in regular class work. They were as follows: William T. Knieszner '16, Harold E. White '16, Carlton J. Spear '16, Herbert H. Porter '16, Earl R. Mellen '16. Those receiving Honorable Mention were:—George D. Anderson '16, Warren A. Strangman '16, Harry L. Lavine '16, Howard P. Claussen '16, Horace R. Bennett '16.

Mr. Frank M. Kanaly has been Director of Physical Education and was ably assisted last year by Mr. George T. Rooney of the Class of 1915.

The statistics compiled in this office with reference to the health of students show almost identically the same conditions as the previous year, the total number of illnesses reported in 1911-12 being two hundred and six and in 1912-13, two hundred and seven. Seventy of these cases were, however, of rather a trivial nature. In the fourth-year class, numbering three hundred and forty-two students, there were thirteen reports of illness and one death, that of Mr. Thomas E. Senior on April 15, 1913. In the third-year class, numbering four hundred and five students, there were thirty-one reports of illness. In the second-year class, numbering three hundred and ninety-eight students, there were fifty-three reports of illness during the year and one death during the past summer, that of Mr. Steven T. Woodbridge. In the first-year class, numbering three hundred and eighty-nine students, there were one hundred and ten reports of illness and one death, that of Mr. Louis L. Connelly on June 3, 1913.

ALFRED E. BURTON,
Dean.

REPORT OF THE MEDICAL ADVISER.

Four lectures, or conferences, have been held with the Freshman Class on successive Wednesdays during the first four weeks of college work. The subjects treated were (1) Sexual Hygiene, (2) Physiology and Hygiene of Digestion, (3) Personal Hygiene (hair, teeth, skin, baths, etc.), (4) Physical Exercise and "First Aids."

The above lectures were designed to cover such points as could be easily understood by the students and at the same time to offer a working basis by which they could put the various topics into practice.

I would suggest, for another year, that this lecture hour be given a definite place in the curriculum, thus guaranteeing full attendance at all four conferences.

The office in the Lowell Building has been open to the students on every Monday and Thursday from four o'clock on and has been fully attended, the number of office calls ranging from seven to fifteen daily. The inquiries made ranged from requests for information relative to specialists for the eyes, throat, etc., to questions of diet, exercise, etc. Many small dressings, and minor operations have been performed. There have been two or three cases of a rather serious nature where the lack of an infirmary placed the students as well as the medical adviser in a trying position. Through the kind assistance of classmates and roommates however, the situations have been, fortunately, solved.

It seems that in the New Technology provision should be made for just such cases as I have referred to. In conferences with physicians of other universities, I find that they all feel the necessity for some kind of infirmary facilities, and I sincerely trust that our model institution across the Charles will not lack this very important feature.

J. ARNOLD ROCKWELL,
Medical Adviser.

REPORT OF THE LIBRARIAN.

In the previous Report mention was made of the Dering Library, which had been presented to the Institute by the American Telephone & Telegraph Company, through the influence of Mr. Theodore N. Vail, president of that Company and member of our Corporation. Since then the ninety-six cases containing the collection have been opened and a rough list of their contents made on standard catalogue cards. The list is complete except for the pamphlets in four cases, estimated to contain about 7,500 pamphlets. At the same time an enumeration was made, showing the number of volumes bound and unbound, and of the unbound volumes the sizes were noted to serve as an estimate for

the cost of binding. The result of the enumeration is as follows:—

TABLE I. CONTENTS OF THE DERING LIBRARY.

Bound volumes	
Books	6,222
Periodicals	264
	<hr/>
Total bound volumes	6,486
Unbound volumes	
Books	5,934
Periodicals	4,189
	<hr/>
Total unbound volumes	10,123
	<hr/>
Total volumes	16,609
Pamphlets (estimated)	17,795
	<hr/>
Grand Total	34,404

Under the conditions of this enumeration, it was impossible to make an accurate count of the unbound periodicals because they were packed so that often parts of the same volume would be in different cases. Where this has occurred the same volume may have been counted twice, and this has led probably to an overestimate in the number of unbound volumes of periodicals. The pamphlets were carefully counted, except those in the four cases mentioned above, where the number was estimated from previous experience. Besides the books, there are in the collection about 450 photographs. Before the enumeration and listing were completed there were removed from the storehouse under direction of Professor Jackson, 2,025 bound volumes, 245 unbound volumes, and 631 pamphlets. These have been placed in Room J, Lowell Building, one of the offices adjoining the Electrical Laboratory, and arranged by subjects on shelves in that room. The cards from the rough list have been arranged in corresponding order to form a shelf list. These books will thus be available for use, pending the completion of a proper catalogue.

From the list we are now extracting the cards for periodicals and arranging them by sets, so as to determine the degree of completeness of the series of periodicals. This is being done with the view of completing sets and arranging the volumes for binding.

As the Dering Library has not yet been fully incorporated into the Library of the Institute, it is not taken into consideration in estimating the total additions to the Library for the year 1912-13. These have totaled 4,570. Their sources, whether from purchase, binding, or gift are shown in the following table:—

TABLE II. TOTAL RECEIPTS, 1912-13.

By purchase	1,188
By binding	864
By gift, volumes	1,318
Pamphlets and maps	1,200
	2,518
Total	4,570

The cost of these additions to the Library, as represented by bills approved by the Librarian, is shown by the following table:—

TABLE III. BILLS APPROVED, 1912-13.

Accessions by purchase	\$3,552.63
Accessions by binding	1,350.72
	4,903.35
Subscriptions to periodicals	2,039.93
	6,943.28
Office supplies	330.63
Total	\$7,273.91

This estimate of the total cost, \$7,273.91, does not include the cost of placing new books upon the shelves or the cost of maintenance.

The net increase in the several Libraries of the Institute, after deducting losses and the like, amounts to 3,188 volumes, 1,053 pamphlets, and 139 maps. The total contents of the Libraries, June 30th, 1913, was 98,716 volumes and 28,431 pamphlets and maps. The distribution of these in the several Libraries of the Institute is shown in the following table:—

TABLE IV. TABLE OF THE NET INCREASE WITH THE COST OF THE SAME DURING THE YEAR 1912-13, AND THE TOTAL CONTENTS OF THE LIBRARIES OF THE INSTITUTE, JUNE 30, 1913.

LIBRARIES.	NET INCREASE.				TOTAL CONTENTS.	
	Volumes.	Pamphlets.	Maps.	Cost.	Volumes.	Pamphlets and Maps.
General Library:						
General	393	128	..	\$167.99	8,464	5,461
English	5	....	..	12.95	3,541	40
Military Science . . . . .	....	....	..	.....	367	9
Walker Memorial . . . . .	....	....	..	.....	485*	.....
Other Depts.	51	....	..	24.01	130	1
Totals General Library . .	449	128	..	\$204.95	12,987	5,511
Architecture	105	10	..	349.11	4,837	298
Biology	107	101	9	220.23	4,121	1,303
Chemistry	441	230	..	978.64	13,319	3,529
Elec. Eng'g	156	21	..	277.11	2,266	134
Engineering.	585	196	..	922.15	17,595	5,958
Geology	227	74	127	291.42	4,971	3,731
History and Econ.	466	85	..	435.92	16,059	4,307
Margaret Cheney Room . . . . .	....	....	..	23.65	867	15
Mathematics	117	15	..	232.12	2,399	346
Mining	218	129	3	426.59	5,926	1,119
Modern Lang.	55	1	..	32.61	2,016	59
Naval Arch.	37	—4	..	166.64	1,811	534
Physics	225	67	..	342.21	9,542	1,587
Totals	3,188	1,053	139	\$4,903.35	98,716	28,431

* Kept in the Reading Room of the Technology Union.

The process of cataloguing new books involved writing 5,229 cards, which were added to the General Catalogue. A duplicate of each of these was added to the catalogue of the Departmental Library concerned.

The total number of serial publications received during

the year has been estimated with more than usual care, and is found to amount to 1,143, involving a total cost estimated at \$3,034.90, of which \$2,109.38 is chargeable to the Periodical Account. The number of periodicals and other serials received in the several Departments, and the estimated costs are shown in the following table:—

TABLE V. PERIODICALS AND OTHER SERIAL PUBLICATIONS RECEIVED DURING THE YEAR 1912-13, CLASSIFIED BY DEPARTMENT AND METHOD OF PAYMENT.

LIBRARIES.	NUMBER RECEIVED.			Totals.	ESTIMATED COST.		Totals.
	Period. Acct.	Dept. Acct.	Gifts.		Period. Acct.	Dept. Acct.	
General	34	16	75	125	\$136.50	\$32.12	\$168.62
Architecture	28	4	11	43	144.19	12.20	156.39
Biology	36	16	19	71	332.71	59.72	392.43
Chemistry	42	49	46	137	277.60	230.63	508.23
Electrical Eng'g.	24	18	12	54	99.66	68.68	168.34
Engineering	75	55	110	240	277.97	148.24	426.21
Geology	22	11	21	54	143.38	51.36	194.74
Political Science	44	39	75	158	129.18	92.31	221.49
Margaret Cheney Room . . . . .	...	8	1	9	.....	25.00	25.00
Mathematics	17	4	5	26	83.31	7.55	90.86
Mining	36	20	39	95	167.60	74.60	242.20
Modern Languages	19	...	2	21	86.50	.....	86.50
Naval Architecture	9	13	6	28	28.00	65.36	93.36
Physics	31	14	37	82	202.78	57.75	260.53
	417	267	459	1,143	\$2,109.38	\$925.52	\$3,034.90

Our system of departmental libraries makes necessary a certain amount of duplication of periodicals, and it may be of some interest to know how much this feature of our library system is costing us. It is found that there are thirty-seven periodicals of which we take more than one copy, and of ten of these we receive three or more copies. The duplicates received number forty-eight, and the cost of duplication is \$270.

The work of the office, during the year, involved the issue of 1,069 orders for the purchase of books and 1,357 orders for binding. The expenditures for binding for the various

departments were as follows, the total amounting to \$1,350.72.

TABLE VI. SPENT FOR BINDING, 1912-13.

Architecture	\$157.80
Biology	27.70
Chemistry	273.68
Electrical Engineering	77.53
Civil Engineering	172.21
Mechanical Engineering	81.37
Geology	122.40
Economics	64.00
History	9.05
Mathematics	30.95
Mining	142.10
Modern Languages	1.50
Naval Architecture	23.35
Physics	100.23
General	66.85
<hr/>	
Total	\$1,350.72

Some indication of the use made of the libraries by students and others is afforded by the returns of books lent for home use, in a few departments where records have been kept. The returns are given below:—

TABLE VII. CIRCULATION.

Architecture	books	4,457
	photographs	2,876
		<hr/>
		7,333
Chemistry		2,473
Engineering		1,838
Mining		394
Physics		1,181

One of the duties of the Librarian has been to represent the Institute as a member of the Board of Directors of the Boston Coöperative Information Bureau. At the time of the previous report, the Librarian was serving as president of the Bureau. His term of office in that capacity expired in January, 1913, and he was succeeded by Professor Alfred C. Lane of Tufts College. Continuing as a

member of the Board of Directors, the Librarian has attended several meetings of that Board, and numerous committee meetings. The object of the Bureau, when established, was to serve as a mutual clearing house for information in regard to sources of knowledge. The co-operative feature, however, has not proved to be a fruitful one. The Bureau has been found to be most useful to engineers, and they are not content with information as to the sources of knowledge, but wish to have furnished to them the knowledge which they are seeking. For this purpose, the services of a paid investigator have been placed at the disposal of inquirers, and for this work, additional fees are charged. The paid service of the Bureau, which is commercial in its aspect, is apparently to overshadow the mutual relations. These changes in the character of the Bureau may eventually necessitate a readjustment of the relation between the Bureau and the Institute of Technology.

An increasing interest in the Library has been manifested by undergraduates of the Institute, as shown by gifts of books. Last year we had the pleasure of recording a gift of books for the Summer Camp from the Civil Engineering Society. The year 1912-13 has been made notable by two similar gifts. The first was from the Chinese Club, and consists of 216 volumes in Chinese, comprising the History of the Dynasties, 200 volumes; The Abridged Chronology from 2000 B.C. to the beginning of the Christian Era, eight volumes; and four other books. The second gift, the Catholic Encyclopedia, fifteen volumes, was from the Catholic Club assisted by four other gentlemen.

A notable addition to the portraits deposited in the General Library is a marble bust of Dr. Jacob Bigelow (1787-1879), who was Rumford Professor and Lecturer on the Application of Science to the Useful Arts in Harvard University; Professor of Materia Medica in the Harvard Medical School, and well known as a botanist. He was

the author of an important work entitled *The Elements of Technology*, and; because of his interest in this subject, and in the aims of the Institute, he was elected Vice-President of the Massachusetts Institute of Technology, and served in that capacity from the founding of the Institute until the government was reorganized after the opening of the school. The bust is given by his grandson, Dr. William Sturgis Bigelow, and was cut in marble, under his direction, by Mr. Frank C. Recchia, from the original cast from the clay modeled by the well-known sculptor, Henry Dexter.

From the Carnegie Institution of Washington have been received seventy-four of their publications, completing our set; and the Institute has been placed on the mailing list to receive future publications when issued. We have also received from the Class of 1913 a copy of the *Senior Portfolio 1913*, and from the Class of 1914, *Technique 1914*. The Honorable Andrew J. Peters and Senator John W. Weeks have been uniformly kind in obtaining for the Institute such of the United States Public Documents as we have needed. Some of the other gifts are noted below.

DONOR.	GIFT.
F. G. Benedict	Benedict, <i>The Composition of the Atmosphere.</i>
C. M. Spofford.	Spofford, <i>The Theory of Structures.</i>
F. Prym and G. Rost	<i>Theorie der Prym'schen Funktionen erster Ordnung.</i>
Roger W. Babson	<i>Stocks and Bonds.</i>
A. H. Gill	Lovibond, <i>Measurement of Light and Color Sensations.</i>
Cecil H. Peabody	<i>Record of American and Foreign Shipping.</i>
Chas. P. Smith	Imbeaux, <i>L'Alimentation en Eau et l'Assainissement.</i>
Class of 1901	<i>Decennial Record 1901-1911.</i>
G. L. Raymond	<i>Suggestions for the Spiritual Life.</i>
F. L. Greeno	Obed Hussey, <i>who of all inventors made Bread Cheap.</i>
C. C. R. Fish	Brestowski, <i>Handwörterbuch der Pharmacie.</i>
C. R. Cross	Watson, <i>General Physics.</i>

DONOR.	GIFT.
C. R. Cross	Hopkins, Experimental Science.
V. Y. Bowditch	Life and Correspondence of Henry Ingersoll Bowditch.
General Electric Co., Research Laboratory	Collins, Commercial Electric Testing.
A. I. Frye	Frye, Civil Engineers' Pocket-Book.
W. E. Carson	Transactions of the National Lime Manufacturers' Association 1903-1912.
D. R. Dewey	Marsh, Taxation of land values in American Cities.
“ “	McMohan, Women and Economic Evolution.
“ “	Turner, Barbarous Mexico.
“ “	Applied History. vol. 1 of Iowa, Applied History Series.
“ “	Brindley, History of Road Legislation.
Hon. Geo. A. P. H. Duncan	Institution of Civil Engineers, Proceedings.
“ “ “ “	Iron and Steel Institute, Transactions.
“ “ “ “	Institution of Naval Architecture, Proceedings.
Associazione Elettrotecnic Italiana	Descrizione de una Macchinetta Elettromagnetica del Dr. Antonio Pacinotti.
Secretaria de Sanidad y Beneficencia, Cuba	Selected Papers, of Carlos J. Finlay.
S. M. Gunn	Ricketts, Infection, Immunity, and Serum Therapy.
“ “	Brill, Psychanalysis.
P. G. Stiles	Stiles, Nutritional Physiology.
J. R. Freeman	Report on Hetch Hetchy Water Supply for San Francisco, 1912.
M. le Baron d'Estournelles de Constant, Paris	Les États-Unis d'Amérique 1913.

ROBERT P. BIGELOW,
Librarian.

REPORT OF THE REGISTRAR.

There is a marked increase, this year, in the registration as the catalogue contains the names of 1685 students, the largest number in the history of the Institute. There is a gain in each of the four classes, in the number of new students, in the number of students who are college graduates, and in the number of students who have come to the Institute after spending a year or more at another college, in the number of students from the North Atlantic and South Atlantic States, and in the number of foreign students. There is also a gain in the professional Courses, in Mechanical Engineering, Chemistry, Physics, Sanitary Engineering and Naval Architecture.

Among the classes the gain in the first year class, from 380 to 415, is the largest. In the case of last year's junior class the gain from those who have entered from other colleges has made the present senior class larger than it was in its third year. It is interesting to note, however, that 87 per cent. of the class returned this year to be seniors.

The number of new students this year is slightly larger than that of last year, but at the same time the percentage of the student body who have returned to the Institute to continue their work is greater than before. Of the new students who have come to the Institute this year the number that have entered from other colleges is 32 per cent., a gain of 2 per cent. over last year, so that there is an increase in the proportion of new students from other colleges.

This year the number of the new students from other colleges who have entered the third year class is considerably larger than the number entering any other class. Twice as many as last year have come from other colleges for graduate work here.

Once more there is a gain in the number of college graduates among our student body. This number, has risen

since last year from 230 to 245, making 14.5 per cent. of the whole student body. The increase from 430 to 479 students coming to the Institute from other colleges after at least a year there has raised the per cent. of these students from 27 to 28.4 per cent. of the registration.

The increase, geographically, is from the North Atlantic States, from the South Atlantic States, and from foreign countries. The increase from the South Atlantic States is from 45 to 66, or an increase of 47 per cent., in this district. There is a marked increase in the number from the District of Columbia, from Maryland, North Carolina, South Carolina, and Florida. From the foreign countries the greatest increase is, once more, from China; the number has risen from the 37 of last year, to 42. The total number of foreign students has risen from 100 to 113. The percentage of students from Massachusetts is 55.5 per cent., practically the same as for the last five years.

In the professional Courses the gain in the number of students is greatest in Mechanical Engineering where the increase is from 243 to 279. There are gains also in the Courses in Architecture, Chemistry, Biology and Public Health, Physics, Sanitary Engineering, and Naval Architecture. The percentage gain in the Department of Chemistry is 30 per cent.

The number of women students has dropped again, and we have now but 12 women students studying at the Institute. Three of them are classified students, one is in the second year studying Architecture; one in the third year studying Chemistry; and one in the fourth year, a candidate for graduation in the Department of Chemical Engineering. Another is an unclassified third year student, another an unclassified student in Architecture, another in Chemistry, while five are special students.

The total number of the instructing staff has risen from 254 to 272. In spite of the fact that the number of students has increased, the ratio of students to instructors

is still low. Not taking into account the nineteen lecturers, the ratio is now 6.7 to 1, a drop of one-tenth since last year.

The amount of undergraduate scholarship assistance given during the school year of 1913 from the Institute funds was \$23,255 and the number of students aided from these funds numbered 207. Aside from the Institute awards there were 99 students aided by the state alone. The number receiving state aid or Institute aid, or both, was 306, which made the ratio to the total number of students 1 to 5.3 or 19 per cent. of the whole number of students at the Institute.

During the past year, while collecting data for the plans for the new buildings a study has been made of earlier assignments of exercises to recitation and lecture rooms. Since the building of the Lowell Building in 1902, there has been no increase in the number of these rooms, but, on the contrary, in spite of the gradual increase in registration, the number of recitation rooms has been diminished by the assignment of some recitation rooms to the departments for offices and laboratories. To compensate for this loss, and because of the marked increase this year in the registration and therefore in the demand for rooms, one of the recitation rooms has been divided into four offices in order that the rooms occupied by four instructors need not be used for consultation purposes or offices by these men. This has permitted the assignment of other exercises than those of these instructors to three of these recitation rooms. This, however, has not completely solved the room scheme problem and two of the larger recitation rooms of the Lowell Building are about to be divided into halves to provide additional rooms for classes that do not need the large floor area that these two larger rooms afford. Other rooms seemed not to be available for division so that any increase in the demand for recitation rooms, it would seem, can be solved only by arranging the time of recitations, and perhaps lectures, more frequently in the after-

noon hours. There has in the past few years been a slight increase in the use of afternoon hours for recitations, or lectures, but if the number of students for next year should increase, in a greater proportion than this year, it would seem to be necessary to have an additional number of recitations assigned to the afternoon and laboratory exercises assigned to the forenoon hours in order to provide proper room assignments.

From the study made of the room scheme it has been found that the average use of a recitation or lecture room is nineteen hours per week.

The usual tables of statistics are submitted herewith.

THE CORPS OF INSTRUCTORS.

	1909-10.	1910-11.	1911-12.	1912-13.	1913-14.
Professors	**44	**45	**41	**56	**56
Associate Professors	14	20	17	16	23
Assistant Professors	32	31	33	35	34
	—90	—96	—91	—112	—113
Research Professors			4	16	18
					—131
No. counted twice				11	17
Faculty	90	96	95	112	114
Instructors	69	66	64	67	74
Assistants	51	55	50	49	54
					—128
Faculty, Instructors and Assistants	210	217	200	228	242
Research Associates	12	8	5	*4	3
Research Assistants	1	5	6	7	*10
					—*13
Lecturers.	18	21	25	16	19
Total members of staff	241	251	245	254	272

* One is also an Instructor. † One is also an Assistant.

** Including three non-resident Professors.

TOTALS OF THE SAME CLASSIFICATION FOR EIGHT YEARS.

YEAR.	ENGINEERING COURSES.										Total of Engineering Courses.	Architecture.	SCIENCE COURSES.				Total of Science Courses.	General Science.	Total of upper three years.*
	Civil Engineering.	Mechanical Engineering.	Mining Engineering.	Electrical Engineering.	Chemical Engineering.	Sanitary Engineering.	Naval Architecture.	Naval Construction.	Electro-chemistry.	Chemistry.			Biology.	Physics.	Geology.				
1906-07	210	214	100	193	55	32	43	18	—	865	102	51	10	18	2	81	0	1,048	
1907-08	210	227	118	202	59	39	37	16	—	908	84	53	17	21	0	91	2	1,085	
1908-09	197	197	104	209	71	52	41	13	—	884	91	60	20	19	2	101	4	1,080	
1909-10	207	204	99	203	84	60	41	14	14	926	109	44	22	4	1	71	4	1,110	
1910-11	220	198	90	210	128	46	26	9	26	953	113	44	19	7	0	70	2	1,138	
1911-12	217	214	79	203	129	57	19	8	35	961	112	56	20	4	2	82	3	1,158	
1912-13	212	243	50	201	149	55	29	6	42	987	127	60	33	5	2	100	4	1,218	
1913-14	209	279	37	196	141	65	31	7	38	1,003	130	78	36	12	3	129	3	1,265	

* First year students do not elect their courses until after this report is presented.

NUMBER OF STUDENTS PURSUING CERTAIN LEADING BRANCHES OF STUDY.

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.	Total Student Hours per week.
Chemistry	416	139	150	131	836	6,601
English	395	332	54	—	781	1,581
Geology	—	10	110	19	139	555
History and Economics	—	300	400	96	796	2,154
Languages	453	309	97	—	859	1,913
Mathematics	452	375	191	5	1,023	3,330
Physics	—	391	331	56	778	2,180

STATISTICS OF ADMISSION.

	Classified.	Unclassified.	Total.
Admitted clear	161	2	163
“ with one condition	64	20	84
“ with more than one condition	37	37	74
“ on examination	262	59	321
Total First-year Class	309	106	415
Admitted but did not enter			36
Candidates at June Entrance Examinations			685
Candidates in September for Entrance and Advanced Standing Examinations			338
Certificates of the College Entrance Examination Board submitted.			131

TOTAL REGISTRATION AND NUMBER OF NEW STUDENTS FOR TEN YEARS.

