# BULLETIN

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# Massachusetts Institute of Technology

## PRESIDENT'S REPORT

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# BULLETIN

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# Massachusetts Institute of Technology

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## REPORTS

OF THE

## PRESIDENT AND TREASURER

PRESENTED AT THE DECEMBER MEETING OF THE CORPORATION

JANUARY, 1913

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

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# Report of the President.

TO THE MEMBERS OF THE CORPORATION:

Following the rules of the Institute, I beg to submit a report on its affairs during the year, appending as usual reports from other administrative officers with reference to the work of their special departments.

## THE CORPORATION.

The Corporation has lost the service of two of its most valued members, Mr. Charles C. Jackson and Professor A. Lawrence Rotch, the former by resignation and the latter by death. Mr. Jackson has taken an active interest in the affairs of the Institute during the twenty-five years of his membership of its Corporation. He has been a generous benefactor and his resignation signifies no diminution of his good-will towards the Institute, but merely that he deems some lessening of his activity desirable as the years go by. The premature death of Professor A. Lawrence Rotch is deplored not only by the Institute but by the scientific world at large. He joined your Corporation in 1891, seven years after his graduation from the Institute's Department of Mechanical Engineering and was always solicitious for the welfare and advancement of his Alma Mater. His allotted span of life was brief, but it sufficed for him to build a noble and enduring monument of scientific achievement. His researches show how valuable is a training in the practical applications of science to the man who knows how to profit by such an experience in the effort to push forward the boundaries of knowledge. He formed one of a brilliant band of Technology graduates whose contributions to pure science have been crowned

by the recognition of the scientific world and whose achievements bear testimony to the depth and breadth of the Institute's mode of training. Technology is popularly thought of as pre-eminently a school of *applied* science, but the line between pure and applied is often extremely thin, and nothing should be done to emphasize it artificially. It would be well for the students and the faculty of the Institute in all the years that are to come if some means could be devised to keep the achievements of Lawrence Rotch constantly before them as a stimulus to activity and as a reminder of the duty of Technology men to advance pure science as well as applied science, wherever the opportunity for advancement is presented.

Unfortunately, I have not exhausted the losses of your Corporation, for I have to announce the impending resignation of Mr. William B. Thurber, the Treasurer of the Institute. Mr. Thurber took up the duties of that important office three years ago at a difficult and critical stage of the Institute's development, and has rendered a great service to his Alma Mater by his devotion to its interests. None will regret his loss more than his colleagues on the Executive Committee, but, in spite of their protestations, he feels constrained to resign, on the ground that other duties that have the first claim on his time and energy do not leave him sufficiently free to do the work of the Treasurer according to his standards of the duties of that officer. His resignation was laid before the Executive Committee some time ago, with the understanding that it was to take effect as soon as a suitable successor could be obtained. (The recommendation of this successor, which I had expected to be able to make today on behalf of the Executive Committee, must be postponed to a later meeting.) Within the last few days I have received a letter from Senator Crane expressing his regret that he has been unable for some time to attend the meetings of this Corporation and asking that his resignation be placed before

you today. This resignation is the more to be regretted in view of the hope that had been entertained that freedom from the duties of his office in Washington would have given Mr. Crane more time to place his experience and influence at the service of the Institute.

During the year the term of three alumni members expired,—that of Messrs. George E. Hale, George W. Kittredge and Frank W. Stantial. They all interested themselves deeply in the advancement of their Alma Mater during their service on its Corporation, although Mr. Hale's residence in California made regular attendance at the meetings impracticable. Their places have been taken by the election of Messrs. Eben S. Stevens, Louis A. Ferguson and Arthur D. Little, the first of whom has already served most acceptably as a term member of the Corporation.

## THE FACULTY.

The losses in the Corporation to which I have referred have their counterpart in the Faculty; the most conspicuous of these has been the loss of the Rotch Professor of Architectural Design, Professor Desiré Despradelle, who died during the summer, after a long illness. He came to the Institute in 1892, and in the President's report for that year, General Walker said, "All that we have learned regarding M. Despradelle both before and since his appointment assures us that we could not have found in all France a worthier successor to Professor Letang." The twenty years of service that followed proved how well-grounded were the expectations with which his coming was hailed. He did more than bring to America the highest artistic ideals of France; he displayed a genius for interpreting those ideals and adapting them to the needs of this community in a manner that aroused the interest and enthusiasm of all who came under the influence of his teaching. He was pre-eminent as a teacher and it was as a

teacher that he influenced most deeply the development of architecture in the country of his adoption. He was, however, much more than a teacher, and had he lived, he might have built a lasting monument of his constructive skill, in what he contributed to the