YEAR.	(1) Total No. of Students.	(2) No. of Students in the Catalogue 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 classified First-year Students.	(5) No. of New Students not of the regular First-year Class.
1902-1903	1,608	949	659	433	226
1903-1904	1,528	1,042	486	249	237
1904-1905	1,551	986	575	295	280
1905-1906	1,466	984	482	213	269
1906-1907	1,397	862	535	272	263
1907-1908	1,415	888	527	273	254
1908-1909	1,462	868	594	323	271
1909-1910	1,479	890	579	317	262
1910-1911	1,506	944	562	283	279
1911-1912	1,559	932	627	312	315
1912-1913	1,611	984	627	310	317
1913-1914	1,685	1,049	636	295	341

NEW STUDENTS FROM OTHER COLLEGES BY YEARS.

CLASS JOINED AT INSTITUTE.	Years Spent at College.				Total.
	One.	Two.	Three.	Four, or more.	
First Year	22	6	3	8	39
Second Year	14	10	7	18	49
Third Year	—	12	10	65	87
Fourth Year	—	—	1	12	13
Graduate Year	—	—	3	11	14
Total	36	28	24	114	202

GRADUATE STUDENTS.

American Colleges and Universities Represented.

	1911-12	1912-13	1913-14		1911-12	1912-13	1913-14
Alabama	1	2	2	Charleston	—	—	1
Alabama Polytechnic Institute	—	—	1	Chicago	—	1	1
Allegheny	—	1	1	City of New York	3	4	1
Amherst	2	3	7	Clark	—	1	4
Baldwin	—	—	1	Clemson Agricultural	—	—	1
Bates	1	3	3	Colby	1	1	2
Baylor	1	1	1	Colgate	—	—	1
Beloit	—	2	3	Colorado	2	1	—
Boston College	2	4	2	Colorado School of Mines	—	1	—
Boston University	3	3	2	Columbia	—	1	2
Bowdoin	2	2	4	Cornell	2	1	—
Bradley Polytechnic Inst.	1	—	—	Creighton	—	—	1
Brown	3	3	4	Dalhousie	1	—	1
Bryn Mawr	1	1	—	Dartmouth	6	9	7
Bucknell	—	—	1	Denison	2	2	2
California	2	—	1	De Pauw	1	—	—
Canisius	2	2	—	Drake	1	2	1
Case School of App. Science	—	1	—	Franklin and Marshall	—	1	1
Central	1	—	—	Furman	—	—	1

GRADUATE STUDENTS—Continued.

American Colleges and Universities Represented.

	1911-12	1912-13	1913-14		1911-12	1912-13	1913-14
Georgetown	2	1	2	Pennsylvania Mil-			
George Washington	1	—	—	tary	2	2	1
Georgia	1	—	1	Pennsylvania State	2	1	1
Georgia School of				Pittsburgh	—	1	—
Technology	—	—	2	Pomona	1	—	—
Gonzaga	—	1	1	Princeton	7	3	6
Grinnell	2	—	—	Purdue	—	—	3
Grove City	1	1	—	Radcliffe	—	—	—
Hamilton	2	3	3	Richmond	1	—	—
Hamline	—	1	1	Rochester	2	—	—
Harvard	8	8	11	Rutgers	1	—	—
Haverford	1	—	—	Saint Johns	—	2	2
Highland Park	—	—	1	Saint Louis	6	3	—
Hobart	—	—	1	Saint Mary	1	1	1
Holy Cross	1	1	3	Saint Olaf	—	1	1
Illinois	1	2	2	Saint Xavier	3	1	—
Iowa State	1	—	1	Sacred Heart	1	—	—
Johns Hopkins	2	2	3	Simpson	—	2	2
Kansas	1	2	—	Smith	—	1	2
Lafayette	1	2	1	South Carolina Mil-			
Lehigh	1	—	—	tary	1	—	2
Leland Stanford				South Dakota State	—	1	—
Junior	3	1	—	Southern California	—	—	1
Maine	1	—	1	Southwestern	—	1	1
Marietta	2	—	—	Spring Hill	4	4	4
Maryland Agricul-				Syracuse	—	1	1
tural	1	—	—	Tarkio	—	1	—
Mass. Institute of				Tennessee	—	1	1
Technology	6	17	22	Texas	2	4	3
Michigan	2	3	6	Texas, Agr. & Mech.			
Michigan Agricul-				Coll. of	—	1	1
tural	—	1	—	Tulane	1	—	—
Middlebury	1	1	3	Union	—	—	1
Minnesota	—	2	1	U. S. Military Acad-			
Mississippi	1	1	—	emy	2	1	1
Mississippi Agricul-				U.S. Naval Academy	9	6	8
tural and Mech.	1	—	2	Ursinus	—	—	1
Missouri	1	—	—	Vermont	—	1	1
Missouri Sch. Min.				Valparaiso	1	—	—
& Met.	1	—	—	Virginia	2	2	1
Montana	1	1	1	Virginia Military	1	1	—
National	1	1	—	Virginia Polytech-			
Nebraska	1	2	1	nic Institute	—	—	1
New Mexico	—	1	1	Wabash	1	1	—
New York Univer-				Washburn	1	2	—
sity	—	3	3	Washington	—	1	—
North Carolina	2	1	2	Washington & Jeff-			
North Dakota Agri-				erson	3	2	1
cultural	2	2	1	Washington & Lee	1	2	1
North Western	—	—	1	Wellesley	—	2	—
Oberlin	4	3	3	Whitman	2	1	1
Occidental	2	2	2	Whitworth	1	—	—
Ogden	—	—	1	Williams	5	11	11
Ohio State	—	1	—	William and Mary	1	1	1
Oklahoma Agr. &				Wisconsin	1	—	2
Mech.	—	—	1	Wooster	—	1	2
Oregon	2	1	1	Worcester Polytech-			
Oregon Agricultural				nic	1	—	1
Otterbein	1	1	—	Yale	7	7	8
Park	—	1	1	Yankton	1	1	—

Foreign Colleges and Universities Represented.

	1911-12	1912-13	1913-14		1911-12	1912-13	1913-14	
Anhui Provincial (China)		2	2	2	Kiang Nan Provincial #	-	-	1
Cambridge (England)	1	-	-	-	Maimi (China)	1	-	-
Central Turkey	-	-	-	1	McGill (Montreal)	1	2	1
Chile	-	-	-	1	Melbourne (Australia)	1	1	-
Chi-li Provincial (China)	1	1	1	1	Nanking (China)	3	3	-
Chinese Naval	1	1	4	1	National (Paraguay)	2	-	1
Ecole Polytechnic (Montreal)	1	-	-	-	New Brunswick	1	-	-
Escuela Industrial (Buenos Ayres)	2	1	-	-	Oxford	1	1	-
Euphrates (Turkey)	-	1	-	-	Presidency (Cuttack)	-	-	1
France	1	1	1	1	Queens (Canada)	1	-	-
Greece National (Athens)	1	-	-	-	Royal Military (Canada)	1	1	-
Havana	1	3	2	-	Royal Tech (Copenhagen)	-	-	1
Heidelberg	1	-	-	-	Scientific & Lit. Inst.	1	1	-
Imperial Poytechnic (Shanghai)	8	8	8	8	Shantien (China)	1	-	-
Japanese Naval Engineering (Tokio)	1	1	1	1	Syrian Protestant	3	4	3
					Toronto	1	1	1
					Wuchang (China)	1	1	1

Graduates who are candidates for Advanced Degrees 40
 Graduates who are pursuing undergraduate work 205
 Colleges and Universities represented 113

COLLEGE STUDENTS AMONG THE COURSES.

GRADUATES AND STUDENTS FROM COLLEGES.	Specials.	Civil Engineering.		Mechanical Engineering.	Mining Engineering.	Architecture.	Chemistry.	Electrical Engineering.	Biology and Public Health.	Physics.	General Science.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Naval Construction.	Electro-chemistry.	Total.
	1st Year.																	
Graduates	2	5	40	26	3	26	35	35	18	-	1	25	11	2	8	7	1	245
Non-graduates	-	34	32	54	7	31	8	35	3	1	2	18	3	-	6	-	-	234
Total	2	39	72	80	10	57	43	70	21	1	3	43	14	2	14	7	1	479
Proportion, in per cent., of these students in the courses.																		
Graduates	13	56	32	30	46	81	50	86	-	-	58	79	-	57	100	-	-	51
Non-graduates	87	44	68	70	54	19	50	14	-	-	42	21	-	43	-	-	-	49

AGES OF STUDENTS.

THE GRADUATING CLASS, JUNE, 1913.

Between 20 and 21	10
" 21 " 22	46
" 22 " 23	65
" 23 " 24	62
" 24 " 25	39
" 25 " 26	19
26 and over	26

Total 267
 The average age was 23 years and one month.

CLASSIFIED FIRST-YEAR STUDENTS.

PERIOD OF LIFE.	1912-1913.		1913-1914.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
16½ to 17 years	5	5	7	7
17 to 17½ "	29	—	17	—
17½ to 18 "	33	62	24	41
18 to 18½ "	55	—	59	—
18½ to 19 "	56	111	59	109
19 to 19½ "	44	—	48	—
19½ to 20 "	28	72	34	82
20 to 20½ "	18	1-1	12	—
20½ to 21 "	11	29	10	22
21 to 22 "	18	18	16	16
	297	297	277	277

Repeating the first year 14
 Students of unusual age 18
 Average age, omitting these 32 18 years, 11 mos.

GRADUATES BY YEARS AND COURSES.

YEAR.	Civil Engineering.	Mechanical Engineering.	Mining Engineering and Metallurgy.	Architecture.	Chemistry.	Electrical Engineering.	Natural History or Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Electro-chemistry.	Total.
1868	6	1	6	—	—	—	—	—	1	—	—	—	—	—	14
1869	2	2	—	—	1	—	—	—	—	—	—	—	—	—	5
1870	4	2	2	—	1	—	—	—	1	—	—	—	—	—	10
1871	2	2	5	—	2	—	—	—	—	—	—	—	—	—	17
1872	3	1	5	—	3	—	—	—	—	—	—	—	—	—	12
1873	12	2	3	1	7	—	—	—	1	—	—	—	—	—	26
1874	10	4	1	1	—	—	—	—	2	2	—	—	—	—	18
1875	10	7	6	1	1	—	—	—	1	2	—	—	—	—	28
1876	12	8	8	—	5	—	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	7	8	2	4	2	—	—	1	—	—	—	—	—	28
1886	9	23	7	1	7	10	1	—	—	—	—	—	—	—	59
1887	10	17	8	1	9	8	1	1	3	—	—	—	—	—	58
1888	11	25	4	5	10	17	3	1	1	—	—	—	—	—	77
1889	14	24	5	3	8	17	1	1	2	—	—	—	—	—	75
1890	25	28	3	5	13	18	3	2	6	—	—	—	—	—	103
1891	18	26	4	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	—	8	8	—	2	—	—	129
1894	21	31	4	14	11	33	1	3	5	12	3	—	—	—	138
1895	25	30	3	15	14	33	—	2	4	11	4	—	5	—	144*
1896	26	34	10	24	17	48	3	3	7	7	4	3	5	—	190*
1897	25	40	7	16	20	33	2	3	7	12	4	1	9	—	179
1898	32	41	7	29	25	33	3	4	6	9	3	—	7	—	199
1899	30	37	9	22	22	32	2	2	1	10	1	—	8	—	173*
1900	32	34	21	21	19	23	3	3	5	11	4	—	9	—	185
1901	37	39	18	21	17	25	1	1	6	14	4	1	10	—	200
1902	24	46	14	18	14	35	5	3	3	9	7	—	14	—	192
1903	26	37	27	15	13	39	1	3	1	10	4	1	12	1†	190
1904	34	45	32	24	15	34	3	5	5	7	2	1	17	8†	232
1905	40	54	26	12	23	31	3	—	3	13	5	1	24	3†	244
1906	47	69	38	22	21	37	2	4	—	10	6	—	19	3†	278
1907	37	52	22	21	10	32	—	—	—	14	3	2	10	5†	208
1908	48	61	19	19	16	38	4	—	—	15	2	—	5	2†	229
1909	51	41	30	18	12	42	5	3	—	13	9	—	5	3	232
1910	57	57	24	18	10	36	3	—	2	18	12	—	11	3	251
1911	46	49	17	10	12	49	1	1	2	19	15	—	6	5	231*
1912	54	47	21	21	7	52	4	2	1	31	14	—	3	3	259*
1913	57	50	20	25	12	43	2	1	—	30	15	—	4	8	267
Totals	1,002	1,168	498	441	445	900	73	58	102	294	127	14	189	44	5,347*

Names counted twice, students graduating in two different years	20
Bachelors of Science	5,327*
Masters of Science, not included in the above	92
Doctors of Philosophy and of Engineering, not included in the above	10
Total	5,429*

*Deducting names counted twice (students graduating in two courses).

†Prior to 1909 this Course was designated as Option 3 (Electro-chemistry) of Course VIII.

STATISTICS OF GRADUATION, CLASS OF 1913.

Number receiving degree after one year at the Institute	2
“ “ “ “ two years at the Institute	27
“ “ “ “ three years at the Institute.	34
“ “ “ “ four years at the Institute	160
“ “ “ “ five years at the Institute	44
<hr/>	
Total number of degrees of S. B. awarded	267
Number entering from other colleges	72
“ of graduates among these	43
“ of non-graduates among these	29

FURTHER STATISTICS OF THE STUDENTS FROM OTHER COLLEGES OF THE GRADUATING CLASS, JUNE, 1913.

<i>Yrs. at the Inst.</i>	<i>Graduate.</i>	<i>Non-Graduate.</i>	<i>Total.</i>
1	1	1	2
2	20	8	28
3	20	11	31
4	1	6	7
more than 4	1	3	4
	<hr/>	<hr/>	<hr/>
	43	29	72

SUMMER SCHOOL.

	1912.	1913.
Number from other colleges and schools attending	49	36
Number not referring to any other school or college	1	7
Number from Massachusetts Institute of Technology	303	362
	<hr/>	<hr/>
	353	405
Registrations for failures or deficiencies	292	298
Registrations to anticipate work	334	442
Number who attended Summer School but did not return for Registration		52

NUMBER OF STUDENTS REGISTERED IN EACH OF THE COURSES OF THE SUMMER SCHOOL FOR THIS YEAR AND THE YEAR BEFORE.

	1912.	1913.		1912.	1913.
Alternating Currents	5	9	Mathematics 2	33	24
Applied Mechanics	25	20	Mathematics 3	0	12
Astronomy	7	5	Mechanical Drawing	11	7
Carpentry	6	0	Mechanical Engineering Draw- ing	25	20
Chemical Engin. Lab.	0	13	Mechanism	24	21
Chemistry, Inorganic and Ana- lytical	86	131	Metal Turning	2	2
Chipping and Filing	7	0	Organic Chemical Laboratory	0	9
Descriptive Geometry	36	27	Pattern Work	11	12
Design	15	10	Physical Laboratory	7	13
English	12	10	Physics	34	41
Forging	5	6	Precision of Measurements	12	17
French	7	11	Shades and Shadows	9	2
German	24	35	Structures	9	5
Industrial Chemical Labora- tory	25	27	Surveying (2)	3	2
Machine Tool Work	18	14	Surveying Camp	69	80
Mathematics 1	21	26	Wood Turning	6	0

RESIDENCE OF STUDENTS.

NUMBER OF STUDENTS IN EACH YEAR, FROM 1903, COMING FROM EACH STATE OR TERRITORY.

STATES AND TERRITORIES.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
<i>North Atlantic.</i>	1,178	1,189	1,080	1,025	1,049	1,116	1,126	1,118	1,152	1,212	1,279
Connecticut . . .	44	48	50	36	29	31	32	33	45	44	45
Maine	34	26	22	18	23	22	20	24	25	24	25
Massachusetts . . .	809	889	807	764	781	839	852	840	860	890	954
New Hampshire . . .	23	36	32	26	27	24	27	27	29	28	34
New Jersey	13	16	11	15	17	14	14	18	33	34	38
New York	104	94	71	84	82	99	99	106	90	108	102
Pennsylvania	52	56	58	55	57	53	46	37	39	43	42
Rhode Island	28	19	24	23	28	28	30	27	25	33	34
Vermont	11	5	5	4	5	6	6	6	6	8	5
<i>South Atlantic.</i>	63	52	53	52	48	51	44	41	49	45	66
Delaware	3	2	1	2	1	—	1	1	1	2	2
Dist. of Columbia . .	15	17	13	12	10	10	8	5	13	12	21
Florida	2	4	3	3	3	6	5	1	2	3	5
Georgia	4	6	8	4	2	3	4	5	3	3	4
Maryland	25	18	19	17	18	17	12	14	8	8	16
North Carolina	7	1	—	1	—	1	—	—	1	1	4
South Carolina	—	—	1	3	2	—	2	1	3	—	5
Virginia	7	4	7	8	9	11	10	12	15	13	8
West Virginia	—	—	1	2	3	3	2	3	3	2	1
<i>South Central.</i>	33	33	30	32	36	38	37	37	48	46	43
Alabama	1	1	1	2	4	3	5	4	6	3	5
Arkansas	1	—	1	—	2	1	2	2	2	2	1
Kentucky	9	8	5	5	5	4	4	2	8	7	10
Louisiana	2	5	1	2	—	3	2	5	4	4	5
Mississippi	4	4	4	5	3	3	3	6	8	7	5
Tennessee	5	2	2	3	6	8	8	5	3	2	2
Texas	11	13	16	15	16	16	13	13	17	21	15
<i>North Central.</i>	155	168	174	153	142	121	123	140	141	137	115
Illinois	44	43	42	37	31	23	24	33	30	25	15
Indiana	6	10	10	15	12	9	11	10	9	10	9
Iowa	6	9	13	14	16	14	5	4	9	8	11
Kansas	1	4	7	6	5	4	6	9	7	8	3
Michigan	9	9	10	7	8	7	10	9	9	7	12
Minnesota	9	11	13	14	8	8	10	8	7	14	15
Missouri	22	25	29	17	14	6	7	13	12	13	3
Nebraska	4	5	4	2	3	2	4	6	8	8	8
North Dakota	1	1	—	3	4	3	3	3	3	3	2
Ohio	37	35	34	30	26	30	27	33	37	32	25
South Dakota	3	2	—	1	3	3	5	3	2	2	2
Wisconsin	13	14	12	7	12	12	11	9	8	7	10
<i>Western.</i>	46	54	55	52	49	54	59	53	57	65	63
Alaska	—	—	—	—	—	—	—	—	—	1	1
Arizona	—	—	—	—	—	—	—	1	1	1	—
California	19	18	23	21	14	20	25	21	23	22	23
Colorado	11	16	17	12	10	5	6	9	11	14	13
Idaho	—	—	—	—	—	1	—	—	—	—	1
Montana	2	5	3	3	3	2	3	2	2	4	4
Nevada	—	—	1	1	1	1	—	—	—	—	—
New Mexico	1	2	—	—	1	1	1	—	—	1	1
Oklahoma	—	—	—	—	1	1	—	—	—	1	2
Oregon	7	8	5	2	3	4	7	8	11	14	11
Utah	3	3	2	3	3	5	5	3	3	2	2
Washington	3	2	2	5	12	13	11	9	6	6	5
Wyoming	—	—	2	5	1	1	1	—	—	—	—

	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
DISTRICT.	3	9	8	7	6	9	11	15	11	6	6
Canal Zone . . .	—	—	—	—	—	1	1	1	—	—	—
Hawaii	1	1	1	2	2	1	2	2	3	2	1
Philippine Islands	—	4	2	3	1	1	1	4	3	1	2
Porto Rico	2	4	5	2	3	6	7	8	5	3	3
Total for the United States	1,478	1,505	1,400	1,321	1,330	1,389	1,400	1,404	1,458	1,511	1,572

NUMBER OF STUDENTS IN EACH YEAR, FROM 1903, COMING FROM EACH FOREIGN COUNTRY.

	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
FOREIGN COUNTRIES.	50	56	66	76	80	72	79	102	101	100	113
Argentine Republic	—	—	—	1	2	2	4	5	2	1	—
Armenia	1	1	3	2	2	2	—	—	1	—	—
Australia	—	—	—	—	—	—	—	—	1	—	—
Austria-Hungary	3	1	3	3	3	—	—	2	1	2	1
Belgium	—	—	—	1	1	—	—	—	—	—	—
Bermuda	1	—	1	1	—	—	—	—	—	—	—
Brazil	3	3	1	—	2	3	1	2	3	5	7
Bulgaria	—	—	—	—	—	—	1	—	—	—	—
Canada	14	13	12	15	9	15	20	18	19	13	14
Cape Colony	—	—	—	1	1	1	—	—	1	—	—
Central America	—	1	—	—	—	—	—	—	—	2	—
Chile	1	1	2	1	1	1	1	3	1	—	1
China	2	8	8	7	9	10	11	27	36	37	42
Colombia	—	—	—	—	—	—	—	—	—	—	1
Costa Rica	—	—	—	—	2	3	2	1	1	—	1
Cuba	3	4	4	4	4	2	7	5	3	6	7
Denmark	1	1	1	1	1	—	—	1	1	—	2
Ecuador	—	1	—	2	2	2	1	1	1	1	1
Egypt	—	—	1	2	2	2	1	1	2	1	1
England	4	4	5	6	4	3	—	1	1	—	—
Finland	—	—	—	—	—	—	—	1	—	—	—
France	—	1	1	—	—	—	—	2	2	3	4
Germany	2	—	—	—	—	—	1	1	2	3	2
Greece	—	—	—	—	—	—	—	1	1	1	1
Guatemala	—	—	—	—	—	—	—	1	—	—	1
Honduras	—	—	—	1	—	1	3	3	2	—	1
India	1	1	2	1	1	2	1	—	—	2	1
Ireland	1	—	2	2	3	1	—	—	—	—	—
Italy	—	—	2	—	2	1	1	1	—	—	—
Jamaica	—	1	—	1	—	1	1	1	1	—	—
Japan	2	1	3	5	3	4	4	4	3	—	1
Korea	—	2	—	—	—	—	—	—	—	2	—
Malta, Island of	1	1	—	—	—	—	—	—	—	—	—
Mexico	8	4	7	12	12	6	10	9	5	4	7
Newfoundland	—	—	—	—	—	—	—	1	1	1	1
New Zealand	—	—	—	—	—	—	—	1	2	1	—
Norway	—	—	—	—	—	—	—	1	—	—	—
Panama	—	—	—	—	1	—	—	—	—	—	—
Paraguay	—	—	—	—	1	1	1	1	1	1	1
Peru	—	—	1	1	2	2	1	2	1	—	2
Poland	—	—	—	—	1	—	—	—	—	—	—
Portugal	—	—	—	—	—	—	—	1	—	—	1
Russia	—	—	—	—	2	2	2	2	3	4	4
Salvador	—	—	—	—	—	—	—	1	—	—	1
Scotland	1	2	1	1	1	—	—	—	—	—	1
South African Republic	—	—	—	—	—	—	—	—	—	1	1
Sweden	—	1	—	—	—	—	—	—	—	—	—
Switzerland	—	—	—	—	—	—	1	1	1	—	—
Syria	1	1	—	—	—	—	—	1	2	3	2
Transvaal	—	1	3	3	3	2	1	2	—	—	—
Turkey	—	2	1	1	2	1	2	2	1	5	3
Uruguay	—	—	2	1	1	1	—	—	—	—	—
Total in school	1,528	1,561	1,466	1,397	1,410	1,461	1,471	1,506	1,559	1,611	1,685

MASSACHUSETTS CITIES WHICH SEND FIVE OR MORE STUDENTS.

Boston	248	Wakefield	9
Cambridge	54	Winchester	9
Newton	38	Concord	8
Malden	28	Marlborough	8
Brookline	27	Milton	8
Somerville	26	Swampscott	8
Lynn	23	Woburn	8
Lawrence	19	Arlington	7
Newburyport	18	Dedham	7
Melrose	16	Salem	7
Lowell	15	Watertown	7
Waltham	15	Andover	6
Brockton	14	Needham	6
Quincy	14	Taunton	6
Medford	13	Weymouth	6
Framingham	12	Braintree	5
Springfield	12	Fitchburg	5
Winthrop	12	Natick	5
Everett	11	New Bedford	5
Fall River	11	Revere	5
Haverhill	10	Tisbury	5
Chelsea	9	Worcester	5

WALTER HUMPHREYS,
Registrar and Recorder.

Reports of Departments.

CIVIL AND SANITARY ENGINEERING.

The work of the Department during the year has been unmarked by any radical change. Considerable progress, however, has been made in the development of advanced courses to meet the increasing demands for instruction of this character. The number of candidates for advanced degrees now taking work in the Department is the largest yet registered and includes five graduates of the Institute and four graduates of other colleges. Of these, five are candidates for the degree of Master of Science in Civil Engineering, and four are candidates for the degree of Master of Science in Sanitary Engineering. Among the former may be mentioned one graduate of the Royal Technical College of Copenhagen, Denmark, who is the first student to come to the Institute as the representative of the American Scandinavian Society.

Changes in the instructing staff during the year include the resignation of Mr. Royall D. Bradbury, who left us after seven years of continuous service as assistant and instructor. Mr. Bradbury's ability as a teacher and his experience in practical work made him a valuable member of the instructing staff.

Other resignations during the year were those of the following five assistants: William H. Coburn, William L. Collins, Randall Cremer, Edwin C. Holbrook and William E. Richardson. All of these resigned after one year's service to engage in active practice. New appointments were as follows: Messrs. Howard B. Luther, S.B., Dipl. Ing., and C. Hale Sutherland, A.B., S.B., as instructors

and Messrs. Albion Davis, S.B., Laurence B. Hoyt, S.B., Eugene L. Macdonald, S.B., Frederick D. Murdock, S.B., and Lindsey W. Whitehead, S.B., as assistants. All of the latter were graduated from the Institute with the class of 1913.

In recommending the appointment of new instructors, it is the policy of the Department to try to secure only those who have had practical experience, or academic training elsewhere as well as at the Institute. Of the two new instructors, Mr. Luther was graduated from the Institute in 1908 and after graduation served two years as assistant in the Department. He then went to Germany as Russel Fellow where he studied for two and one-half years at the Polytechnic School in Dresden, from which he was graduated in February last with the degree of *Diplôme Ingenieur*. His services are largely devoted to instruction in graduate work although he is taking undergraduate classes in Hydraulics and Third Year Structures. Mr. Sutherland was graduated with the degree of Bachelor of Arts from Harvard University in 1906. He then spent one and one-half years in business in California, coming to the Institute as a student in February, 1908. From September, 1909, to June, 1911, he served as half-time assistant in the Department of Drawing. During this time he was pursuing his engineering studies, and received the Bachelor's degree in 1911, having done the necessary undergraduate work and a considerable amount of advanced work. He then spent several months as draftsman with the Phoenix Bridge Company. His next professional experience was with the Corrugated Bar Company at Buffalo, N. Y., where he was engaged upon the design of reinforced concrete structures for a little less than two years. Mr. Sutherland's work at the Institute is principally devoted to instruction in reinforced concrete design to graduate and undergraduate students. The work in Bridge Design and

Theory of Structures formerly conducted by Mr. Bradbury is divided between Messrs. Sutherland and Luther.

The promotions during the year were as follows:—Assistant Professors George E. Russell and Lewis E. Moore to the grade of Associate Professor, and Instructor John W. Howard to the position of Assistant Professor of Topographical Surveying. Professor Howard has been a member of the instructing staff since 1903, and has held the position of instructor since 1905. His surveying experience is a broad one, and includes work upon the state survey of the town boundaries of Massachusetts and on the survey of the national boundary between Panama and Costa Rica. He now holds the position of consulting engineer for Panama upon the determination of the Costa Rican boundary.

The second session of the Summer Surveying Camp was held this year from August 6th to September 23d. The attendance consisted of eighty students and the following members of the regular instructing staff:—Professors Allen, Burton, Robbins, Breed (half-time), Hosmer, Russell and Howard, and Messrs. Sawyer, Davis, Hoyt, Macdonald, Murdock and Whitehead. Mr. Edward P. Alexander, now a fourth-year student, also served as an assistant, and a graduate of last year's class, Mr. John H. Hession, as clerk. A physician, Dr. C. M. Robinson of Portland, Maine, was also in attendance during the entire session. The writer inspected the camp several times during the summer, and spent in all about three weeks either at the camp or in its immediate vicinity. The health of all in attendance was uniformly good, no cases of illness occurring. One of the members of the instructing staff, however, had the misfortune to break one of the small bones in his leg but was able to continue his work after a few days.

The surveying course was broadened during the year by an elective course in Underground Surveying given by Professor Howard at an iron mine of the Canada Iron Corporation at Torbrook, Nova Scotia. The course was a

successful one and will be required hereafter, provided the mine is available, of students in the Department of Mining Engineering. The additional cost of this trip was little and the time required was slightly over a week.

The most notable improvement during the year to the camp property has been the addition of an athletic field through the kindness of Mr. Charles W. Eaton, who previously gave a considerable sum for equipment. Owing to the rolling character of the land in the vicinity, no level space was available for such a field without much clearing, but this was done during the spring, and while the field was not entirely ready for use during the past season owing to the incompleteness of the gravel surfacing, it was possible to make some use of it. Another year it is expected that the field will be of much assistance in the operation of the camp.

Another valuable feature added to the camp during the year was the new post office,—Technology, Maine. This is a summer post office established by the Government with our caretaker as postmaster although the official duties of the post office were conducted by the camp clerk. This post office made it possible to handle the camp correspondence with much greater ease and accuracy than in the previous year, and the income received from the Government assisted materially in the payment of the camp expenses.

It is interesting to note that the additional expense involved by the Summer Camp has apparently had no tendency to reduce the number of students taking Civil and Sanitary Engineering as there has been an increase of ten registered in the Sophomore class this year. Registration in this class for the last ten years is as follows:

Year	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
Course I	66	69	51	62	54	70	69	64	66	63
Course XI	11	6	10	19	20	19	6	20	11	24
	<u>77</u>	<u>75</u>	<u>61</u>	<u>81</u>	<u>74</u>	<u>89</u>	<u>75</u>	<u>84</u>	<u>77</u>	<u>87</u>

The field work of the season included the completion of a survey of the boundaries of the camp property. This survey shows that the total area of the Institute property is eight hundred and eighty-four acres and that the length of the shore line on Gardner's lake is 8.4 miles. This is somewhat more than we had anticipated from the survey made by the local surveyor at the time the property was purchased.

The Department staff has continued its close relationship with professional practice during the past year as well as with national and local engineering societies. In this connection it may be stated that the members of the Department have served during the year as consulting engineers for the cities of Boston, Lynn, Taunton, Salem, New Bedford and Quincy, and the towns of Waverly and Framingham on engineering projects involving estimated expenditures of from \$10,000,000 to \$15,000,000. Members of the staff have also served as members of the Board of Directors of the Boston Society of Civil Engineers, and on important committees of the American Society of Civil Engineers, and the American Railway Maintenance of Way Association. Professor Burton received during the year the honorary degree of Doctor of Science from Bowdoin College, his Alma Mater.

Close relations have been preserved with practicing engineers both amongst the alumni and others. Voluntary lectures have been given by Messrs. Frederic H. Fay, Charles R. Gow, Henry E. Warren, and Sanford E. Thompson, to whom the thanks of the Department are due. The Department is also grateful to the Proprietors of Locks and Canals at Lowell for favors received in connection with the course in Stream Gaging, and to Mr. W. F. C. Parsons, Chief Engineer and General Manager of the Canada Iron Corporation, for permission to conduct a course in Underground Surveying in the mine of that company located at Torbrook, Nova Scotia. It also wishes to ex-

tend special thanks to Mr. Louis K. Rourke, Commissioner of Public Works, City of Boston, and to Professors William T. Sedgwick and Harrison W. Smith for their kindness in making trips to the Summer Camp in order to address the students.

A considerable demand for graduates of the Department has existed during the year, the total number of applications since the last report, of which record has been kept, is one hundred and two. This does not include all the applications that have been received, many of which have been made informally to the members of the instructing staff and have not been recorded. While most of these applications have been for recent graduates, some have been for positions of considerable importance.

CHARLES M. SPOFFORD.

MECHANICAL ENGINEERING.

The number of students in the Department has increased appreciably since the year 1911-12. This increase has followed the change in the schedule of studies in Mechanical Engineering which went into effect for the second year class in February, 1912. The constantly increasing demand for graduates of Course II may also have had some influence in causing students to select this course.

The following table made from data compiled by the Registrar shows this growth:

STUDENTS IN MECHANICAL ENGINEERING.

PERIOD 1906-1914.

YEAR.	1906-07	1907-08	1908-09	1909-10	1910-11	1911-12	1912-13	1913-14
Total in School	1,397	1,410	1,461	1,479	1,506	1,559	1,611	1,685
Total number including graduate students and specials not classified by year or class.	214	226	196	202	198	214	243	279
By Classes: 4th yr. and Candidates for Advanced Degrees	59	70	59	65	56	53	62	79
Third Year	81	73	66	55	66	62	88	90
Second year	74	83	71	82	76	94	93	107
Specials not classified . . . . .	..	..	..	..	..	5	..	2

Average number students per year for School years 1906-07 through 1911-12	208
Number of students for school year 1912-13	243
Number of students for school year 1913-14	279
Percentage increase in the number for the year 1912-13 over the average for the preceding 6 years	16.8%
Percentage increase in the number for the year 1913-14 over the same period as above	34.1%
Percentage increase in the number for the year 1913-14 over that of 1912-13	14.8%
Average number of students in school per year from 1906-07 through 1911-12	1,469
School year 1912-13	1,611
Total students in school 1913-14	1,685
Percentage increase in students 1912-13 over average for preceding 6 years	9.9%
Percentage increase in number of students 1913-14 over average for the same period as above	14.7%

It has been necessary to provide desks in the fourth year drawing room not only for the seventy-nine men in the senior class, but also for those college men classed as third year students who are taking certain fourth year studies. This has necessitated crowding ninety-one desks into a space originally planned for sixty-four.

Factory Construction, one of the new subjects added to the course, becomes a required study this year. Al-

though some instruction in this subject has been given during the past two years the time available has been small. This year, however, with the full allotment of time it will be possible not only to discuss the fundamentals underlying the selection of site, determination of type of building and materials to be used in construction, but also to have the men make such drawings and calculations as may be necessary in designing a factory building.

The lectures on Foundations are now given by Professor Lewis E. Moore of the Civil Engineering Department. By this arrangement duplication is avoided, as the Course II students take this work with the men of Course I.

There were two subjects given last year for the first time:—The Physical Chemical Properties of Engineering Alloys, by Dr. Fay, and Mechanism of Machines by Professor Haven and Mr. Heuter. The Department believes the students will find that what they have learned from these lectures will be of great value to them in their later professional work. Work equivalent to that of our course in Mechanism is given in but few of the colleges or technical schools. Although many of the college men who enter the Institute have studied Kinematics, but few have made any application of the subject to engineering problems and consequently are not in a position to go on with work depending directly on this subject.

The six lectures by Mr. Albert A. Merrill on Aviation were well attended, the maximum attendance being one hundred and four, and the average ninety-two. The enthusiasm shown by many of our students for this subject has led the Faculty to offer a course of thirty hours in Aviation, which may be substituted by a senior in Course II for General Engineering Lectures, a required subject in the fourth year.

The work in the Testing Materials Laboratory is now supplemented by five lectures in which is pointed out

not only the value of laboratory tests to an engineer, but also the use that he can make of such tests in drawing up specifications for materials.

The Engineering Laboratories are in almost constant use during the day from October to January. Between January and June the laboratory runs during the day, during the evening and on Saturday afternoons. Throughout this period exercises are held in the laboratory from 7.30 to 10 P. M. for the students in the Lowell School for Industrial Foremen.

Professor Woodbridge, who has been connected with the teaching staff at the Institute for a great many years, has given up active work in the Department. The Lectures on Heating and Ventilating Engineering given to Courses II and IV, have been taken over by members of the Department and by Mr. William G. Snow, '88, an expert in this branch of Mechanical Engineering.

During the summer a Billings & Spencer drop hammer has been installed in the Mechanical Laboratories and students are given practice with the use of this machine in the making of drop forgings.

Under the new schedule the Machine Tool Laboratory is run during periods of three hours each, instead of two hours as in the past. These longer exercises in the laboratory give the men more actual working hours at the tools, and it is expected that they will accomplish more than formerly.

The work on Applied Mechanics, by Professors Fuller and Johnston, which was in press last year, is now in use by the classes in Applied Mechanics. Professor James and Mr. Mackenzie have published during the summer a book entitled "Working Drawings of Machinery," which is now in use by our second and third year classes.

The changes in the instructing staff are as follows: Professor S. Homer Woodbridge retired; Instructor Royal R. Heuter and assistants Thomas H. Haines, David J.

McGrath and Ralph F. Simonds resigned; Arthur L. Brown, S.B., Charles W. Burrage, S.B., George H. Clark, S.B., Burton L. Cushing, S.B., James G. Russell, S.B. appointed as assistants.

EDWARD F. MILLER.

MINING ENGINEERING AND METALLURGY.

Graduate Students.—The Department has this year three advanced students. One is Mr. Alan H. Means, who was graduated last year, and is doing advanced work to obtain the degree of Master of Science, the other two students are Mr. M. Th. Ortin and Mr. N. S. Penn, both graduates from the Polytechnic Institute of Tomsk, Siberia. They have been sent to the United States by the Russian Government, and intend to spend some time with us in advanced study, especially in the line of Ore Dressing and Gold Milling.

Undergraduate Students.—The number of undergraduate students shows a considerable decrease from former years. A study of past records shows that the Mining Course had a great increase in its number of students beginning about 1900, and at present we are back to the normal attendance before 1900. This decrease in the number of mining students is not local at the Institute, but has made itself felt with few exceptions throughout the country.

Summer School.—No summer school trip was made last summer owing to failure of sufficient applications to warrant the expense. The policy of the Department of obtaining practical work in the mines for such students as desire it leads to a lessened demand for summer school. The required summer school in surveying coming between the second and third years may also be a factor in lessening the demand, since the question of expense affects many of the men who do not feel able to afford two summer schools in one year.

Theses.—Amongst the different metallurgical theses the following are of special interest. Converting Copper Matte was carried on by Messrs. Henry W. Dew and Horace M. Lawrence. This is the first test that has been made with the new converter built last year. In the metallographical division the Equilibrium Diagrams of the Systems $\text{Cu}_2\text{S}-\text{Na}_2\text{S}$ and $\text{Ni}_3\text{S}_2-\text{Na}_2\text{S}$ were investigated by Mr. Charles L. Burdick, and the Equilibrium Diagram of the System $\text{Cu}_2\text{S}-\text{Ni}_3\text{S}_2$ by Messrs. Allison Butts, and Edgar H. Weil. The Cyanidation of Low Grade Silver Ore from Utah by Mr. Charles R. Hill, and A Method for Determining the Heat of Conductivity of Firebrick by Mr. David F. Baker, assisted by Robert R. Langer, were two theses, one given in the Metallurgical Department, and the other in the Heat Laboratory.

Demand for Men.—The demand for mining graduates is as good as ever and we are unable to supply all the requests for young men. There is a constantly increasing tendency to replace the old time practical foreman by the technical graduate after he has served the necessary apprenticeship in practical work, and the field is constantly broadening for the technical man.

Organization.—In the teaching of metallurgy a change has been made in making the Metallurgy of Copper the major study in the first term, this taking the place of the Metallurgy of Lead which now forms a minor subject. In connection with the teaching of the Metallurgy of Copper, greater stress is laid on General Metallurgy than has hitherto been the case. This has been made possible by the publication of Professor Hofman's treatise on "General Metallurgy," which is now used as a text-book instead of his "Metallurgy of Lead," which served for this purpose a number of years.

This year for the first time, attendance was required for Options 1 and 3 at the Summer Surveying Camp, in connection with which an optional course of one week

was offered in Underground Surveying in an iron mine at Torbrook, Nova Scotia. The course was so satisfactory that it was proposed to make it compulsory hereafter with the provision that other work may be substituted if a suitable mine cannot be obtained.

Changes in Staff.—Mr. Ralph L. Bartlett who was Assistant last year left in the Spring to go into placer mining in Alaska. This winter he has resumed his position on the instructing staff of the Lehigh University. Another Assistant, Mr. R. L. Whipple, left at the end of the year to go into practical work. His place has been filled by Mr. Carl N. Anderson, B.S., 1913, Oregon Agricultural College, who is taking the opportunity to pursue some studies at the Institute in connection with his work as Assistant. Mr. Bartlett's place has not been filled, as we are able to do with less assistance, owing to the decreased number of students.

Professional Work.—Professor Richards has made two trips to Michigan in connection with his pulsator jig and to Denver to give expert testimony on the Wilfley table suits. Last February Professor Hofman was appointed official Metallurgical Examiner for the U. S. Civil Service Commission in which capacity he has to pass upon the candidates for metallurgical positions in the work of the Government. The treatise on "General Metallurgy" by Professor Hofman was published last August. It has met with much favor. The book is being translated into German by the Secretary of the German Mining and Metallurgical Society to meet the want of a treatise of this kind in the German language. The manuscript of the "Metallurgy of Copper" by Professor Hofman was sufficiently advanced so as to go into the hands of the printer in December. It will appear in May, 1914.

Assaying.—During the past year we have added an 18 x 18-inch single chamber horizontal filter press. This is designed to work with up to 30 pounds pressure, and

will also be used for vacuum filtering. The private laboratory and Room 7 have been equipped with electric ventilating fans; and they have done very well in keeping down the acid fumes.

Library.—The overcrowded condition of the cases in the Mining and Metallurgical Library has been somewhat relieved by transferring complete sets of periodicals from Room 8 to cases in Room 2. These cases have served so far for exhibiting ore-dressing and metallurgical specimens. The specimens have been packed into wooden boxes ready for shipment to the new site.

Gifts.—Professor Richards designed and purchased a hindered-settling, open-spigot classifier for the thesis work of Robert R. Langer. He has also continued his gifts of the Mining & Scientific Press, the Proceedings of the American Society of Testing Materials, and of the Society for the Promotion of Engineering Education to the library. Mr. Edwin D. Mellen, Class of 1884, sent us a miscellaneous lot of books, maps and blue prints for the library. From Harley B. Curtis we have received a classifier and Sturtevant laboratory crusher, rolls and screens, and from the Power & Mining Machinery Company came a laboratory McCully breaker. Space is inadequate for the installation of all this apparatus at the present time; they will have to be stored until the new laboratories are available. Through the kindness of Mr. Allen H. Rogers, Class of 1890, we have received a laboratory unit of the Hyde Flotation Apparatus, and from the Huff Separator Company of Boston, we have the loan of an Elmore Laboratory Flotation Apparatus, so that we are equipped for the testing of ores by the new and rapidly growing method of flotation.

The American Institute of Mining Engineers has donated a large supply³ of copies of papers printed in the Transactions. These are being classified and catalogued and will be available for sale to the students at a nominal price.

New Apparatus.—The Metallurgical Laboratory has purchased for its work a Scimatco Optical and a Hoskins Electric Resistance pyrometer which will greatly help in giving precision to the regular laboratory work. There has also been added a Helberger Electrical Crucible Furnace for the purpose of making fusions of four or five pounds of metal or smaller weights of other substances occupying the same volume.

In addition to the hindered-settling classifier and flotation apparatus mentioned under the head of gifts, the Department has bought a Kinney Vacuum Pump and a motor for use in connection with the Elmore apparatus. A set of Tyler standard testing screens has been purchased for ore dressing work.

The copper converter mentioned last year, required the installation of an oil burner and tank; the extra load on the Department motor caused by the increased blower capacity required for the converter necessitated a rewiring of the electric mains in the Department.

The Department was able to purchase several small motors on very favorable terms so that we are now supplied for some time to come. Likewise, a gas holder which had been used for private purposes was obtained.

ARCHITECTURE.

It is very gratifying to the Department to be able to report a continuance of the bright prospects for a successful year such as was indicated in last year's statement. Although slightly handicapped by the temporary character of the instruction in Design, the work for the year was as a whole satisfactory. This year, through the additions that have been made to our instructing staff, this handicap is now a thing of the past, and already the work done

by the students in Design gives evidence that the selections of new members were wisely made.

Mr. Edgar I. Williams, a graduate of the Institute and a Fellow of the American Academy in Rome, and Mr. Albert LeMonnier, a graduate of the École des Beaux Arts, have been appointed Assistant Professors. In addition, Messrs. William T. Aldrich and Charles Everett, both former students of the Institute and also graduates of the École des Beaux Arts in Paris, have been engaged for part-time service in the instruction of Design. With this staff of instructors, together with Professor Gardner and Mr. Mead, no reason can be seen why the work of the Department should not at least retain, if not increase, its old-time prestige.

The registration for the year exceeded by two that of last; two students have dropped out, however, so that our present enrolment remains the same as last year. Of those entering this year sixteen are college graduates, one from the Institute itself, and fourteen others have had a partial collegiate training.

In the instructing staff there have been numerous changes. Professor Duquesne is no longer with us, Professors Williams and LeMonnier taking the work he formerly had. Messrs. Aldrich and Everett have taken the work of Mr. Allen H. Cox whose business engagements compelled him to withdraw from our staff. Mr. Cox had successfully performed the work for several years. Another loss came with the resignation of Mr. David A. Gregg, who for twenty-six years has given the course in Pen and Pencil Rendering. Mr. Gregg's health has failed to such an extent that it was impossible for him to continue; in fact he has not only given up here but has retired from all business. Mr. Gregg will be greatly missed both by the students and by the faculty of this Department. His charming nature and constant interest in his work has endeared him to all who came in contact with him.

I desire to acknowledge the receipt of the following gifts made during the year:

Mrs. Helen Longyear (Paul), '09, two hundred and fifty photographs, also pamphlets and prints,—The Boston Society of Architects, one hundred and fifty-seven lantern slides,—Professor Charles R. Cross, a collection of post cards and photographs,—Mrs. Desiré Despradelle, a collection of drawings of her husband, the late Professor Despradelle. The Carnegie Institute of Washington, two volumes of their publications,—The American Bridge Company, fourteen copies of “Tables and Specifications for Steel-frame Structures,”—Richard E. Schmidt, '87, a copy of “The Modern Hospital,” a work compiled by himself and Dr. Hornsby.

In addition to these gifts, the equipment of the Department has been increased by several thousand photographs purchased by Professors Gardner and Sumner while in Europe last summer, and by the collection of Cantagalli ceramic ware, selected by Professor Gardner at the works in Florence.

Mr. Guy Lowell again very generously donated the amount of his fees for three lectures on “Landscape Architecture,” to be expended for additional casts or objects of art for our gallery. Accordingly a volume of Piranesi's engravings of vases and candelabra was purchased by Professor Gardner while abroad.

The thousand dollar Traveling Fellowship so kindly provided by the Corporation, was awarded in 1913 to Mr. Thomas H. Mace, Jr., in competition with eight others. The jury of award was composed of Professors Chandler and Duquesne, Messrs. Codman, Cox and Mead.

The Rotch Prizes of two hundred dollars each for the regular and the special student having the best general records in four years and two years respectively, were for the first time awarded to students in the Architectural Engineering Option. Mr. Andrew Vogel was given the

prize for the regular student, and Mr. Charles H. Hopkins the prize for the special student.

The two annual prizes of fifty dollars each given by the Boston Society of Architects were awarded to Mr. Charles D. Morgan, regular student, and Mr. Barton E. Brooke, special student.

The two "Class of 1904" Prizes of ten dollars each were awarded to Mr. Dale R. McEnary, regular student, and Mr. Frank S. Whearty, special student.

As arrangements had not been completed to make either the Francis Ward Chandler Prize or the W. E. Chamberlain Prize available, no award was made. The latter prize we have been advised will be available this year, and a competition to decide its award will therefore be held. The Chandler Prize is not yet available.

The Architectural and the Architectural Engineering Societies are continuing their good work of past years, and do much to keep up the interest and enthusiasm of the whole body of students.

To the Technology Architectural Record, the quarterly publication of the Department, congratulations are due because this year it has become self-supporting in that the receipts have equalled the expense of publication. We consider it of great value to the Institute.

The Interscholastic Competition was inaugurated two years ago but it has not given the results hoped for. Owing to the very great interruption in the regular work caused by the preparation of the drawings the Department has decided to withdraw from this year's competition.

While the work of the Department is seriously interfered with by the crowded quarters occupied, it is recognized that only the removal to the new building on the new site can furnish relief.

There is one recommendation, made last year, which we desire to repeat, that of the extension of opportunities for evening work in the Department by opening the library

from seven to ten to all students of the school, the work, however, to be limited for the evening hours to research work in Design and to reading and study in connection with Architectural History and the European Civilization and Art courses. It is necessary to make this restriction in order not to annul the policy of not affording facilities for evening work in the drawing rooms in Design during the second and third years. We are more than ever impressed with the wisdom of this recommendation, and feel that in thus giving our students the fullest opportunities for the study of their chosen profession we are only keeping abreast of what is being done in other well-known Schools of Architecture.

Mr. John H. Scarff and Mr. Thomas H. Mace, Jr., the successful competitors in the 1912 and the 1913 competitions for the Traveling Fellowship, are both abroad. Through the action of the Executive Committee this year's Fellowship is assured, and the Department hopes that it will not be thought unduly persistent when it repeats the urgent appeals of the past years in asking that action be taken that will definitely fix this feature as an annual event. As was stated last year, the success of the advanced course in Design is largely dependent on the ability to offer such a prize, and the fact that it was a fixed annual feature would, I am sure, be very conducive in influencing students to select the Institute for advanced work in preference to other schools. The Department, therefore, again urges in the strongest manner action by the Corporation on those lines. It also renews the recommendation made last year that a provision be incorporated in the conditions governing the award of this Fellowship making it obligatory on the part of the recipient to serve the Department as an assistant in Design for at least a part of the year succeeding his return at a salary to be fixed.

Professor Lawrence reports as follows with reference to the Option in Architectural Engineering:

“There are forty-three students registered for the Option as compared with forty-one last year. Two of these are candidates for the Master’s degree, so that the number of undergraduates remains the same as last year. They are divided among the classes as follows: senior, six; junior, sixteen; sophomore, nineteen.

It is gratifying to find that the older graduates of the Option are beginning to advise young men employed in their offices to take the course. Several of the students now in the Option have been so advised, and have come to me with letters of introduction from older graduates.

I have already pointed out in previous years that there should be a permanent Instructor in the Department who could take up the work of Option II in case of my own disability. The point of view of the Option in Architectural Engineering is quite different from that of any of the other Engineering courses at the Institute, and it would be difficult for a new man successfully to carry on the work even temporarily without materially changing the character of the course. As this character is the only real excuse for its existence it seems evident that as an insurance against the annihilation of the course there should be a second permanent instructor in the Option. The opportunities in practical work are so many for the graduates of this course that it is extremely difficult to find a man with the proper training and experience who at the same time is fitted and willing to teach. When such a man is found I cannot urge too strongly that the Department make every effort to enroll him permanently as a member of our staff.

In accordance with my suggestions of last year, a number of changes have been made by the Faculty in the curriculum of the Option tending to its greater efficiency. The students have been relieved from some of the more special work in Ornament Design, and a much-needed short course in Surveying has been substituted. A course has

been added in the first term of the third year in Structural Drawing as an introduction to the professional work in Structural Design, and which promises to have a very beneficial effect upon the latter course. Time was found for this change in the hours set free through the changes in the course in Heating and Ventilation. In passing I must express my great satisfaction with the manner in which the latter course, now being given by the Department of Mechanical Engineering, is being handled.

I wish to urge again the consideration of the degree of "Master of Science in Architectural Engineering" for the graduates of the advanced year in Option II in place of the somewhat misleading degree of "Master of Science in Architecture" that is now given. I believe that for the S.B. degree the "Bachelor of Science in Architecture" is proper for both Options, but in the advanced year of Option II the work is of such a special engineering character that the broader title is inappropriate and misleading."

JAMES KNOX TAYLOR.

CHEMISTRY AND CHEMICAL ENGINEERING.

It was briefly noted in the last Report that the Institute had received a gift of \$15,000 from friends of Mrs. Robert H. Richards, to be known as the "Ellen H. Richards Research Fund." The following is the statement accompanying the gift, and expressing the wishes of the donors:

The income of the Fund is to be devoted to the promotion of research in sanitary chemistry, the branch of science to whose development Mrs. Richards so greatly contributed. It is understood that the income will be utilized by the Institute for the award of fellowships to advanced students competent to pursue this line of research, for the employment of research assistants, and such other ways as will best promote investigation in the field in question.

The income from the Fund sufficiently accumulated in June last to permit of the employment of a research assist-

ant for half-time service. Mr. Robert G. Daggett was appointed to this position, and is now carrying on, under the direction of Dr. John F. Norton, and in the laboratory formerly occupied by Mrs. Richards, an investigation upon the influence of oxygen under pressure on the chemical and bacterial changes in sewages. This promises to yield interesting results. By the opening of the next year and thereafter, the annual income should be sufficient to provide free tuition for two graduate students, or to provide for the employment of a research assistant for at least eight months. It will be the purpose of the Department to show its appreciation of this memorial gift to the Institute by carefully considered suggestions as to appropriations from the income of this Fund for purposes which shall worthily promote the work in the chemistry of sanitation to which Mrs. Richards devoted so much of her life.

Among the notable events of the past year is the resignation of Professor Thomas E. Pope from his professorship of Inorganic Chemistry, after a long period of successful teaching. Professor Pope first came to the Institute in 1874, five years after his graduation at Harvard. After two years service as instructor, he resigned to accept the chair of Chemistry at Iowa Agricultural College, but returned to the Institute as Assistant Professor of Analytical Chemistry in 1884. On the death of Professor William R. Nichols in 1888, Professor Pope took charge of the instruction of the first year students in chemistry, and has been associated with that branch of the Department until the close of the past year. Always earnest and painstaking to the highest degree in his teaching, Professor Pope has placed hundreds of students under a debt of gratitude for his sympathetic helpfulness. His excellent judgment and fair-mindedness in his estimate of a student's real worth will be much missed by his colleagues. He retires under the provisions of the Carnegie Foundation. Professor Spear will assume the instruction formerly under

Professor Pope's charge, assisted by Dr. Edward Mueller, promoted to an assistant professorship in Inorganic Chemistry. Mr. Clarence K. Reiman was appointed to the instructorship vacated by Dr. Mueller's promotion.

Assistant Professors Mulliken and Sherrill received merited promotion to associate professorships in Organic Chemical Research and Theoretical Chemistry respectively. Mr. Charles R. Cressy resigned, and Mr. Duncan McRae was promoted to be Instructor in Inorganic Chemistry to fill the vacancy. The following assistants also resigned:—Messrs. John A. Gann, Bertrand F. Brann, Frank D. Bishop, Wylie J. Daniels, Christopher Fallon, Eugene T. Marceau, and Paul M. Tyler. Mr. John W. Livingston was promoted to an instructorship in Industrial Chemistry, and Mr. W. J. Murray to be Instructor in Analytical Chemistry. The following were appointed to assistantships:—Arthur E. Bellis, S.B., Robert D. Bonney, S.B., Charles L. Burdick, S.B., Warren E. Glancy, S.B., Lester F. Hoyt, S.B., Frederick W. Lane, Leon W. Parsons, S.B., Ferdinand H. Pendleton, Jr., S.B., Philip B. Terry, S.B., Charles S. Venable, M.A. (University of North Carolina), and Wilford J. Winninghoff, B.S. (University of Montana).

The summer requirement in Qualitative Analysis in the Courses in Chemistry and Chemical Engineering became effective for the first time during the past summer. The course opened immediately after the close of the annual examinations and continued until July 12th. It was attended by fifty students. The instructors in charge were Professors Noyes, Hall and Blanchard, assisted by Mr. Wallace J. Murray. Class-room instruction was given each morning at half-past eight, to three sections, thus leaving the remainder of the day for uninterrupted laboratory work. The results obtained from this new course appear, at present, to be excellent. Consecutive thought and effort on the part of the students, and the division of the class into small sections, which afforded opportunity

for a large measure of personal contact between instructors and students, rendered this period one of effective teaching; but it was still rather too brief for the best results, and the question of an extension of time from four to six weeks is now under discussion.

The optional summer course in Industrial Chemical Laboratory which was first offered by Professor Warren K. Lewis in 1912 proved so successful that a somewhat more extended course was offered in August and September of the past summer. This course comprised two parts, first, a week spent in a laboratory study of such general operations as filtration, evaporation, sedimentation, air separation, electrolysis, and the use of the electric furnace; and, second, a four weeks' course covering the required work in the Industrial Laboratory of the Fourth year of the Course in Chemical Engineering. The number of students taking the course was twenty-nine, and the interest shown in the work was most gratifying. These students will be able to utilize the time thus gained for additional thesis work, or for subjects not normally required for the degree.

A new course of exercises in Organic Chemistry for post-graduate students was announced by Professor Samuel P. Mulliken, and is well attended.

Through the liberality of Professor F. Jewett Moore, Miss Ruth M. Thomas has been continued as Research Assistant in Organic Chemistry.

The schedules of the Courses in Chemistry and Chemical Engineering, revised to take advantage of the time gained by the summer requirement in Qualitative Analysis, went into effect in the second year of those courses in September.

The monthly departmental conferences have been held throughout the year, and with excellent results. One of the more important of these has been an improvement in the conduct of the thesis work done by fourth-year students. The number of these theses to be provided for

has greatly increased, and coördination of the work was needed. The placing of the matter in the hands of a Committee of the Department has made it possible to bring about a more fitting selection of subjects on the part of the individual students than was formerly the case, and to secure a somewhat greater uniformity of standards. The Committee hopes to make further improvements during the present year, on the basis of experience already gained.

Although the list of publications by members of the Department is shorter than usual this year, there has been no lack of activity, for the papers which are in preparation, many nearly ready for publication, are at least equal in number to those of a normal year. The members of the Department have also been actively engaged in consultation work relating to private and public interests, and in participation in the meetings of committees of the various scientific societies and organizations.

H. P. TALBOT.

RESEARCH LABORATORY OF PHYSICAL CHEMISTRY.

During the past year the work on the thermodynamic constants of ammonia, carried out by Dr. Keyes with the assistance of students of the Mechanical Engineering Department, has been completed; and from the data obtained "ammonia tables" corresponding to the "steam tables" in common use by engineers are being computed with the aid of a grant from the Rumford Fund of the American Academy of Arts and Sciences, and will soon be published; thus making available the exact data that are much needed in the planning and operation of refrigeration plants. The similar investigation on the pressure-volume relations of water up to high pressures and temperatures has been continued by Mr. Roy D. Mailey and is now nearly completed.

Professor Kraus has continued his studies bearing on the anomalies exhibited by strong electrolytes in aqueous and non-aqueous solutions; and in coöperation with him, Mr. Louis Weisberg has carried out an experimental investigation on the conditions of formation of hydrocyanic acid from ammonia and carbon at high temperatures.

Under the direction of Professor Noyes, work has been pursued by four graduate students on the oxidation-potential of various oxidizing and reducing agents with the purpose of fixing their position accurately in the electromotive series. With the aid of Professor Isaburo Wada of the Tokio Normal School, who has been a guest of the laboratory during the past year, and of students pursuing theses, work has been continued on the scheme of qualitative analysis including the rare elements.

The laboratory has unfortunately lost the services of Dr. Frederick G. Keyes, who has resigned from the staff to accept the position of Chief Engineer of the Cooper-Hewitt Electric Company.

On the financial side, the researches in the laboratory have again been assisted by a grant of \$3,000 made to Professor Noyes by the Carnegie Institution of Washington.

A. A. NOYES.

RESEARCH LABORATORY OF APPLIED CHEMISTRY.

The necessity of providing adequate facilities for the post-graduate work in the course in Chemical Engineering continues to limit the more strictly professional activities of this laboratory. One of the original purposes in organizing the laboratory was to offer to manufacturers opportunity to study some of the problems arising in their respective industries. The usefulness of such a laboratory is today as keenly recognized by the manufacturer as in former years, and there are now a number of problems

for which financial support has been provided, but which we lack the space to undertake. It is considered, however, more important that the post-graduate work of our students should be taken care of, even if opportunities for serving the manufacturing public be temporarily lost. It is becoming increasingly evident that one of the chief functions of a laboratory of this kind is to train men capable of independently directing industrial research immediately upon leaving the Institute. It has been found that in the complete study of an industrial problem it is necessary not only to determine the scientific principles which enter into its solution, and to apply these principles according to modern methods of scientific research, but also to consider the economic conditions by which the final solution must eventually be confronted and controlled. The industrial efficiency and economy of the results obtained in the laboratory are important factors which must be considered in determining the success of the investigation; and the experience of this laboratory has shown that training in this phase of the work is no less important for the student than the more strictly scientific preparation. The majority of the men who have held assistantships in this laboratory are now conducting research laboratories in the most diversified industries, and there are at present on file requests from manufacturing concerns for men thus trained.

Of the problems mentioned in our report of last year, that relating to the bacteriacidal properties of the higher phenolic acids has been brought to a successful conclusion. In this connection there has been developed a new method for the quantitative estimation of the value of commercial disinfectants which is believed to be more accurate and less cumbersome than the methods now in use.

The problems in the search for a furnace lining to withstand strongly alkaline fusions, and on the design of an electric furnace for the preparation of lime and carbon

dioxide, have passed beyond the laboratory stage and are being studied further on a semi-industrial scale by Mr. Hugo H. Hanson, in Canada.

The determination of the transfer of heat through iron pipes as a function of the difference in temperature, of the viscosity of the liquids heated, and of the rate of heat transfer is being continued, as is also a study of the general laws governing systematic extraction and lixiviation.

Among the new problems undertaken an exceptionally interesting one is a study of the possible utilization of the many thousands of tons of sulphate of iron now produced as a by-product in industries requiring acid cleaned iron, and which are at present thrown away for lack of a profitable market.

WILLIAM H. WALKER.

ELECTRICAL ENGINEERING.

A significant and far-reaching recognition of the ideals of the Department of Electrical Engineering has been made by the formal organization within the Department of a Division of Electrical Engineering Research. This is planned to carry on investigations of such unsolved problems in electrical engineering as may be proposed by the Department staff or may be brought to the Department for its investigation by individuals or corporations. The organization of the Research Division is a logical consequence of the momentum of our advanced or post-graduate instruction in electrical engineering subjects and the increasing research activity of the Department which have developed as the outcome of the last half dozen years. The new division is fortunately formed with Professor Pender as Director, and he is aided by an advisory committee consisting of Professors Jackson, Laws, Lawrence and Wickenden. For convenience in administering the work, Mr. Harry F. Thomson has been appointed the Director's

first assistant. Mr. Thomson also ranks as an Instructor in the teaching staff of the Department. In addition to directing the organized work of research, Professor Pender continues to deliver his advanced or post-graduate lectures but is relieved of the arduous course for third year students which has heretofore been in his hands. The responsibility for this course has been transferred to Professor Wickenden.

Besides the foregoing members of the Department staff, the Research Division has now three research men who devote their entire time to the specific problems of research which are in hand. These are Mr. H. O. Taylor, Ph.D. (Cornell), Research Associate, with appointment taking effect Dec. 1, Mr. Calvin P. Eldred, S.B., (Technology), Research Assistant, who has been in the Department in a like post for a year past, and Mr. David J. McGrath, S.B. (Technology), Research Assistant, who was appointed last October. Each of these men is assigned to a particular problem of investigation, and it is contemplated that additional investigations will be undertaken and additional Research Assistants appointed whenever additional funds become available.

Two candidates for the degree of Doctor of Engineering are also engaged on rather extensive research problems as a part of the requirements for the attainment of their degrees, and candidates for the degree of Master of Science are employed on lesser research problems.

The close association of undergraduate instruction, graduate instruction and research in the electrical engineering sciences which we aim to accomplish is of much practical pedagogic import. The practice of electrical engineering consists largely in economic applications of principles of the underlying sciences to specific problems and calls for the same kind of spirit and initiative which is developed by research designed to extend knowledge of the principles themselves. Hence, by bringing the definite work of research into association with the laboratories where the

body of the students are engaged at work, every individual has constantly before him illustrations of the true methods for attacking electrical engineering problems, which cannot so readily be illustrated by the less comprehensive problems of the class room or by the undergraduate laboratory problems. The undergraduate students with well fixed ambitions and suitably tempered abilities are also encouraged by the association to take up themselves some period of advanced study and research, which is particularly desirable as the final preparation for those who hope to obtain the highest distinction in engineering employment. Besides the foregoing, the arrangement which we have now in effect affords the Department a fortunate opportunity of adding a quota of knowledge to the electrical sciences and of illustrating the best methods of applying electrical engineering principles to produce desirable economic results. In case additional funds or endowments are contributed for this purpose, there is every reason to believe that the advantages derived from this work will steadily multiply.

Coincident with the formal organization of the research division, various promotions and changes of the staff have been made. As already pointed out, Professor Pender has been made Director of the new division, but his title of Professor of Electrical Engineering is continued. Professor Laws has been promoted from the position of Associate Professor of Electrical Testing to the rank of Professor of Electrical Engineering. Mr. Thomson has been promoted from the position of Research Associate to the position of Instructor in Electrical Engineering and Assistant of the Director of the research division. Mr. Nathaniel S. Mars-ton has been promoted from the position of Assistant in Electrical Engineering to the position of Instructor in Electrical Engineering. Mr. Otto R. Schurig (Technology '11) has been appointed Instructor in Electrical Engineering *vice* Mr. William S. Gorton resigned. Messrs. F. H. Achard (Technology '13), H. C. Harrison (Colorado Col-

lege '10, Technology '13), and R. E. Leonard (Technology '13), have been appointed Assistants in Electrical Engineering in place of Messrs. James P. King, David M. Terwilliger and R. J. Wiseman, who resigned. Mr. Ralph S. Rankin (Technology '13) has also been appointed Assistant in Electrical Engineering. Mr. Wiseman stays with the department as a graduate student, being a candidate for the Degree of Doctor of Engineering.

It is to be expected that the Assistants will change from year to year and that few will remain in the staff long enough to obtain promotion to instructorships. The Department has been fortunate in recent years in obtaining some unusually able young men for this rank in the staff, who have been chosen from our own men just graduated or from the men just graduated in other engineering schools, but this good fortune must be ascribed to other than the attractions of salary. These young men enter subordinate teaching work, the routine of which leaves but little time for independent study and reflection. The opportunity for some advanced study is a good reason for an able young man to take an assistant's position for a year or two, provided the program of work leaves some time for such study and the salary paid is sufficient for self-support, but the work of our Assistants is onerous and the salaries attached to all of the junior positions are meagre. One of the national societies of professional engineers has recently obtained from its members some statistics of professional income. These include some figures regarding the earnings of junior members. It appears from these that the average earnings of those amongst these juniors who have been in engineering employment for one year is \$1300 per year per man, and of those who have been five years in engineering employment is \$2000 per year per man. The young engineers who enter the junior ranks of the national engineering societies are likely to be engineering graduates of high ideals and the most initiative; that is, they comprise

a select class, but the young men whom we take into our teaching staff even for a year in the subordinate positions should be selected most carefully for ability, learning and initiative. The salaries paid to these younger men in our staff is in unhappy contrast with the figures named above.

During the course of the year various additions have been made to the equipment of the Department. A portion of the Dering library has been brought into service; a large continuing contribution for research has been made by the American Telephone and Telegraph Co., and another has been made jointly by the General Electric Co., the Public Service Railway Co. and Stone and Webster. These have heretofore been publicly announced through your office. Various minor gifts for laboratories have been received. The Edison electric vehicle research and the investigation of congestion and delays at the Boston freight terminals have been concluded. The third report of progress on the former was made in March, 1913, in a pamphlet written by Professor Pender and Mr. Thomson, and numerous additional data have been since gathered. The preparation of a concluding report will be a duty of the new Research Division. The information bulletins and data issued as a consequence of this investigation have been in much demand by users of trucks.

DUGALD C. JACKSON.

BIOLOGY AND PUBLIC HEALTH.

The trend of the times towards applied science, and especially towards a new humanism which seeks to conserve and promote health and human efficiency, is making itself felt in Biology perhaps even more than in the other sciences. At the Institute, this movement, as far as biology is concerned, has led to the emphasis of public health and indus-

trial micro-biology and in these directions the Institute now stands among the leaders in America.

Perhaps the most noteworthy single event of the year has been the establishment, in coöperation with Harvard University, of a school of high grade for the training of health officers. This was opened at the beginning of the school year, in September, and has already registered eight students, five of whom are Doctors of Medicine, and three Bachelors, one each of Arts, Science and Philosophy. In view of the extent and significance of the public health movement in America today and the wide-spread demand for properly trained health officers, it seems certain that this new enterprise will quickly become a training school of the first importance to applied biology and in the service of the public health.

The total number of students receiving instruction from this Department during the year is more than three hundred, among whom are many graduate students from other colleges. The demand for graduates trained in Biology and Public Health continues to exceed the supply, while the salaries offered show that the need for them is real and great.

In the early summer the writer was requested by the Secretary of Agriculture of the Federal Government to make a personal inspection of certain meat packing houses in New England engaged in interstate meat traffic and to report directly to the Secretary. This work is still in progress. Professor Prescott, in addition to his regular work upon various problems of public milk supply, has begun a novel and important series of investigations of the sanitary aspects of the candy industries. Professor Gunn, besides continuing his duties as Secretary of the American Public Health Association and serving as Editor of the American Journal of Public Health, has found time to make on behalf of the Business Men's Association of Pawtucket, R. I., a minute sanitary survey of that city, followed by a lengthy report containing many recommendations for municipal

improvement. Mr. Franz Schneider, Jr., Instructor in Biology and Public Health, was released at his own request in February, to take a new and promising position as sanitarian in the Department of Surveys and Exhibits of the Russell Sage Foundation. Dr. D. B. Armstrong, who received our degree of Master of Science in Biology and Public Health in June last was, even before his graduation, appointed to the Bureau of Public Health of the New York Association for Improving the Condition of the Poor. These two appointments show well the humanitarian trend of one aspect of our work, and the indications are that these novel features will develop very rapidly all over the country.

Meantime, the regular work of painstaking and thorough instruction in the fundamentals of the sciences underlying these manifold activities is carefully attended to, and special mention should here be made of the work of Professor Bigelow, Dr. Howe, Dr. B. L. Arms and Mr. Ingham. We have also had valuable assistance chiefly in the laboratory, from Messrs. W. C. Purdy, A. P. Sturtevant and H. C. Woodfall.

The equipment of the Department has been materially strengthened by the gift of five high power microscopes from an anonymous friend.

WILLIAM T. SEDGWICK.

SANITARY RESEARCH LABORATORY AND SEWAGE EXPERIMENT STATION.

Under the same generous gift which has been bestowed upon the Institute annually since 1902, a large amount of work has been done for Sanitary Science and Public Health in new directions, described in the following report of Professor E. B. Phelps, who has been for some years in immediate charge of the work and until his resignation on October 1st to become Professor of Chemistry in the Hygi-

enic Laboratory, U. S. Public Health Service, Washington, D. C.

"Our activities during the year have been extended over two principal lines, (a) An Experiment in Coöperative Suburban Board of Health Service and (b) A Study of the physical principles underlying the Problem of Ventilation.

"Details of the Coöperative Public Health Work for Towns have already been reported in a paper presented by Professor Phelps before the Massachusetts Association of Boards of Health at their annual summer meeting and published in the American Journal of Public Health for September, 1913. In addition to what was stated in that paper it should be noted especially that the Sanitary Research Laboratory has been of material financial assistance in this movement from the start. At its inception and during the period when the income was insufficient to provide the necessary working staff the part-time services of Mr. Franz Schneider, Jr., Instructor in the Department of Biology and Public Health, were made available to the organization. Mr. Schneider's keen interest in the experiment and his conscientious efforts to extend its scope, were large factors in its successful organization. During this critical period we also received valuable assistance from Dr. B. L. Arms, Lecturer in the Department, who took charge of the diagnostic work and rendered us other assistance. Somewhat later we were fortunate in securing the services of Miss Edith A. Beckler, a graduate of the Department, who helped us to tide over a most difficult period by giving us valuable aid in diagnostic and laboratory work at merely nominal cost. Professor Gunn has likewise given freely of his time and advice, and his wide experience in the organization and routine management of Board of Health work has been made freely available to us at all times.

"The Sanitary Research Laboratory was also of direct financial service in advancing funds during the preliminary

period of organization and rendered invaluable moral support by enabling us to eliminate any suggestion of commercial or personal advantage in the new movement. It has been my hope and expectation that the Coöperative Board of Health Service shall in return be of some direct value to the Institute by affording opportunity for actual field work in public health on the part of our advanced students and especially on the part of the students in the School for Health Officers. It is possible that another year a definite place may be allotted in the curriculum of that School for field work at Wellesley.

“The staff organization at present comprises Mr. Robert N. Hoyt, who serves as the general administrative officer of the group and who is the actual agent of the various Boards; Miss Edith A. Beckler, who acts as Mr. Hoyt's chief assistant, having special care of the office routine, and is also responsible for the diagnostic and general laboratory work and is designated as Bacteriologist of the various Boards; Mr. Thomas F. Harris, Sanitary and Plumbing Inspector who serves as outside inspector and as milk collector and who is designated as Plumbing Inspector of the towns of Belmont and Weston; and Mr. H. L. Shoub, Technical Assistant of the Hygienic Laboratory, United States Public Health Service, who has been detailed to assist the work of organization until April 1st, 1913.

“The Surgeon-General of the United States Public Health Service has permitted the writer to continue in active charge of the work, but practically the whole responsibility necessarily devolves upon Mr. Hoyt. It is a pleasure to recognize his untiring and unselfish labors and their most satisfactory results. Whatever measure of success may attend the final outcome of this work will be largely due to Mr. Hoyt's devoted interest and faithful work. Miss Beckler's influence has likewise been of inestimable value. Her experience and knowledge of laboratory technic and details have commanded respect and admiration and

her earnest efforts under working conditions that have been at times most trying have made our laboratory work one of the strongest points in the entire administration. Mr. Harris' work too has been done in an entirely commendable manner and he has won the cordial regard, not only of his associates but of the officials and towns-people with whom he has come in contact. His labors have involved working at all hours of the day and night and in all kinds of weather and he has carried out his share of the organization's work with a real interest that has made him a valuable member of the service.

"Perhaps the most evident indication of the success of this movement is the desire that has been expressed on the part of a majority of the coöperating communities to continue the arrangement for another year and in three cases an expressed willingness to ask the coöperating towns for additional appropriations for this purpose.

"The Sanitary Research Laboratory has also continued the investigations in the field of ventilation which were begun last year. Early in the summer the writer was appointed a member of the New York State Ventilation Commission and it was deemed advisable to consolidate the work of this Laboratory with the more extensive work of that Commission. The New York Commission has accordingly appropriated the sum of two thousand dollars to be expended at the Institute in the continuance of the investigations that are now under way. This will make it possible to purchase certain recording instruments which were sadly needed and also to assign to the work two part-time employees who will accumulate the necessary experimental data during the winter and spring. This arrangement also makes it feasible for the writer to remain in charge of the work, his membership on the Ventilation Commission having received the sanction of the Surgeon-General of the United States Public Health Service.

"The investigation now under way contemplates a de-

termination of all the physical factors which have to do with the dissipation of heat from the human body. A complete analysis of the physical processes involved reduces these factors to four. First, comes radiation, of which some special account must be made later. At present we have to deal with the three remaining factors, temperature, humidity and velocity of air movement. We propose to study the rate of heat loss from moist and dry surfaces maintained at 37° C., and exposed to an atmosphere which can be varied over a wide range in respect to each of these three factors. The investigations now under way will involve some thousand or more separate observations and a great deal of mathematical compilation and study of results. The work is in charge of Mr. William Grant who is assisted by Mr. George B. Zimmele.

“The Sanitary Research Laboratory has further made from time to time various investigations of a more immediately practical nature. On behalf of the Boston School Committee, the writer drew up specifications for the purchase of disinfectants and with the help of Mr. Ingham examined and reported upon a number of samples of disinfectants submitted. As the result of this work the School Committee were enabled to purchase a disinfectant this year at something over one-half the price per unit that has been customary for high grade disinfectants. Some coöperative work has also been done at the suggestion of the General Electric Company upon the effect of ozone in room ventilation. The results thus far obtained have been inconclusive and the work will be continued.”

Professor Phelps has been associated with the work of the Sanitary Research Laboratory from its very beginning, and his resignation is a heavy loss to it and to the Institute. If the important experiment in suburban health administration described above and now going on well proves continuously successful it will be chiefly because of Pro-

fessor Phelps' administrative enterprise and scientific ability.

We have been fortunate enough to secure in place of Professor Phelps, Mr. Robert Spencer Weston, the well-known Sanitarian, as Assistant Professor of Public Health Engineering. Prof. Weston began his duties on October 1st, so that the work of the Sanitary Research Laboratory has proceeded without serious interruption.

WILLIAM T. SEDGWICK,
Director.

DEPARTMENT OF PHYSICS.

There have been few developments or changes in the Department during the past year which call for special notice at this time. The numerous lectures and laboratory arrangements referred to in the Report of last year have been in operation to the satisfaction of all concerned. All the Courses, with the exception of Civil Engineering, Mining Engineering (Options 1 and 3), and Sanitary Engineering have now revised their schedules of study so as to begin work in the physical laboratory in the first term of the second year. This permits the introduction of exercises in Electrical Measurements running in parallel with the lecture and class-room work in electricity in the second term. The instruction in Physics as a whole has been greatly benefited by this procedure, and it is hoped that the schedules of the remaining courses into which the change has not yet been introduced may be made to include electrical laboratory work at an early date. This is particularly desirable for Courses which subsequently include work in the Electrical Engineering laboratories. The aim of the Department is to keep the laboratory and class-room work in the second year as closely related as is practicable, and this, with the increasing size of the classes,

has necessitated much new equipment in recent years, in duplication of standard apparatus already in use.

The publication by Professor Goodwin of a text-book upon "Precision of Measurements" will be of great help to the students in this important, but to a beginner somewhat perplexing, subject.

In connection with his lectures on Heat, given to students of the third year, Professor Norton has prepared a set of lecture notes similar in character to those on Mechanics, now in use by the second year class in Physics.

Among the advanced courses given in the Department, reference should be made to that in Photomicrography, given by Professor Derr. The number of persons wishing to enter it, several of whom are assistants, has been so large as to necessitate the formation of a second section, the capacity of the room devoted to the subject being too small to accommodate the whole class.

In this connection it should be noted that the various installations of machinery have increased the vibration of the Walker Building to a degree which is a serious handicap to anyone attempting high-power photomicrographic work. Thanks to our powerful and convenient illuminating apparatus, low power work is not difficult; but the photography of objects requiring high-power immersion lenses is at best unsatisfactory under existing conditions.

Various additions have been made to the apparatus of the Rogers Laboratory, the only one of which calling for special notice being a Gaede molecular air-pump. This remarkable machine should be of much use both for demonstration and research.

The apparatus for the liquefaction of air, described in the last Report, has been in operation for some months. It fully justifies our expectations, giving a yield of about three liters per hour. An apparatus for the preparation of liquid hydrogen is in preparation.

In the Laboratory of Heat Measurements an extensive

research has been started upon the transmission of heat through various kinds of bricks, particularly such as are used for linings and walls of furnaces. Through the kindness of some of the manufacturers of substances of this sort, specimens have been obtained of practically all the materials in extensive use in the American market.

The detailed examination of materials having great efficiency as thermal insulators, which has been going on for the past three years, is now practically completed. The results will be published shortly.

In the Course in Electrochemistry the total registration remains about the same as last year, so that with our present laboratory facilities we shall probably be able to accommodate all regular students until we move to the new site. Pending a decision regarding the character of the electric power supply in the new laboratory, a conservative policy as to increasing laboratory equipment is being pursued. For this reason during the last year the only expensive new apparatus added, aside from necessary duplication of desk equipment, has been a Leeds potentiometer for thermo-electric measurements and the most recent form of Wanner pyrometer. The curriculum of the Course has undergone no radical change calling for particular mention. The opportunities offered to students in other Courses for taking optional laboratory work given by the Department are availed of to an increasing extent.

By far the most important recent development of the work of the Department is the establishment, as an Option in Course VIII, of the new Course in Industrial Physics, which this autumn has been opened to students of the second year.

Few persons not familiar with the manufacturing industries fully realize the great and increasing need in these of expert knowledge of physical principles, processes and methods of measurement. A considerable number among

the graduates of the Institute are engaged in responsible work of this character.

The lack of perfect definiteness which at present exists as to the scope of the profession, and as to the assured demand for those trained in it as experts, tend somewhat to obscure to the students the value of the opportunities which are opened in this new Course. A good beginning has been made, however, and there can be no doubt that as it becomes more fully known the number will increase very largely.

The thoughts and work of the various members of the staff have in large measure centred upon the new quarters soon to be occupied by the Department. The original detailed plans, tentatively presented in such form as best to make clear the needs of the Department, were worked out by the architect, who, with great skill, adapted them to the form and scale of the building which it had meanwhile been decided to erect. These plans with the necessary rearrangement of certain details will probably give all that it is practicable to secure in view of the necessary limitations of the total space available.

CHARLES R. CROSS.

GEOLOGY.

Instructing Staff.—No changes in the instructing staff have taken place since the changes mentioned in my last report were effected. Professor Waldemar Lindgren, appointed Head of the Department, began his work at the Institute on November 17th, 1912. The courses in Mineralogy and Petrography are as before given by Professor Charles H. Warren, and those in Paleontology and Stratigraphic Geology by Professor Hervey W. Shimer. Dr. Frederick H. Lahee gives the lectures on General Geology, while Mr. John D. MacKenzie is Instructor in Lithology and Field Geology.

Course Scheme.—The only important change in the Course Scheme consists in the introduction of a course of fifteen hours of lecture in Elementary Economic Geology in the second term of the third year of the mining engineers. It has been found that the fourth year students did not derive full benefit from the more extended course in Economic Geology, because of their lack of preliminary preparation, and this course is expected to supply that deficiency. The courses in Field Geology for mining engineers will be somewhat modified by giving more attention to accurate and instrumental methods of surveying.

Evening conferences for the presentation of geological investigations by instructors and advanced students have been held at intervals throughout the academic year, and have also been well attended by instructors and students from Harvard University and Tufts College.

Advanced Students.—During the year the Department has had one advanced student candidate for the degree of Master of Science, Mr. Sidney Powers. Mr. Powers completed his work, and presented a thesis on the geology of a certain part of Northern Rhode Island. At the close of the year the degree of M.S. was conferred upon him.

During the academic year begun in 1913, four graduate students in Chemistry have taken the new course in Optical Crystallography and Applications. It is encouraging to see that the importance of this branch of physical crystallography in advanced work in chemistry is appreciated.

Students.—The courses in General Geology were attended by eighty-seven students mainly from the Civil Engineering course. Most of the other courses given by the Department are attended by the students in Mining Engineering; the fourth year class in this branch numbered nineteen. In addition there were special students in several of the courses.

Collections and Instruments.—A number of smaller donations have been received for the geological collections.

One specially noteworthy, representing the Tertiary rocks of Alabama, was contributed by Professor William O. Crosby. The economic collections have been considerably increased by smaller suites of specimens, a number of which were donated by Professor Lindgren.

The instrumental equipment of the Department was considerably increased during the year. A machine was purchased for sawing and polishing rock specimens, and another machine for polishing metallic ores was kindly transferred from the Mining Department. A Greenough binocular microscope for the examination of minerals and specimens with low magnifying power was purchased. For the metallographic study of ores, a large microscope with camera of the Leitz type was purchased, as well as two students' microscopes for the same purpose, of the Sauver type. A small model refractometer suitable for general laboratory use was purchased for the Mineralogical Laboratory. The instrumental equipment of the Department is now quite satisfactory.

Professional Work.—Professor Lindgren devoted such time of the year as could be spared to the preparation of a text-book on “Mineral Deposits” consisting of about 900 pages. This text-book was published in the summer of 1913, and is now in use at the Institute. Professor Lindgren also undertook some professional work in Mexico on two occasions during the year. In February he visited the properties of the Cortez Associated Mines in Hidalgo, Mexico, having obtained leave of absence from February 9th to March 14th. During the summer vacation he visited the mines of El Oro, State of Mexico, the trip occupying the time from May 30th to July 23rd. The collections obtained in both cases are now being studied with reference to scientific results.

During the year Professor Warren completed an extensive paper on the “Petrology of the Alkaline Granites and Porphyries of Quincy and the Blue Hills.” The paper

was published in the Proceedings of the American Academy of Arts and Sciences. During the summer Professor Warren devoted much time to geological work on the igneous rocks of Salem and vicinity. He also completed together with Mr. Sidney Powers a geological and petrographic study of the "Diamond Hill-Cumberland District in Northern Rhode Island," which will soon be published.

Professor Shimer published during the year an article on the "Spiriferoids of Lake Minnewanka, Alberta," in the Bulletin of the Geological Society of America. Also an article on "Early Man" in Science Conspectus, and a paper on a "New Sponge from the New Jersey Cretaceous" in the Bulletin of the Natural Museum. Professor Shimer is now completing a book entitled "Introduction to Fossils." During the past summer he has been studying the occurrence of late Quaternary shells of Boston, largely on the basis of the finds made during the construction of the new subway.

Dr. Frederick H. Lahee during the present year has published a paper on the "Geology of the New Fossiliferous Horizon and the Underlying Rocks in Littleton, N. H." This paper was printed in the American Journal of Science. He is now studying the petrography of the metamorphic rocks of Rhode Island, and has in preparation a book on "Methods of Field Geology." During the summer vacation Dr. Lahee was engaged as field assistant of the United States Geological Survey and was attached to a party which conducted a preliminary examination of the southern part of the Sierra Nevada.

Mr. John D. MacKenzie spent his summer vacation in examining, as chief of party and assistant geologist in the Geological Survey of Canada, a part of the geology of the Queen Charlotte Islands, B. C.

WALDEMAR LINDGREN.

NAVAL ARCHITECTURE AND MARINE ENGINEERING.

Following the decision that the Bureau of Construction and Repair should be charged with technical supervision of aëronautics for the Navy, request was made that instruction should be given at the Institute in that subject to student officers. This work has been in progress two years and now Assistant Naval Constructor, Jerome C. Hunsaker, U. S. N., has been appointed instructor in Aëronautical Engineering, and assigned to this Department. He will immediately take charge of instruction in aëronautics to the student-officers, and as soon as facilities can be developed, will offer instruction in aëronautical engineering and design to graduate and undergraduate students. It is expected that opportunity for experimental investigations will be provided.

The Department has consistently encouraged students to work in shipyards during summer vacations and has always been able to find opportunities for students who desired such work. With increasing numbers, it has been found advisable to give more systematic attention to the matter, and inquiry brought a cordial response from the leading shipyards. Last summer students were placed in groups at the Maryland Steel Company, the Newport News Ship and Dry Dock Company and the New York Shipbuilding Company. The officers of each of these companies gave personal attention to the welfare of the students and gave them exceptional facilities. Such contact with the work of the yards is of the greatest value to the students and is first felt in connection with instruction in ship design.

Two series of investigations in preparation of these may be mentioned:

(1) By Assistant Naval Constructor Ralph D. Weyerbacher and Thomas B. Richey on anchor engines for a recent battleship.

(2) By Messrs. Armin L. Pitz and Chee S. Hsin on the stability of ships' lifeboats, especially of certain types made for close stowage in consequence of new demands for passenger ships.

During the summer the Department has continued experiments on the *Fulton* to determine the resistance of bilge-keels. The results have been reported to the Society of Naval Architects and Marine Engineers. The means for this investigation were provided by Mr. Henry A. Morss, Mr. Lewis A. Crossett, Mr. Frederick C. Fletcher and Mr. Herbert M. Sears. The experiments were carried out under the direction of the head of the Department by Professor Everett assisted by Mr. Constable.

As in the year previous, Professor Everett has been yacht measurer to the principal yacht clubs and racing associations of the State.

A tentative arrangement has been made to give instruction in naval construction and warship design under the direction of Professor Hovgaard to students of any nationality, parallel to, but distinct from, that given to student officers of the United States Navy.

CECIL H. PEABODY.

MATHEMATICS.

During the year 1912-13 there has been no marked change in the character or extent of the work of this Department.

The numbers of students and sections in the general mathematical subjects have been as follows:

	Students.	Sections.
Trigonometry	344	17
First-year, first-term mathematics	414	20
First-year, second-term mathematics	389	19
Second-year, first-term mathematics	372	17
Second-year, second-term mathematics	359	17
Third-year, first-term mathematics	176	10
	<hr/>	<hr/>
Total	2,054	100

The average size, $20\frac{1}{2}$, of all sections is somewhat larger than formerly, and should be reduced when possible.

The total number of persons receiving instruction in mathematics during the year has been, in round numbers, 1,000.

The increase of students this year has been offset by the appointment of Mr. Thomas S. Holden, a graduate student from the University of Texas, as half-time instructor in Mathematics.

The unified course in mathematics prepared by Professors Woods and Bailey in 1907-08, having been in continuous use for six years, a change, for a time at least, has been thought advantageous, and we are now using a recent text-book on Analytic Geometry in the first year, expecting to follow it by some approved Calculus next term. This experiment will help us to determine whether to return to the previous text, or perhaps to prepare a new one along similar lines, with such improvements as have naturally suggested themselves during the years that text has been used.

The Runkle Library of Mathematics now contains about 2,400 volumes. The shelf-room is seriously overtaxed, but relief will naturally await our transfer to the new site.

Department meetings have been held in alternate weeks during the year. Besides subjects presented by members of the Department, Professor Phelps has discussed Statistical Methods in Biology, and Professor Bradley has spoken on Descriptive Geometry. Professor Passano has presented a mathematical study of Efficiency in a Printing Establishment. A comparative study of methods of dealing with students' problem work is now in progress.

Professor Woods has been appointed chief examiner in algebra for the College Entrance Examination Board.

H. W. TYLER.

DRAWING AND DESCRIPTIVE GEOMETRY.

During the past year no general departure has been made from the routine of the previous year, but on account of changes in professional subjects, Courses X and XIV will drop second year Descriptive Geometry. For these courses a tentative change will be made this year in Mechanical Drawing to see if a portion of the second year Descriptive Geometry can be included to advantage in the second term Descriptive Geometry of the first year.

As the Institute will soon enter upon a period of expansion, the present time seems opportune for speaking of conditions affecting the efficiency of this Department. From present indications the equipment in the new buildings for instruction in Mechanical Drawing, Descriptive Geometry and first year Freehand Drawing is likely to be adequate. There are certain matters concerning the efficiency of the instruction in these subjects which may properly come up at another time. The immediate question of importance, however, is the provision which is to be made for the Freehand Drawing in the Department of Architecture.*

The importance of Freehand Drawing in the practice of Architecture is shown by the fact that it is included in the professional studies of the Architectural Department. But while the technical importance of the subject has been thus emphasized, and while aside from its technical use, it is said to afford good general training, yet it may be questioned whether there is any widespread appreciation that Freehand Drawing may, to a greater extent than any other subject, be made a means for giving the kind of cultural training needed by the architect.

The Department of Drawing has been deeply interested in this phase of the subject, and it is believed that much

*The term "Freehand Drawing" here includes Life Class and the subject of Decorative Figure Design.

has been accomplished toward giving the student a sense of arrangement, values and color harmony, and toward training his judgment in the use of ornament, and in art appreciation. The enthusiastic comments of our students in the graduate year, of those returning from study abroad, and of competent judges from other schools have been most gratifying.

The results both in drawing and culture have been due partly to our insistence upon teaching Pure Drawing or fundamental principles and methods, uninfluenced by passing fashion or fancy, or by consideration of special methods in architectural rendering.

The approval of Professor Chandler and the liberal policy of the Corporation has made possible the working out of these results. The particular educational methods adopted and the personality and unremitting efforts of Professor Brown have counted for much. The studio in the Pierce Building, spacious, admirably lighted, and with its art atmosphere, has been an important factor. The question which now interests the Drawing Department is whether our quarters, equipment and support in the new Technology will be such that we may go forward.

The influence of environment counts for much. The class room should have ample overhead space, and the instructor should not be hampered by lack of floor space in making such distributions of students and drawing objects as may be called for by variations in the exercises. Crowding must be avoided at all times, and it should be understood that the drawing exercises may vary to such extent that a floor space sufficient for thirty students in one form of practice, may, in another form of practice, accommodate only ten or twelve.

The lighting of the room is of great importance. The light should come from both the top and sides of the room so that different light and shade effects may be obtained. The amount of both kinds of light should be as great as

possible to permit all in the class, or a considerable portion of it, to work under nearly identical conditions.

Perhaps the question will be raised whether there is imperative need of a room designed and furnished to give an art atmosphere, whether the same culture cannot be obtained by holding some of the exercises in the galleries of the Art Museum. This has been tried in the past, but on the whole the results were not satisfactory. While occasional work in the Art Museum is of real value, a general objection to extended work outside of the freehand drawing room is the loss of concentration attending the scattering of the students, and the mixing with others. Another advantage in keeping the work in our own room is the opportunity to address the whole class frequently and whenever occasion may arise.

In planning for the accommodation of the freehand work in the Architectural Department it is earnestly hoped that due consideration will be given to our special needs as set forth in this report.

The changes in the instructing staff have been as follows:

Assistant Professor Ervin Kenison has been advanced to the rank of Associate Professor of Descriptive Geometry and Mechanical Drawing. Mr. Gideon resigned during the summer to take a position in the University of Texas. His place has been satisfactorily filled by the appointment of a man of professional and teaching experience, Mr. Ralph C. Overland. Mr. John E. Bird is now half-time assistant in place of Mr. George W. Duncan, resigned.

ALFRED E. BURTON.

MODERN LANGUAGES.

The work of the Department of Modern Languages has gone on during the past year without many notable changes. The work in the second year has been somewhat more closely articulated with the professional aims of the students in the various courses, by the use of neostyled copies of selections from modern text-books, and from the latest German magazine literature. All courses in the second year except IV, IX, and XIII, have a modern language requirement in the second year. The third year optional courses in German are more largely attended this year than ever before.

One hundred and forty-two applicants for admission to the Institute from other colleges have satisfied our Elementary German requirements, ninety-nine our Intermediate German requirements, and twenty-nine our Advanced German requirements for the respective Courses which they wished to enter by records from the institution from which they came; likewise one hundred and nine have similarly satisfied our Elementary French requirement, and fourteen the Intermediate French requirement.

The work in German is this year distributed among six instructors (one on part time) in thirty-nine sections, averaging twenty-one students to each section, and sixteen hours of instruction to each instructor per week. There are three sections in French, one in Spanish and one in Italian, all assigned to one instructor, giving ten hours of instruction per week, with an average of nine students in each section.

Mr. Blachstein has returned from a year's leave of absence improved in health, and Mr. Orié W. Long has been called to the head of the Department of Modern Languages at the Worcester Polytechnic Institute.

FRANK VOGEL.

The Society of Arts.

During the season of 1912-13 seventeen new members were admitted to the Society of Arts. Five lectures have been given in Huntington Hall, Massachusetts Institute of Technology, as follows:

681st meeting, January 20, 1913. "Mosquitoes and some Suggestions for their Suppression." By W. Lyman Underwood.

682nd meeting, January 30, 1913. "The Pyramids as an Astronomical Monument." By Dr. Percival Lowell.

683rd meeting, February 11, 1913. "New light on the Old Problem of Age and Death of some of the Lowest Forms of Life." By Gary N. Calkins.

684th meeting, February 24, 1913. "Early Man." By Hervey W. Shimer.

685th meeting, March 3, 1913. "The Oyster." By Earle B. Phelps.

The attendance at the meetings of the society has been very satisfactory. SCIENCE CONSPECTUS, the publication of the Society of Arts, has kept up to its previous standard and appears to be of special interest to professional men who do not have the opportunity to read up on other than their own professional lines.

The Executive Committee elected for the coming season is as follows:—The President, Elihu Thompson, Arthur D. Little, Theodore N. Vail, James P. Munroe, Frederic H. Fay and I. W. Litchfield.

I. W. LITCHFIELD,
Secretary.

Publications.

THE INSTITUTE.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—President's Report. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVIII., No. 2. Boston, January, 1913.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Summer Courses. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVIII., No. 2. Boston, March, 1913.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Summer Surveying Camp. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVIII., No. 3. Boston, May, 1913.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Programme. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVIII., No. 4. Boston, June, 1913.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Officers of Instruction, 1913-14. Boston, November, 1913.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Catalogue. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLIX. No. 1. Boston, December, 1913.

ADMINISTRATIVE OFFICERS.

RICHARD C. MACLAURIN.—Scientific Research as a Financial Asset. *The Youth's Companion*, July 10, 1913.

CIVIL ENGINEERING.

CHARLES M. SPOFFORD.—Thaddeus Hyatt, an Early American Investigator and User of Reinforced Concrete. *Journal of the Association of Engineering Societies*, Vol. L., No. 5, 1913, p. 212.

LEWIS E. MOORE.—The Design of Plate Girders. New York. McGraw-Hill Book Company. 1913. 285 pp.

LEWIS E. MOORE.—A Suggestion with Regard to the Westport Wreck. *Railway Age Gazette*, January 15, 1913.

MECHANICAL ENGINEERING.

EDWARD F. MILLER and CECIL H. PEABODY.—Steam Boilers. 2d revision, New York, 1913.

WALTER H. JAMES and MALCOLM C. MACKENZIE.—Working Drawings of Machinery. Boston, 1913.

MINING ENGINEERING AND METALLURGY.

ROBERT H. RICHARDS.—Improvements in Ore Dressing. *Transactions American Institute Mining Engineers*, Vol. XLIV.

ROBERT H. RICHARDS.—Discussion of papers on Ore Dressing by Hayden, Bardwell, Wiggin, and Ammon. *Transactions American Institute of Mining Engineers*, Vol. XLIV.

ROBERT H. RICHARDS.—The Tyler Standard Sieve. *Mining and Scientific Press*, 1913.

ROBERT H. RICHARDS and CHARLES E. LOCKE.—Progress in Ore Dressing and Coal Washing in 1912. *Mineral Industry*, 1913.

HEINRICH O. HOFMAN.—Lead. American Year Book for 1912. New York, Appleton. 1912.

HEINRICH O. HOFMAN.—Recent Improvements in Lead Smelting. *Mineral Industry*, Vol. XXL., 1912.

HEINRICH O. HOFMAN.—Review of "Die Electrochemische Industrie Frankreichs." By R. Pitaval. Translated by M. Huth. *American Chemical Journal*, 1913.

HEINRICH O. HOFMAN.—The Metallurgy of Lead in 1912. *Engineering and Mining Journal*, 1913.

HEINRICH O. HOFMAN.—Review "Die electrolytische Alkalichloridzerlegung mit festen Kathodenmetallen." By J. Billiter. Theil II. Beschreibung ausgeführter Anlagen usw. Halle. Knapp. 1913. *American Chemical Journal*, 1913.

HEINRICH O. HOFMAN.—Review of Liebig's, "Zink und Cadmium und ihre Gewinnung aus Erzen und Nebenproducten." Leipsic. Spamer. 1913. *American Chemical Journal*, 1913.

HEINRICH O. HOFMAN.—Discussion of Preparation of Ore Containing Zinc for the Recovery of Other Metals. By S. E. Bretherton. *Transactions American Institute Mining Engineers*, Vol. XLVI., 1913.

HEINRICH O. HOFMAN.—Discussion of paper, "Notes on the Metallography of Refined Copper." By E. S. Bardwell. *Transactions American Institute Mining Engineers*, Vol. XLVI., 1913.

HEINRICH O. HOFMAN.—Discussion of paper, The "Reducibility of Metallic Oxides as Affected by Heat Treatment." By W. McA. Johnson. *Transactions American Institute Mining Engineers*, Vol. XLVI. 1913.

HEINRICH O. HOFMAN. Lead. American Year Book for 1913. New York. Appleton & Co. 1913.

CHARLES E. LOCKE.—School Laboratory Work, Sampling of an Ore Containing Coarse Gold. *Bulletin American Institute Mining Engineers*, No. 75, 1913.

CHARLES E. LOCKE.—Mining and Ore Dressing in 1912. American Year Book, 1913.

CARLE R. HAYWARD.—Reviews of "Metal und Erz" and "Stahl und Eisen." *Abstracts for American Chemical Society*, 1913.

CHEMISTRY AND CHEMICAL ENGINEERING.

HENRY P. TALBOT.—Ehrlich's Chemotherapy. *Science Conspectus*, Vol. III., March, 1913.

ARTHUR A. NOYES and MILES S. SHERRILL.—The General Principles of Chemistry. Parts III and IV. The Equilibrium of Chemical Reactions. Parts V and VI. Thermochemistry and Electrochemistry. Boston. Thomas Todd Co.

WILLIAM H. WALKER.—The Corrosion of Iron and Steel. *Journal of Industrial and Engineering Chemistry*, Vol. V., p. 444.

AUGUSTUS H. GILL.—Upon the Determination of Minute Quantities of Nitrates, Particularly in Potable Waters. *Journal American Public Health Association*, 1913.

AUGUSTUS H. GILL.—The Decomposition of Steam by Heat. *Power*, Vol. 37, p. 113.

AUGUSTUS H. GILL.—Gas and Fuel Analysis for Engineers. 7th Edition. New York. John Wiley & Sons. 1913.

AUGUSTUS H. GILL.—Engine Room Chemistry. New Edition. New York. McGraw-Hill Book Company. 1913.

MILES S. SHERRILL.—See Arthur A. Noyes.

WILLIAM T. HALL.—Quantitative Analysis by Electrolysis. Translated from the German by A. Classen. New York. John Wiley & Sons. 1913.

ALPHEUS G. WOODMAN.—An Honest Label. *Science Conspectus*, Vol. III., January, 1913.

GEORGE W. ROLFE.—Some Industrial Uses of Sugar. *Science Conspectus*, Vol. III., January, 1913; *Chemical News*, 107, p. 217.

JOHN F. NORTON.—Swimming Pool Sanitation. *Science Conspectus*, Vol. III., April, 1913.

J. W. PHELAN (With J. H. COHEN).—Valuation and Fixation of Tanning Effluents. *Journal of the American Leather Chemists Association*, October, 1913.

RESEARCH LABORATORY OF PHYSICAL CHEMISTRY.

Serial Publications of the Research Laboratory.

No. 92.—The Activity of the Ions and the Degree of Dissociation of Strong Electrolytes. By Gilbert N. Lewis. *Journal of the American Chemical Society*, Vol. XXXIV., pp. 1631-1644.

No. 93.—The Free Energy of Chemical Substances. By Gilbert N. Lewis. *Journal of the American Chemical Society*, Vol. XXXV., pp. 1-30.

No. 94.—The Potential of the Lithium Electrode. By Gilbert N. Lewis and Frederick G. Keyes. *Journal of the American Chemical Society*, Vol. XXXV., pp. 340-344.

No. 95.—A General Relation between the Concentration and the Conductance of Ionized Substances in Various Solvents. By Charles A. Kraus and

William C. Bray. *Journal of the American Chemical Society*, Vol. XXXV., pp. 1315-1434.

No. 96.—The Isolation and Properties of some Electropositive Groups and their Bearing on the Problem of the Metallic State. By Charles A. Kraus. *Journal of the American Chemical Society*, Vol. XXXV., pp. 1732-1741.

ELECTRICAL ENGINEERING.

DUGALD C. JACKSON (With J. P. JACKSON).—Alternating Currents and Alternating Current Machinery. New York. The Macmillan Co. 968, IX pp.

HAROLD PENDER and HARRY F. THOMSON.—Notes on the Cost of Motor Trucking. *Vehicle Research Bulletin*, No. 2. Published by the Department.

HAROLD PENDER and HARRY F. THOMSON.—Observations on Horse and Motor Trucking. *Vehicle Research Bulletin*, No. 3. Published by the Department.

HAROLD PENDER and R. L. JONES.—The Annealing of Steel in an Alternating Magnetic Field. *Physical Review*, April, 1913.

WALDO V. LYON.—Effective Resistance and Reactance. *Electrical World*, Nov. 15, 1913.

HARRY F. THOMSON.—The Electric Automobile Defined. In Pastime Journeys for Electric Automobiles. Issued by the Electric Motor Club of Boston.

HARRY F. THOMSON.—Comparing the Incomparable. *Scientific American*, February 22, 1913.

BIOLOGY AND PUBLIC HEALTH, SANITARY RESEARCH LABORATORIES AND SEWAGE EXPERIMENT STATION.

WILLIAM T. SEDGWICK.—The Interpretation of Nature. An address at the dedication of the Carnegie Science Hall of Bates College, Jan. 14, 1913. *Science*, August 8, 1913.

WILLIAM T. SEDGWICK.—School Hygiene. *Youth's Companion*, April 24, 1913.

WILLIAM T. SEDGWICK.—Public Health and Hygiene. American Year Book, 1913. New York. Appleton & Co.

WILLIAM T. SEDGWICK.—Reappearance of the Ghost of Malthus. *American Journal of Public Health*, October, 1913.

SAMUEL C. PRESCOTT (With C.-E. A. WINSLOW).—Elements of Water Bacteriology with Special Reference to Sanitary Water Analysis. 3d Edition, re-written. Pp. 318, XIV. New York. John Wiley & Sons. 1913.

SAMUEL C. PRESCOTT.—Bacteriology of Fermentation and Putrefaction in Relation to Conservation of Foods. *American Journal Public Health*, Vol. II, No. 1. Pp. 834-839.

SAMUEL C. PRESCOTT (With C. A. MAGOON).—Bacteriological Examination of Foods with Special Reference to Gelatin. *American Journal Public Health*, Vol. III, No. 1. Pp. 62-66.

SAMUEL C. PRESCOTT.—Sanitation and Hygiene in the Candy Industry. An address before the Thirtieth Annual Convention of the National Confectioners' Association at Cleveland, Ohio, June, 1913. *Confectioners' Gazette*, Vol. XXXIV; No. 383. Pp. 26-29.

SAMUEL C. PRESCOTT.—Public Health Aspects of the Candy Industry. *American Journal Public Health*, Vol. III; No. 10. Pp. 1046-1056.

SAMUEL C. PRESCOTT.—Farm Water Supplies with Special Reference to Dairy Farms. *American Journal Public Health*, Vol. III, No. 9. Pp. 892-902.

SAMUEL C. PRESCOTT.—The Source and Significance of B. coli in Milk. *Creamery and Milk Plant Monthly*, Vol. II, No. 3, 1913.

ROBERT P. BIGELOW.—Age. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 1., 1913, pp. 144-151.

ROBERT P. BIGELOW.—Allantois. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 1, 1913, pp. 217-221.

ROBERT P. BIGELOW.—Amnion. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 1, 1913, pp. 251-259.

ROBERT P. BIGELOW.—Area Embryonalis. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 1, 1913, pp. 517-524.

ROBERT P. BIGELOW.—Biology. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 2, 1913, pp. 53-58.

ROBERT P. BIGELOW.—Blastoderm. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 2, 1913, pp. 82-87.

ROBERT P. BIGELOW.—Blastopore. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 2, 1913, pp. 91-94.

ROBERT P. BIGELOW.—Blood-vascular System, Origin of. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 2, 1913, pp. 217-219.

ROBERT P. BIGELOW.—Budding. *Reference Handbook of the Medical Sciences*, Edition 3, Vol. 2, 1913, pp. 550-552.

ROBERT P. BIGELOW.—"Michigan Bird Life," Review of special bulletin of Michigan Agricultural College, by W. B. Barrows. *Technology Review*, Vol. XV., pp. 234-235, April, 1913.

SELSKAR M. GUNN.—The Need for a More General Co-operation between Health and Police Departments. *American Journal of Public Health*, Vol. III, No. 4, pp. 318-326.

SELSKAR M. GUNN (with others).—Report of Committee of the Massachusetts Association of Boards of Health on Uniform Health Reports. *American Journal of Public Health*, Vol. III, No. 6, pp. 595-631.

SELSKAR M. GUNN.—The Public Health. Women's Home Library, Chicago. Vol. IX.

SIMEON C. KEITH, JR.—The Survival of Bacteria at Temperatures in the Vicinity of the Freezing Point of Water. *Science*, June 6, 1913.

FREDERICK A. WOODS.—Hereditry in the Hall of Fame. *Popular Science Monthly*, May, 1913.

FREDERICK A. WOODS.—The Influence of Monarchs: Steps in a New Science of History. New York. The Macmillan Co. 1913.

L. T. TROLAND.—A Definite Physico-chemical Hypothesis to Explain Visual Response. *American Journal of Physiology*, May, 1913.

PHYSICS.

HARRY M. GOODWIN.—Precision of Measurements and Graphical Methods. McGraw-Hill Book Co. 1913. Pp. 104.

CHARLES L. NORTON.—Some Thermal Properties of Concrete. *Journal of American Society of Mechanical Engineers*, Vol. XXXV, No. 1, p. 1011, 1913.

WILLIAM J. DRISKO.—Problems in Physics. New edition. 1913.

GEOLOGY.

WALDEMAR LINDGREN.—Mineral Deposits. 1913.

CHARLES H. WARREN.—Petrology of the Alkaline Granites and Porphyries of Quincy and the Blue Hills. *Proceedings of the American Academy of Arts and Sciences*, 1913.

HERVEY W. SHIMER.—Spiriferoids of Lake Minnewanka, Alberta. *Bulletin of the Geographical Society of America*, 1913.

HERVEY W. SHIMER.—Early Man. *Science Conspectus*.

HERVEY W. SHIMER.—New Sponge from the New Jersey Cretaceous. *Bulletin of the Natural Museum*, 1913.

FREDERICK H. LAHEE. Geology of the New Fossiliferous Horizon and the Underlying Rocks in Littleton, N. H. *American Journal of Science*, 1913.

NAVAL ARCHITECTURE AND MARINE ENGINEERING.

CECIL H. PEABODY.—Computations for Marine Engineers, Vol. 1. New York. 1913.

CECIL H. PEABODY.—Resistance of Bilge Keels. *Transactions of the Society of Naval Architects*, 1913.

HAROLD A. EVERETT.—Stability of Life Boats. *Transactions of the Society of Naval Architects*, 1913.

MATHEMATICS.

EDWIN B. WILSON.—Mathematics. American Year Book, 1912, pp. 596-598.

EDWIN B. WILSON.—The Unification of Vectorial Notations. *Bulletin American Mathematical Society*, Vol. XIX., pp. 524-530.

EDWIN B. WILSON.—Review of Fisher's "Purchasing Power of Money." *Science*, 1913, pp. 758-763.

EDWIN B. WILSON.—Let us have our Calculus Early. *Bulletin American Mathematical Society*, Vol. XX., pp. 30-36. Being in part a review of Mercer's Calculus for Beginners.

EDWIN B. WILSON.—Reviews in *Bulletin American Mathematical Society*, Vol. XIX., of E. and F. Cosserat's *Theorie des corps deformables*, pp. 242-246; Prasad's "Differential Calculus and Integral Calculus," pp. 363-367; Lamb's "Dynamical Theory of Sound," pp. 260-264; Whittaker's "History of Theories of Aether and Electricity," pp. 423-427.

LEONARD M. PASSANO.—Education and Modern Progress. *Bulletin Society for the Promotion of Engineering Education*, Vol. III., No. 4, 1912.

LEONARD M. PASSANO.—Efficiency vs. the Individual. *The Mathematics Teacher*, Vol. VI., No. 1, 1913.

LEONARD M. PASSANO.—The College as a Commercial Factory. *Educational Review*, Vol. XLVI., No. 5, 1913.

ENGLISH.

HENRY G. PEARSON.—James S. Wadsworth of Geneseo. Vol. 1. 1913.

DAVID CARB.—Voice of the People. Boston. 1913.

MODERN LANGUAGES.

ERNEST F. LANGLEY.—The Extant Repertory of the Early Sicilian Poets. *Publications of the Modern Language Association of America*, Vol. XXVIII., 1913.

MASSACHUSETTS
INSTITUTE OF TECHNOLOGY

TREASURER'S REPORT



FOR THE YEAR ENDED JUNE 30, 1913

Treasurer's Report.

*To the Corporation of
The Massachusetts Institute of Technology:*

I have the honor to submit herewith statements showing the financial condition of the Massachusetts Institute of Technology as of June 30, 1913, as well as the financial transactions during the fiscal year ended on that date.

The following gifts and legacies which have been received during the year call for the sincere thanks of the Institute:

Anonymous donor, account of New Site	\$1,000,000.00
Anonymous donor, account of New Site	100,000.00
Estate of F. H. Cilley, cash securities and real estate totalling	57,786.83
Caroline L. Weld, account of New Site	10,000.00
C. A. Stone, account of New Site	10,000.00
E. S. Webster, account of New Site	10,000.00
Geo. R. White, account of New Site	10,000.00
Wm. Endicott, account of New Site	10,000.00
George Wigglesworth, account of New Site	10,000.00
Henry L. Higginson, account of New Site	5,000.00
Gaston, Snow & Saltonstall	5,000.00
C. A. Coffin, account of New Site	5,000.00
"A friend," account of New Site	5,000.00
Eben S. Draper, account of New Site	5,000.00
Ellen H. Richards Research Fund, thro' George Wigglesworth Treas. as a memorial	15,046.05
Anonymous donor, for Sanitary Research	5,000.00
Edison Electric Ill. Co., for Edison Research Fund	4,500.00
Boston Chamber of Commerce, for Edison Research Fund	50.00
General Electric Co., for Traffic Research Fund	1,000.00
N. Y. & N. H. R. R., for Terminal Research Fund	1,000.00
Boston & Maine R. R., for Terminal Research Fund	1,000.00
Arthur A. Noyes, for Physics-Chemical Research Fund	3,000.00
Alumni, for Civil Engineering Summer School	8,047.16
Helen N. Cabot, for Samuel Cabot Fund	5,000.00
Mrs. F. J. Moore, for John Hume Tod Fund	2,500.00
Henry A. Morss, for the Naval Architectural Fund	1,000.00
Herbert M. Sears, for the Naval Architectural Fund	100.00
Wm. Endicott, for the Naval Architectural Fund	700.00
Henry A. Morss, for Seismological Fund	500.00
Henrietta G. Fitz, for Seismological Fund	500.00
H. J. Keith, for Egg Investigation	1,699.20
Technology Fund Committee	2,868.75
James M. Crafts	10,000.00
Estate of Susan E. Dorr	1,500.00
Thomas Gaffield	650.00
Emma B. Rogers	663.10
C. W. Eaton, for Summer Camp	860.08
Estate of Francis E. Weston, for Scholarships	400.00

Schedule B-1.

INCOME.

INCOME FROM STUDENTS:

Tuition fees *	\$360,786.50	
Entrance examination fees forfeited	715.00	
Locker fees	573.00	
Supplies, chemicals, laboratory materials, etc.	16,274.51	
Sale of lecture notes, etc	1,040.69	
Registration fees	90.00	
Summer Camp fees	6,095.94	\$385,575.64

INCOME FROM INVESTMENTS:

Endowments for general purposes, Schedule P	\$39,245.04	
Endowments for designated purposes, Sched- ule Q recapitulation	81,502.42	
Income not distributed to funds.	7,291.40	

Total per Schedule H \$128,038.86

Less:—

Accrued interest on pur- chases, Schedule H.	\$6,291.40	
Annuity to Samuel Dorr	1,000.00	7,291.40
		120,747.46

RENTS FROM INVESTMENTS OF REAL ESTATE (net), Schedule
F-3

17,075.52

GRANTS BY NATION AND STATE:

Annual grant from State of Massachusetts.	\$100,000.00	
Federal Aid Income from land grant, Act 1862	5,306.68	
Act 1890	16,666.67	121,973.35

GIFTS FOR

Minor Funds:

Edison Electric Vehicle Research Fund.	\$4,550.00	
Egg Investigation Fund	1,699.20	
Electric Railway Traffic Fund	1,000.00	
Ozone Fund	225.00	
Physico-Chemical Research Fund	3,000.00	
Sanitary Research Fund	5,000.00	
Seismological Research Fund	1,000.00	
Terminal Research Fund	2,000.00	
Naval Architecture Fund	1,800.00	

\$20,274.20

Other Designated Purposes:

Salaries	\$600.00	
Summer Camp	907.24	
Architecture Department	45.00	
Biological Department	6.10	
General Library	600.00	22,432.54

* In addition to the above, \$21,805 was transferred from the income of scholarship funds in payment of scholarships.

INCOME FROM OTHER SOURCES:

Interest	\$3,066.13	
Rents, Huntington Hall	3,500.00	
Sales of electricity	1,439.61	
Bursar's Fund reimbursements	300.00	
Printing, etc., for Alumni Association	55.27	
Sales of old material	3.84	
	<hr/>	\$8,364.85

Minor Funds earnings

Jacques Fund :	\$13.99	
Letter Box Fund	27.75	
Physico-Chemical Research Fund	61.15	
Research Laboratory of Applied Chem- istry	3,310.36	
Röntgen Ray Experiment Fund	15.37	3,428.62
	<hr/>	

INCOME FROM SOCIETY OF ARTS:

Dues		<u>1,047.04</u>
----------------	--	-----------------

Total Income (Schedule A)		<u><u>\$680,645.02</u></u>
-------------------------------------	--	----------------------------

GIFTS

For General Purposes (Schedule A):

J. M. Crafts	\$10,000.00	
Estate Thomas Gaffield	650.00	
Herbert E. Fales	250.00	
Alumni Association	2,868.75	\$13,768.75
	<hr/>	

Schedule C-1.

OUTGO.

SALARIES OF TEACHERS:		
Professors	\$148,684.81	
Associate Professors	33,760.28	
Assistant Professors	65,390.58	
Instructors	66,800.16	
Lecturers	7,502.11	
Librarian	1,750.00	
Assistants	39,226.85	\$363,114.79
<hr/>		
WAGES ACCESSORY TO TEACHING:		
Clerks	\$2,469.37	
Stenographers	7,809.67	
Assistants	4,740.96	15,020.00
<hr/>		
DEPARTMENT SUPPLIES AND REPAIRS (Schedule C-2)		
Supplies	\$50,107.14	
Wages	4,350.01	54,457.15
<hr/>		
ADMINISTRATION AND GENERAL EXPENSES:		
Salaries of officers	\$26,783.25	
Salaries of assistants, stenographers, etc.	18,925.39	
Advertising and printing	16,985.31	
Insurance	5,239.09	
Other general expenses	19,491.76	87,424.80
<hr/>		
OPERATION AND MAINTENANCE OF PLANT:		
Mechanicians' wages	\$5,740.65	
Janitor's, etc.	44,344.98	
Light, heat and power	29,939.17	
Repairs (Schedule C-3)	9,524.18	
viz.: wages	\$4,507.10	
stock	5,017.08	89,548.98
<hr/>		
OTHER WAGES		1,777.94
MISCELLANEOUS EXPENSES:		
Premiums charged off—		
General Investments	\$1,948.05	
Rogers Memorial Investments	578.50	2,526.55
<hr/>		
Whitney Fund	\$1,000.00	
Ednah Dow Cheney Fund	121.49	1,121.49
<hr/>		
Lunch Room expense (net)		164.73
Summer Camp expense		8,286.22
<hr/>		
EXPENSES OF MINOR FUNDS (excluding salaries):		
Egg Investigation Fund	\$300.69	
Edison Research Fund (Electric Vehicle tests)	1,576.74	
Jacques Fund	850.00	
Letter Box Fund	4.75	
Ozone Fund	25.00	
Physico-Chemical Research Fund	1,366.99	
President's Fund	398.93	
Research Laboratory of Applied Chemistry	1,511.20	

EXPENSES OF MINOR FUNDS—*Continued.*

Roentgen Ray Experiment Fund	\$197.18	
Sanitary Research Fund	2,232.92	
Samuel Cabot Fund	1.02	
Seismological Research Fund	1,000.00	
Terminal Research Fund	263.71	
Travelling Scholarship in Architecture	500.00	
Naval Architecture Fund	442.35	\$10,671.48
<hr/>		
AWARDS:		
Edward Austin Fund awards	\$1,050.00	
Teachers' Fund awards	500.00	
<hr/>		
	\$1,550.00	
Bursar's Fund	475.00	
Fellowship awards	1,500.00	
Students' Loan Fund	100.00	
Architectural prizes	200.00	3,825.00
<hr/>		
INTEREST		156.03
SOCIETY OF ARTS. Expenses		1,824.36
<hr/>		
Total Outgo (Schedule A)		<u>\$639,919.52</u>

Schedule C-2.
DETAIL OF DEPARTMENTS.

	<i>Expense.</i>	<i>Repairs.</i>	
	Supplies, etc.	Stock.	Labor.
Architecture	\$1,777.71	\$74.74	\$84.29
Biology	1,411.24	102.71	86.05
Chemistry	15,566.97	504.69	665.52
Civil and Sanitary Engineering	2,149.36	19.08	32.72
Drawing	80.33	5.70	14.83
Economics	404.12	0.00	0.00
Electrical Engineering	3,246.58	269.46	569.10
Electro-Chemistry (Laboratory)	947.27	95.48	128.74
English	110.19	0.00	0.00
General Library	3,070.56	0.00	4.30
Geology	1,536.09	17.24	19.88
History	1,194.05	—	—
Mathematics	608.60	—	—
Mechanic Arts	3,141.42	—	—
Mechanical Engineering	4,148.19	314.47	498.86
Military Science	1,136.62	—	—
Mining	1,959.60	68.80	135.41
Modern Language	335.13	—	—
Naval Architecture	895.25	51.18	51.70
Physical Culture	1,847.42	—	—
Physics	4,398.72	228.01	397.67
	<hr/>	<hr/>	<hr/>
Totals	\$49,965.42	\$1,751.56	\$2,689.07
Labor in "Expense"	1,660.94	—	1,660.94
	<hr/>	<hr/>	<hr/>
Additional disbursements from Gifts:	\$48,304.48	\$1,751.56	\$4,350.01
Architecture	45.00		
Biology	6.10		
	<hr/>		
Total department supplies	\$48,355.58		
Total repair stock	1,751.56		
	<hr/>		
Total labor	\$50,107.14		
	<hr/>		
Total Schedule C-1	\$54,457.15		

Schedule C-3.
DETAIL OF PLANT REPAIRS.

	Stock.	Labor.
Rogers Building	\$334.68	\$950.31
Walker Building	151.77	438.83
Lowell Building	133.09	363.42
Engineering A and B	126.94	284.77
Engineering C	24.22	127.94
Pierce Building	64.15	298.79
Mechanical Laboratory	78.86	162.92
Gymnasium	134.39	140.70
Boiler Room	225.28	215.53
Power Plant	404.88	456.85
Laundry Installation.	117.17	764.04
Undistributed	3,221.65	303.00
	<hr/>	<hr/>
Totals, Schedule C-1	\$5,017.08	\$4,507.10

Schedule D.

TREASURER'S BALANCE SHEET

I.

INVESTMENTS ASSETS.

Deposits in Savings Department, O. C. Trust	\$1,000,000.00
Securities and investments, Schedule H	3,437,162.35
Real Estate, Schedule I	469,917.32
	<hr/>
Total Investments	\$4,907,079.67
Cash: In bank for investment, Schedule E	390,390.28
	<hr/>
	<u>\$5,297,469.95</u>

2.

CURRENT ASSETS.

Cash available for general purposes, Schedule E	\$33,498.49
Accounts Receivable, Schedule F-2	1,145.88
Rents Receivable (less reserve), Schedule F-3	2,500.00
Unexpired Insurance	9,922.78
Advances against Alumni New Site Fund	5,824.18
	<hr/>
Total	\$52,891.33
Excess of investments asset (brought down, contra)	232,583.85
	<hr/>
	<u>\$285,475.18</u>

3.

EDUCATIONAL PLANT ASSETS.

Lands, Buildings and Equipment. Nominal Values.

Total book value at beginning of year	\$2,495,442.58
Additions during year	59,969.30
	<hr/>
Total book value at end of year, Schedule J	\$2,555,411.88
Unexpended balance in Investments as above	2,123,200.97
	<hr/>
	<u>\$4,678,612.85</u>

WALKER MEMORIAL. ASSETS.

Securities (page 00)	\$133,088.30
Cash in bank for investment, Schedule E	5,920.61
	<hr/>
Total assets	<u>\$139,008.91</u>

IMPROVEMENT FUND. ASSETS.

Securities (page 00)	\$17,484.68
Cash in bank for investment, Schedule E	2,977.02
	<hr/>
	<u>\$20,461.70</u>

CILLEY FUND. ASSETS.

Securities (page 00)	\$50,351.00
Cash in bank for investment, Schedule E	8,444.08
	<hr/>
	<u>\$58,795.08</u>

Schedule D.

JUNE 30, 1913.

I.

ENDOWMENT AND OTHER FUNDS.

Funds for general purposes, Schedule P	\$1,253,483.43	
Funds for designated purposes, Schedule Q recapitulation	1,620,983.73	
Minor Funds, Schedule R	15,627.07	
Fund's income balance, Schedule R	51,590.90	
		<hr/>
Total Funds	\$2,941,685.13	
Excess of investment assets (carried down, contra)	\$232,583.85	
New Site cash and investments	2,123,200.97	2,355,784.82
		<hr/>
		\$5,297,469.95

2.

CURRENT LIABILITIES.

Accounts Payable, Schedule N	\$320.37	
Tuition in advance for year 1913-14	8,376.00	
Summer Camp fees in advance	760.00	
Entrance examination fees	3,545.00	
Students' deposits in advance (breakage and supplies)	2,299.25	
Students' deposits outstanding	2,685.80	
Locker deposits outstanding	148.00	
Alumni Site Fund	5,000.00	
Gift for salaries, anticipated	600.00	
		<hr/>
Total	\$23,734.42	
Surplus available for current expense, Schedule S	261,740.76	
		<hr/>
		\$285,475.18

3.

EDUCATIONAL PLANT ENDOWMENTS AND CAPITAL ACCOUNTS.

Endowment for Electrical Engineering Buildings	\$68,000.00	
New Site and Buildings Funds	2,939,494.71	
Other endowment funds and capital (not analyzed)	1,671,118.14	
		<hr/>
		\$4,678,612.85

WALKER MEMORIAL FUND.

Balance at beginning of year	\$133,453.91	
Net income for year added to fund	5,555.00	
		<hr/>
		\$139,008.91

IMPROVEMENT FUND.

Balance at beginning of year	\$19,566.05	
Net income for year added to fund	895.65	
		<hr/>
		\$20,461.70

CILLEY FUND.

Original gift	\$57,786.83	
Net income for year added to fund	1,008.25	
		<hr/>
		\$58,795.08

Schedule E.

CASH RECEIPTS AND DISBURSEMENTS.

FOR THE YEAR.

Total Cash Disbursements	\$2,843,554.43
Total Cash Receipts	2,823,387.76
Excess of Disbursements	\$20,166.67
Cash balance at beginning of year	461,397.15
Cash balance at end of year	<u>\$441,230.48</u>

Viz.:—

CASH BALANCE.

Cash on deposit at banks:			
	<i>Special.</i>	<i>General.</i>	<i>Total.</i>
Old Colony Trust Co.			\$415,286.70
Viz.: For Walker Memorial	\$5,920.61		
" Improvement Fund	2,977.02		
" Cilley Fund	8,444.08		
" Investment	390,390.28		
" General Purposes.		\$7,554.71	
National Shawmut Bank			24,644.51
For General Purposes		24,644.51	
Total on deposit			\$439,931.21
Cash at office:			
For General Purposes		1,299.27	1,299.27
Cash balance as above	<u>\$407,731.99</u>	<u>\$33,498.49</u>	<u>\$441,230.48</u>

Schedule F-2.

ACCOUNTS RECEIVABLE.

For Tuition:		
2 Students		\$70.00
Miscellaneous:		
Chemical Breakage		980.39
Debit balances of Accounts Payable		86.49
		<u>\$1,145.88</u>

Schedule F-3.

RENTS RECEIVABLE.

Arrears of Rents at beginning of year			\$8,500.00
Rents due during year:			
Huntington Hall, Schedule B-1			3,500.00
Rents from Real Estate Investments:			
Clarendon St. (Grundmann Studios).		\$6,000.00	
Edge Hill Road	\$1,000.00		
Less expense	277.28	722.72	
Massachusetts Avenue	891.81		
Less expense	421.39	470.42	
Emma Rogers Estate	\$18,150.05		
Less expense	8,267.67	9,882.38	
	\$8,267.67		
Total net Rents, Schedule B-1			\$17,075.52
			<u>\$29,075.52</u>
Rents Collected (net) during year			24,075.52
Arrears of Rent at end of year			\$5,000.00
Less Reserve for doubtful rents			2,500.00
Rents Receivable, Schedule D			<u>\$2,500.00</u>

Schedule H.

SECURITIES: BONDS, STOCKS AND

<i>Bonds.</i>	<i>Description of Securities.</i>	<i>Balance at beginning of year.</i>
\$26,000.00	Am. Dock and Improvement Co. 5% due 1921	\$26,660.00
115,000.00	Am. Tel. & Tel. Co. 4% " 1929	114,025.00
25,000.00	Atchison, Topeka & St. Fe R.R. 4% " 1995	25,000.00
34,000.00	Baltimore & Ohio R.R. 3 1-2% " 1925	30,090.00
7,000.00	Boston & Albany R.R. 4% " 1913	—
10,000.00	Boston & Northern St. Ry. Co. 4% " 1954	9,250.00
1,000.00	Burlington & Mo. River R.R. (Neb.) 6% " 1918	3,000.00
43,000.00	Chesapeake & Ohio Ry. Co. 5% " 1939	48,055.00
38,000.00	Chi. Burl. & Quincy R.R. 4% " 1958	38,090.00
70,000.00	Chi. Junc. & Union Stock Yards 5% " 1915	70,614.00
50,000.00	Chi. Junc. & Union Stock Yards 4% " 1940	49,250.00
100,000.00	Chi. & West Michigan R.R. 5% " 1921	100,825.00
25,000.00	Cleveland & Pittsburgh R.R. 4 1-2% " 1942	—
39,000.00	Columbus (Ga.) Electric Co. 5% " 1914	—
25,000.00	Cumberland Tel. & Tel. Co. 5% " 1937	25,132.00
17,000.00	Delaware & Hudson Co. 4% " 1943	17,300.00
25,000.00	Detroit Edison Co. 5% " 1933	—
25,000.00	Electrical Securities Corp. 5% " 1943	—
25,000.00	General Electric Co. 5% " 1952	—
3,000.00	Illinois Central R.R. 4% " 1951	3,000.00
25,000.00	Illinois Central R.R. 4 1-2% " 1914	—
50,000.00	Illinois Steel Co. 5% " 1913	49,586.25
7,000.00	K. C., Clinton & Spgfd. R.R. 5% " 1925	6,289.21
50,000.00	K. C., Ft. Scott & Mem. R.R. 6% " 1928	55,439.00
8,500.00	K. C., Mem. & Birmingham R.R. 4% " 1934	8,287.50
37,000.00	K. C., Mem. & Birmingham R.R. 5% " 1934	34,225.00
18,000.00	Kentucky Central Ry. Co. 4% " 1937	17,910.00
3,000.00	Lake Shore & Mich. Southern R.R. 4% " 1928	3,000.00
85,000.00	Lake Shore & Mich. Southern R.R. 4% " 1931	84,087.50
100,000.00	Long Island R.R. 4% " 1949	96,137.50
110,000.00	Maine Central R.R. 4% " 1913	110,000.00
25,000.00	Mass. Electric Co. Notes 4 1-2% " 1913	24,468.75
50,000.00	Mass Gas Co. 4 1-2% " 1931	49,312.50
15,000.00	Melrose City of:—Tax Notes " 1914	—
50,000.00	Merchants & Miners Trans. Co. Notes " 1914	—
50,000.00	Minneapolis General Electric Co. 5% due 1934	—
17,000.00	Missouri Pacific Ry. Co. 5% " 1914	—
50,000.00	New Eng. Tel. & Tel. Co. 4% " 1930	50,362.00
10,000.00	New Eng. Tel. & Tel. Co. 5% " 1932	—
36,000.00	N. Y. C. Equipment 5% " 1919	34,740.00
52,000.00	N. Y. C. & H. R.R. (L. S.) 3 1-2% " 1998	46,046.65
15,000.00	N. Y., N. H. & H. R.R. 5% " 1913	—
31,000.00	N. Y., N. H. & H. R.R. 6% " 1948	35,159.00
25,000.00	New York Telephone Co. 4 1-2% " 1939	—
50,000.00	Nor'n Pac. Gt. Nor'n R.R. 4% " 1921	48,500.00
25,000.00	Old Colony St. Ry. 4% " 1954	9,100.00
6,000.00	Omaha St. Ry Co. 5% " 1914	—
50,000.00	Oregon R.R. & Navigation Co. 4% " 1946	50,997.00
50,000.00	Oregon Short Line R.R. 4% " 1929	48,500.00
25,000.00	Pacific Tel. & Tel. Co. 5% " 1937	25,020.00
25,000.00	Portland General Electric Co. 5% " 1935	25,598.00
75,000.00	Puget Sound Trac. L't & P'r Co. 5% " 1914	—
50,000.00	Rio Grande & Western Ry. Co. 4% " 1939	49,180.00

Schedule H.

REAL ESTATE MORTGAGES.

<i>Purchases and charges during the year.</i>	<i>Sales and credits during the year.</i>	<i>Balance at end of the year.</i>	<i>Accrued Int. paid.</i>	<i>Interest received.</i>
—	\$80.00	\$26,580.0	—	\$1,300.00
—	—	114,025.00	—	4,600.00
—	—	25,000.00	—	1,000.00
—	—	30,090.00	—	1,190.00
6,956.25	—	6,956.25	\$61.44	140.00
—	—	9,250.00	—	400.00
—	2,000.00	1,000.00	—	180.00
—	194.00	47,861.00	—	2,150.00
—	2.00	38,088.00	—	1,520.00
—	307.00	70,307.00	—	3,500.00
—	—	49,250.00	—	2,000.00
—	100.00	100,725.00	—	5,000.00
25,832.50	—	25,832.50	203.13	—
38,707.50	—	38,707.50	839.58	—
—	5.00	25,127.00	—	1,250.00
—	10.00	17,290.00	—	680.00
25,443.75	22.75	25,421.00	375.69	625.00
25,000.00	—	25,000.00	236.11	—
25,977.50	25.50	25,952.00	429.57	625.00
—	—	3,000.00	—	120.00
24,906.25	—	24,906.25	515.63	—
413.75	50,000.00	—	—	2,500.00
—	—	6,289.21	—	350.00
—	362.00	55,077.00	—	3,000.00
—	—	8,287.50	—	340.00
—	—	34,225.00	—	1,850.00
—	—	17,910.00	—	720.00
—	—	3,000.00	—	120.00
—	—	84,087.50	—	3,400.00
—	—	96,137.50	—	4,000.00
—	*110,000.00	—	—	—
531.25	25,000.00	—	76.33	1,125.00
—	—	49,312.50	—	2,250.00
15,000.00	—	15,000.00	—	576.33
50,000.00	—	50,000.00	—	2,398.96
50,625.00	30.00	50,595.00	131.94	1,250.00
16,952.40	—	16,952.40	299.86	425.00
—	21.00	50,341.00	—	2,000.00
10,150.00	8.00	10,142.00	12.50	—
—	—	34,740.00	—	1,800.00
—	—	46,046.65	—	1,820.00
14,925.00	—	14,925.00	39.58	375.00
—	118.00	35,041.00	—	1,860.00
24,187.50	—	24,187.50	490.63	562.50
—	—	48,500.00	—	2,000.00
13,650.00	—	22,750.00	23.33	700.00
5,970.00	—	5,970.00	29.17	—
—	30.00	50,967.00	—	2,000.00
—	—	48,500.00	—	2,000.00
—	.80	25,019.20	—	1,250.00
—	27.00	25,571.00	—	1,250.00
74,700.00	—	74,700.00	1,100.70	—
—	—	49,180.00	—	2,000.00

*Transferred to New Site Fund Investments.

Schedule H. (Continued.)

Bonds.	Description of Securities.		Balance at beginning of year.
\$19,000.00	Seattle Electric Co. 5%	due 1929	\$18,430.00
6,000.00	Seattle Electric Co. 5%	" 1930	6,312.00
30,000.00	Somerville, City of: Tax Notes	" 1914	—
25,000.00	Southern Ry. Co. 4%	" 1951	24,875.00
25,000.00	St. Croix Paper Co. 5%	" 1914	—
40,000.00	Stamford, Conn., City of: Tax Notes	" 1913	—
5,000.00	Terminal R.R. Asso. of St. Louis 4%	" 1953	5,000.00
50,000.00	Union Pacific R.R. Co. 4%	" 1947	51,438.00
8,000.00	United Fruit Co. 4 1-2%	" 1923	—
17,000.00	United Fruit Co. 4 1-2%	" 1925	—
29,000.00	U. S. Smelt'g, Refin'g & Min'g Co 5%	" 1914	—
28,000.00	U. S. Steel Corporation 5%	" 1963	29,281.00
25,000.00	Wabash R.R. Equipment 4 1-2%	" 1912	24,360.00
19,000.00	Wabash R.R. Equipment 4 1-2%	" 1916	18,259.00
30,000.00	Waterville, Me., City of: Tax Notes	" 1913	—
25,000.00	Western Electric Co. 5%	" 1922	24,875.00
100,000.00	West End St. Ry. Co. 4%	" 1917	101,080.00
10,000.00	West End St. Ry. Co. 4 1-2%	" 1914	—

\$1,826,146.86

30 shares	Atlantic Cotton Mills	par 100	\$1,200.00
272	" Boston & Albany R.R.	100	56,656.50
10	" Boston Ground Rent Trust	" 100	900.00
64	" Boston Real Estate Trust	" 1000	68,461.64
80	" Chi. Mil. & St. Paul Ry. Co. Pfd	" 100	5,718.00
2	" Coöperative Publishing Co.	" 1	2.00
2	" Dwight Mfg. Co.	" 500	1,600.00
27	" Essex Co.	" 100	3,780.00
31	" Great Falls Mfg. Co.	" 100	3,472.00
56	" Hamilton Woolen Co.	" 100	5,390.00
50	" Lancaster Mills	" 100	5,519.00
50	" Nashua Mfg. Co.	" 500	32,500.00
17	" Pepperell Mfg. Co.	" 100	2,789.50
50	" Pray Building Trust	" 50	2,500.00
25	" South Terminal Trust	" 100	2,000.00

\$192,488.64

NOTES RECEIVABLE:

Burke Loan (transferred from Schedule F-1).

MORTGAGE NOTES:

E. V. & C. T. Bigelow	\$7,500.00
W. H. Partridge	7,000.00

\$14,500.00

INVESTMENTS W. B. ROGERS MEMORIAL FUND:

\$25,000.00	Atchison, Top. & St. Fe Ry. Co 4%	due 1995	\$24,470.00
6,000.00	Baltimore & Ohio R.R. 3 1-2%	" 1925	5,310.00
7,000.00	Chesapeake & Ohio R.R. 5%	" 1939	7,823.00
1,000.00	Chi. Burl. & Quincy R.R. 4%	" 1958	1,000.00
40,000.00	Chi. Junc. & Union Stock Yards 5%	" 1915	40,560.00
4,000.00	Cin., Ind., St. Louis & Chi. R.R., 6%	" 1920	4,000.00
37,500.00	Detroit, Gt. Rapids & Western R.R. 4%	" 1946	37,500.00
35,000.00	Fort St. Union Depot Co. 4 1-2%	" 1941	34,825.00
27,000.00	Kansas City Belt Ry. 6%	" 1916	27,400.00
31,000.00	N. Y. C. & H. R.R. 4%	" 1934	30,225.00
1,000.00	N. Y. Central Equipment 5%	" 1919	965.00
24,000.00	Rome, Watert'n & Ogdensb'g R.R. 5%	" 1922	25,200.00
1,000.00	Wabash R.R. Equipment 4 1-2%	" 1916	961.00
4,000.00	United Electric Securities Co. 5%	" 1940	4,040.00

\$244,279.00

Schedule H. (Continued.)

<i>Purchases and charges during the year.</i>	<i>Sales and credits during the year.</i>	<i>Balance at end of the year.</i>	<i>Accrued Int. paid.</i>	<i>Interest received.</i>
—	—	\$18,430.00	—	\$950.00
—	\$18.00	6,294.00	—	300.00
\$30,000.00	—	30,000.00	—	1,137.50
—	—	24,875.00	—	1,000.00
24,687.50	—	24,687.50	329.86	—
40,000.00	—	40,000.00	—	1,150.00
—	—	5,000.00	—	200.00
—	42.00	51,396.00	—	2,000.00
7,642.50	—	7,642.50	474.13	417.50
16,156.25	—	16,156.25		
28,710.00	—	28,710.00	503.47	—
—	25.00	29,256.00	—	1,400.00
640.00	25,000.00	—	—	562.50
—	—	18,259.00	—	855.00
30,000.00	—	30,000.00	—	788.67
—	—	24,875.00	—	1,250.00
—	270.00	100,810.00	—	4,000.00
9,962.50	—	9,962.50	118.75	—
<u>\$637,727.40</u>	<u>\$213,698.05</u>	<u>\$2,250,176.21</u>	<u>\$6,291.40</u>	<u>\$86,313.96</u>
—	\$1,200.00	—	—	—
—	—	\$56,656.50	—	\$2,480.00
—	—	900.00	—	45.00
—	—	68,461.64	—	2,880.00
—	5.00	5,713.00	—	560.00
—	—	2.00	—	—
—	—	1,600.00	—	120.00
—	—	3,780.00	—	216.00
—	—	3,472.00	—	372.00
—	—	5,390.00	—	336.00
—	—	5,519.00	—	—
—	—	32,500.00	—	2,500.00
—	—	2,789.50	—	204.00
—	—	2,500.00	—	—
—	—	2,000.00	—	87.50
—	\$1,205.00	\$191,283.64	—	\$9,800.50
400.00	—	400.00	—	73.21
—	\$1,000.00	\$6,500.00	—	\$315.24
—	—	7,000.00	—	315.00
—	\$1,000.00	\$13,500.00	—	\$630.24
—	—	\$24,470.00	—	\$1,000.00
—	—	5,310.00	—	210.00
—	31.00	7,792.00	—	350.00
—	—	1,000.00	—	40.00
—	280.00	40,280.00	—	2,000.00
—	—	4,000.00	—	240.00
—	—	37,500.00	—	1,500.00
—	—	34,825.00	—	1,575.00
—	133.00	27,267.00	—	1,620.00
—	—	30,225.00	—	1,240.00
—	—	965.00	—	50.00
—	133.00	25,067.00	—	1,200.00
—	—	961.00	—	45.00
—	1.50	4,038.50	—	200.00
<u>—</u>	<u>\$578.50</u>	<u>\$243,700.50</u>	<u>—</u>	<u>\$11,270.00</u>

Schedule H. (Continued.)

INVESTMENTS JOY SCHOLARSHIP FUND:		
Mass. Hospital Life Insurance Co.		\$5,000.00
INVESTMENTS SUSAN H. SWETT SCHOLARSHIP FUND:		
Mass. Hospital Life Insurance Co.		\$10,000.00
INVESTMENTS RICHARD LEE RUSSEL FELLOWSHIP FUND:		
\$2,000.00 Conveyancers Title Ins. Co. Mort. 4 1-2% due 1913		\$2,000.00
INVESTMENTS JONATHAN WHITNEY FUND:		
4,477 shares Clinton Real Estate Trust		\$497,000.00
\$21,000.00 United Electric Securities Co. 5% . . . due 1940		21,102.00
		<hr/>
		\$518,102.00
Total		<hr/>
		\$2,812,516.50
INVESTMENTS NEW SITE AND BUILDING FUNDS:		
(See detail below.)		—
Grand Total Schedule D		<hr/>
		\$2,812,516.50
INVESTMENTS WALKER MEMORIAL FUND:		
\$30,000.00 Am. Tel. & Tel. Co. 4% due 1929		\$30,300.00
10,000.00 Chi. Burl. & Quincy R.R. 4% " 1958		10,000.00
17,000.00 Electrical Securities Corporation 5% " 1940		16,915.00
54,000.00 N. Y. C. & H. R. R.R. (L. S.) 3 1-2% " 1998		47,986.35
14,000.00 Oregon Short Line R.R. 5% " 1946		16,310.00
5,000.00 St. Louis, Iron Mt. 4% " 1933		4,812.50
7,000.00 Wabash R.R. Equipment 4 1-2% " 1916		6,764.45
		<hr/>
Total		\$133,088.30
INVESTMENTS IMPROVEMENT FUND:		
\$8,000.00 Electrical Securities Corporation 5% . . . due 1940		\$7,960.00
9,000.00 U. S. Steel Corporation 5% " 1963		9,524.68
		<hr/>
Total		\$17,484.68
INVESTMENTS NEW SITE AND BUILDINGS FUNDS:		
\$100,000 Lowell, City of: Tax Notes 4% due 1913		—
110,000 Maine Central R.R. 4% " 1913		—
100,000 Mass. Electric Co., Notes 4 1-2% " 1913		—
140,000 Newton, City of: Tax Notes 3 1-2% " 1913		—
100,000 N. Y. C. & H. R. R.R. 4 1-2% " 1914		—
400,000 Notes of T. C. duPont 4% " —		—
		<hr/>
Total		—
INVESTMENTS FRANK HARVEY CILLEY FUND:		
40 shares Boston & Albany R.R. par 100		—
10 " Boston & Providence R.R. " 100		—
30 " Edison Electric Ill. Co. " 100		—
50 " Fitchburg R.R. Pfd. " 100		—
75 " Mass. Gas Co. Pfd. " 100		—
50 " N. Y., N. H. & H. R.R. " 100		—
25 " Springfield Ry. Co. Pfd. " 100		—
50 " West End St. Ry. Co. " 100		—
South American Properties.		—
D. C. Aznive, Mortgage Note		—
Jacob Levenson " "		—
A. J. Diamond " "		—
Real Estate:		—
66 Capen St.		—
9-11 Paul St., \$8,500. Less mortgage \$7,500		—
		<hr/>
Total		—

Schedule H. (Continued.)

<i>Purchases and charges during the year.</i>	<i>Sales and credits during the year.</i>	<i>Balance at end of the year.</i>	<i>Accrued Int. paid.</i>	<i>Interest received.</i>
—	—	\$5,000.00	—	\$206.25
—	—	10,000.00	—	412.50
—	—	2,000.00	—	90.00
—	\$497,000.00	—	—	18,192.20
—	—	21,102.00	—	1,050.00
—	\$497,000.00	\$21,102.00	—	\$19,242.20
\$638,127.40	\$713,481.55	\$2,737,162.35	\$6,291.40	\$128,038.86
950,865.00	250,865.00	700,000.00	—	—
\$1,588,992.40	\$964,346.55	\$3,437,162.35	—	—
—	—	\$30,300.00	—	\$1,200.00
—	—	10,000.00	—	400.00
—	—	16,915.00	—	850.00
—	—	47,986.35	—	1,890.00
—	—	16,310.00	—	700.00
—	—	4,812.50	—	200.00
—	—	6,764.45	—	315.00
—	—	\$133,088.30	—	\$5,555.00
—	—	\$7,960.00	—	\$400.00
—	—	9,524.68	—	450.00
—	—	\$17,484.68	—	\$850.00
\$100,240.00	\$240.00	\$100,000.00	\$100.00	—
110,000.00	110,000.00	—	—	\$4,400.00
100,375.00	375.00	100,000.00	—	2,250.00
140,000.00	140,000.00	—	—	5,141.66
100,250.00	250.00	100,000.00	1,887.50	4,512.50
400,000.00	—	400,000.00	—	4,000.00
\$950,865.00	\$250,865.00	\$700,000.00	\$1,987.50	\$20,304.16
\$8,000.00	—	\$8,000.00	—	\$80.00
2,500.00	—	2,500.00	—	25.00
8,100.00	—	8,100.00	—	75.00
5,000.00	—	5,000.00	—	62.50
6,825.00	—	6,825.00	—	150.00
4,700.00	—	4,700.00	—	175.00
2,125.00	—	2,125.00	—	—
3,600.00	—	3,600.00	—	87.50
1.00	—	1.00	—	—
1,600.00	—	1,600.00	—	—
2,400.00	—	2,400.00	—	30.00
2,000.00	—	2,000.00	—	25.00
2,500.00	—	2,500.00	—	88.61
1,000.00	—	1,000.00	—	209.64
\$50,351.00	—	\$50,351.00	—	\$1,008.25

Schedule I.
**INVESTMENTS IN REAL ESTATE OTHER THAN EDUCATIONAL
 PLANT.**

<i>Description of Properties</i>	<i>Balance at be- ginning of year.</i>	<i>Balance at end of year.</i>
Clarendon St. Land and Buildings, Grundmann Studios	\$142,762.94	\$142,762.94
930-934 Mass. Ave., Cambridge, Land and Buildings	16,154.38	16,154.38
26 Edge Hill Road Land and Buildings	18,000.00	18,000.00
Newport, R. I., Land and Buildings	22,600.00	0.00
117 Marlboro St., Land and Buildings	27,000.00	0.00
200 State St. Land and Buildings	38,000.00	0.00
11-13 Temple Place, Land and Buildings	291,000.00	291,000.00
Norfolk St., Dorchester	2,000.00	2,000.00
	<u>\$557,517.32</u>	<u>\$469,917.32</u>

Schedule J.
LANDS BUILDINGS AND EQUIPMENT.

EDUCATIONAL PLANT:

Land and Buildings, Book Values.

Rogers Building	\$200,000.00	
Walker Building	150,000.00	
Engineering Building A, Trinity Place	90,000.00	
Engineering Building B, " "	57,857.10	
Engineering Building C, " "	47,561.08	
Henry L. Pierce Building, " "	154,297.05	
Boiler and Power House, " "	26,916.74	
Tech Union, " "	19,460.36	
Lot Number 1, " "	76,315.69	
Lot Number 2, " "	137,241.60	
Lot Number 3, " "	282,286.35	
Electrical Engineering Building, Clarendon St.	121,790.93	
Mechanic Arts Building, Garrison St.	30,000.00	
Land on Garrison St.	50,840.00	
Gymnasium Building	12,624.07	
Athletic Field, Brookline	112,964.32	
	<u>\$1,570,155.29</u>	
Summer Camp, East Machias, Me.	36,081.81	
New Site and Preliminary Expense	816,293.74	\$2,422,530.84

Equipment, Book Values.

In Engineering Building "A"	\$20,645.24	
In Electrical Engineering Building	91,607.24	
In Mechanic Arts Building	20,628.56	132,881.04

Total Educational Plant, Book Values \$2,555,411.88

Schedule K.

ADDITIONS TO LANDS, BUILDINGS AND EQUIPMENTS.

Summer Camp, East Machias, Me.	\$23,852.35
New Site and Preliminary Expense thereon	<u>36,116.95</u>
	<u>\$59,969.30</u>

Schedule M.

NOTES PAYABLE.

Notes Payable:	<i>Amount.</i>	
Temporary loans issued	\$30,000.00	
Temporary loans paid	<u>30,000.00</u>	
Total Notes Payable outstanding		\$0.00
Interest accrued		<u>0.00</u>
Total Notes Payable and Interest accrued thereon		<u><u>\$0.00</u></u>

Schedule N.

ACCOUNTS PAYABLE.

Total per balance sheet	\$32.37
-----------------------------------	---------

Schedule P.
ENDOWMENT FUNDS FOR GENERAL PURPOSES.
Increases and Decreases of Funds for General Purposes.

<i>Invested Funds.</i>	<i>Funds June 30. 1912.</i>	<i>Investment income.</i>	<i>Other increases of funds.</i>	<i>Expenditures and other decreases of funds.</i>	<i>Funds June 30, 1913.</i>
<i>Restricted.</i>					
George Robert Armstrong	\$5,000.00	\$272.25	—	\$272.25	\$5,000.00
Charles Choate	32,149.54	1,750.54	—	1,750.54	32,149.54
Martha Ann Edwards	30,000.00	1,633.50	—	1,633.50	30,000.00
James Fund	163,654.21	8,910.97	—	8,910.97	163,654.21
Katharine B. Lowell	5,000.00	272.25	—	272.25	5,000.00
Richard Perkins	50,000.00	2,722.50	—	2,722.50	50,000.00
John W. and Belinda L. Randall	83,452.36	4,543.98	—	4,543.98	83,452.36
William B. Rogers	250,225.00	11,270.00	—	11,270.00	250,225.00
Samuel E. Sawyer	4,764.40	259.42	—	259.42	4,764.40
Albion K. P. Welch	5,000.00	272.25	—	272.25	5,000.00
<i>Unrestricted.</i>					
Sidney Bartlett	10,000.00	544.50	—	544.50	10,000.00
Stanton Blake	5,000.00	272.25	—	272.25	5,000.00
George B. Dorr	49,573.47	2,699.28	—	2,699.28	49,573.47
Arthur T. Lyman	5,000.00	272.25	—	272.25	5,000.00
James McGregor	2,500.00	136.13	—	136.13	2,500.00
Nathaniel C. Nash	10,000.00	544.50	—	544.50	10,000.00
Frances M. Perkins	16,500.00	—	—	—	16,500.00
Emma Rogers	486,459.92	—	663.10	14,139.34	472,983.68
Robert E. Rogers	7,680.77	418.22	—	418.22	7,680.77
Nathaniel Thayer	25,000.00	1,361.25	—	1,361.25	25,000.00
Charles G. Weld	15,000.00	816.75	—	816.75	15,000.00
Alexander S. Wheeler	5,000.00	272.25	—	272.25	5,000.00
	<u>\$1,266,959.67</u>	<u>\$39,245.04</u>	<u>\$663.10</u>	<u>\$53,384.38</u>	<u>\$1,253,483.43</u>

Schedule Q.
ENDOWMENT FUNDS FOR DESIGNATED PURPOSES.

Increases and Decreases for Designated Purposes.

<i>Invested Funds.</i>	<i>Funds June 30, 1912.</i>	<i>Investment income.</i>	<i>Other increases.</i>	<i>Expenditures and other decreases of funds.</i>	<i>Funds June 30, 1913.</i>
FUNDS FOR SALARIES:					
Sarah H. Forbes					
For General Salaries . . .	\$500.00	\$27.22	—	\$27.22	\$500.00
George A. Gardner					
For General Salaries . . .	20,000.00	1,089.00	—	1,089.00	20,000.00
James Hayward					
Professorship of Engineer- ing	18,800.00	1,023.66	—	1,023.66	18,800.00
Wm. P. Mason					
Professorship of Geology	18,800.00	1,023.66	—	1,023.66	18,800.00
Henry B. Rogers					
For General Salaries . . .	25,000.00	1,361.25	—	1,361.25	25,000.00
Nathaniel Thayer					
Professorship of Physics . .	25,000.00	1,361.25	—	1,361.25	25,000.00
Totals	\$108,100.00	\$5,886.04		\$5,886.04	\$108,100.00
FUNDS FOR FELLOWSHIPS:					
Dalton Graduate Chemical	\$5,333.37	\$272.25	—	—	\$5,605.62
Willard B. Perkins	6,687.43	326.70	—	—	7,014.13
Richard Lee Russel	2,181.57	90.00	—	—	2,271.57
Henry Saltonstall	10,528.00	544.50	—	400.00	10,672.50
James Savage	14,195.61	544.50	—	500.00	14,240.11
Susan H. Swett	10,657.95	412.50	—	400.00	10,670.45
Totals	\$49,583.93	\$2,190.45		\$1,300.00	\$50,474.38
FUNDS FOR SCHOLARSHIPS:					
Elisha Atkins	\$5,264.00	\$272.25	—	\$200.00	\$5,336.25
Billings Student Fund	50,690.00	2,722.50	—	2,000.00	51,412.50
Lucius Clapp	5,475.83	272.25	—	400.00	5,348.08
Isaac W. Danforth	5,330.26	272.25	—	200.00	5,402.51
Ann White Dickinson	41,456.35	2,210.36	—	1,600.00	42,066.71
Farnsworth Fund	5,264.00	272.25	—	200.00	5,336.25
Charles Lewis Flint	5,311.51	272.25	—	200.00	5,383.76
T. Sterry Hunt	3,250.40	163.35	—	150.00	3,263.75
Wm. F. Huntington	5,249.10	272.25	—	150.00	5,371.35
Joy Scholarship	10,000.00	—	—	—	10,000.00
Income Joy Scholarship	2,446.74	478.50	—	105.00	2,820.24
Elisha T. Loring	5,314.79	272.25	—	200.00	5,387.04
James H. Mirrlees	2,947.40	136.13	—	100.00	2,983.53
Nichols Fund	5,264.00	272.25	—	200.00	5,336.25
Charles C. Nichols	5,305.29	272.25	—	200.00	5,377.54
John Felt Osgood	5,355.00	272.25	—	300.00	5,327.25
Richard Perkins	54,491.37	2,818.58	—	2,000.00	55,309.95
Thomas Sherwin	5,314.00	272.25	—	200.00	5,386.25
Susan Upham	1,085.48	54.45	—	75.00	1,064.93
Ann White Vose	63,406.75	3,284.06	—	2,000.00	64,690.81
Wm. Litchfield	5,305.00	272.25	—	200.00	5,377.25
Frances Erving Weston	200.00	—	\$200.00	—	400.00
Samuel Martin Weston	200.00	—	200.00	125.00	275.00
Totals	\$293,927.27	\$15,134.93	\$400.00	\$10,805.00	\$298,657.20

Schedule Q. (Continued.)

FUNDS FOR LIBRARY AND READING ROOM:

Charles Lewis Flint Library	\$5,000.00	\$272.25	—	\$272.25	\$5,000.00
William Hall Kerr Library	2,000.00	108.90	—	108.90	2,000.00
Arthur Rotch Architectural Library	5,000.00	272.25	—	272.25	5,000.00
John Hume Tod Fund . . .	—	—	\$2,500.00	—	2,500.00
Edna Dow Cheney for Margaret Cheney Reading Room	14,429.35	762.30	—	381.88	14,809.77
Totals	<u>\$26,429.35</u>	<u>\$1,415.70</u>	<u>\$2,500.00</u>	<u>\$1,035.28</u>	<u>\$29,309.77</u>

FUNDS FOR PRIZES:

Arthur Rotch Prize Fund in Architecture	\$5,164.00	\$272.25	—	\$200.00	\$5,236.25
Arthur Rotch "Special" Prize Fund in Architecture	5,564.00	272.25	—	200.00	5,636.25
Totals	<u>\$10,728.00</u>	<u>\$544.50</u>	<u>—</u>	<u>\$400.00</u>	<u>\$10,872.50</u>

OTHER FUNDS:

Edward Austin Fund . . .	\$360,000.00	\$19,602.00	—	\$19,602.00	\$360,000.00
Edward Austin (income reserve)	19,100.80	—	\$1,960.20	—	21,061.00
Bursar's Fund	6,327.75	333.27	300.00	475.00	6,486.02
Susan E. Dorr Fund . . .	24,288.48	1,322.51	1,500.00	1,322.51	25,788.48
Students' Loan Fund . . .	100.00	—	—	100.00	—
Charlotte B. Richardson (Industrial Chemistry) .	37,378.78	2,035.27	—	2,035.27	37,378.78
Arthur Rotch Architectural Fund	25,000.00	1,361.25	—	1,361.25	25,000.00
Saltonstall Fund	44,989.73	2,449.69	—	1,837.27	45,602.15
Teachers' Fund	100,000.00	5,445.00	—	5,445.00	100,000.00
Architectural Society Fund	1,055.82	57.49	22.30	—	1,135.61
Samuel Cabot Fund (Indus- trial Chemistry)	45,528.75	2,722.50	5,000.00	114.08	53,137.17
Whitney Fund	26,175.00	1,361.25	—	1,000.00	26,536.25
Jonathan Whitney Fund . .	518,000.00	19,242.20	961.18	132,203.38	406,000.00
Eaton Fund	5,975.40	—	13,000.00	18,975.40	—
Ellen H. Richards Research Fund	—	398.37	15,046.05	—	15,444.42
Totals	<u>\$1,213,920.51</u>	<u>\$56,330.80</u>	<u>\$37,789.73</u>	<u>\$184,471.16</u>	<u>\$1,123,569.88</u>

Schedule Q. (Continued.)

Recapitulation of Funds.

	<i>At beginning.</i>	<i>Investment Income.</i>	<i>Other Increases.</i>	<i>Expense and Outgo.</i>	<i>At end.</i>
SPECIAL FUNDS:					
Funds for Salaries	\$108,100.00	\$5,886.04	—	\$5,886.04	\$108,100.00
Funds for Fellowships . . .	49,583.93	2,190.45	—	1,300.00	50,474.38
Funds for Scholarships . . .	293,927.27	15,134.93	\$400.00	10,805.00	298,657.20
Funds for Libraries and Reading Room	26,429.35	1,415.70	2,500.00	1,035.28	29,309.77
Funds for Prizes	10,728.00	544.50	—	400.00	10,872.50
Other Funds	1,213,920.51	56,330.80	37,789.73	184,471.16	1,123,569.88
Total Special Funds . . .	\$1,702,689.06	81,502.42	\$40,689.73	\$203,897.48	\$1,620,983.73
GENERAL FUNDS:					
Funds for General Purposes . .	1,266,959.67	39,245.04	663.10	53,384.38	1,253,483.43
Grand total	\$2,969,648.73*	\$120,747.46	\$41,352.83	\$257,281.86	\$2,874,467.16

*Income from investments per Schedule B-I.

Schedule R.

INCREASES AND DECREASES OF MINOR FUNDS.

MINOR FUNDS:	<i>Funds June 30, 1912.</i>	<i>Income and other increases of funds.</i>	<i>Expenditure and other decreases of funds.</i>	<i>Funds June 30, 1913.</i>
Research Laboratory of Applied Chemistry	\$997.55	\$4,624.44	\$3,709.80	\$1,912.19
Research Laboratory of Organic Chemistry	1,550.00	0.00	0.00	1,550.00
Roentgen Ray Experiment Fund	965.87	15.37	197.18	784.06
Sanitary Research Fund	2,341.49	5,000.00	5,322.92	2,018.57
Seismological Research Fund . .	0.00	1,000.00	1,000.00	0.00
Traveling Scholarship in Archi- tecture	0.00	1,000.00	500.00	500.00
Weld Naval Architectural Fund	285.03	1,840.45	1,865.37	260.11
Vehicle Research Fund	1,250.00	0.00	0.00	1,250.00
Cabot Medal Fund	37.90	0.00	1.02	36.88
Electric Railway Traffic Re- search Fund	0.00	1,000.00	0.00	1,000.00
Dormitory Fund	1,868.96	668.08	0.00	2,537.04
Jacques Fund	1,549.54	13.99	850.00	713.53
Letter Box Fund	50.75	27.75	4.75	73.75
President's Fund	1,465.68	0.00	398.93	1,066.75
Terminal Research Fund	0.00	2,000.00	1,204.97	795.03
Ozone Fund	0.00	225.00	175.00	50.00
				<u>\$14,547.91</u>
Egg Investigation Fund	141.45	1,699.20	2,149.75	*309.10
Edison Research Fund	<u>\$12,504.22</u>	<u>\$19,114.28</u>	<u>\$17,379.69</u>	<u>\$14,238.81</u>
Physico-Chemical Research Fund	*23.57	4,556.00	4,314.81	217.62
	*16.27	8,281.25	7,094.34	1,170.64
	<u>\$12,464.38</u>	<u>\$31,951.53</u>	<u>\$28,788.84</u>	<u>\$15,627.07</u>
<hr/> <hr/>				
*Overdrafts.				
FUNDS' INCOMES: (Cash Accumulations.)				
Edward Austin Fund Income . .	\$6,157.17	\$19,602.00	\$16,860.20	\$8,898.97
Teachers' Fund Income	19,870.04	5,445.00	3,690.00	21,625.04
Jonathan Whitney Fund In- come	6,819.01	20,203.38	5,955.50	21,066.89
	<u>\$32,846.22</u>	<u>\$45,250.38</u>	<u>\$26,505.70</u>	<u>\$51,590.90</u>
	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>	<hr/> <hr/>

Schedule S.

Balance July 1, 1912	\$253,204.96
Net increase, Schedule A	8,535.80
	<hr/>
Balance June 30, 1913	\$261,740.76
	<hr/> <hr/>

DETAILS OF LOSSES AND GAINS, ETC.:

LOSSES AND CHARGES:

Appropriations for Eaton Fund	\$9,876.95
Loss on sale of Atlantic Mills Stock	737.25
Old breakage and supplies charged off	187.50
Refund of Students' Fees, 1911-12	50.00
Cash short and over	23.64
	<hr/>

Total, per Schedule A	\$10,875.34
	<hr/> <hr/>

GAINS AND CREDITS:

Rents Receivable Reserve transferred to surplus	\$3,000.00
Gain on Sales of Bonds	1,585.00
Unclaimed Breakages of earlier years	331.30
	<hr/>

Total, per Schedule A	\$4,916.30
	<hr/> <hr/>

November 3, 1913.

To the Auditing Committee

of the Massachusetts Institute of Technology, Boston.

GENTLEMEN:

WE HEREBY CERTIFY that we have examined the books and have audited the accounts of the Treasurer and Bursar of the Massachusetts Institute of Technology for the year ended June 30, 1913.

We have established the assets and liabilities of the Institute as set forth on the balance sheet of the printed report of the Treasurer, except that we have not made a physical inventory of the securities, which we understand has been done by your committee.

We have verified the details of the bookkeeping during the year, have examined the vouchers for disbursements and have satisfied ourselves that all receipts of money have been acknowledged on the books and deposited in the bank and that the cash balances shown by the books on June 30, 1913, were actually available and that these balances are correct.

Very respectfully,

HARVEY S. CHASE & COMPANY,
Certified Public Accountants.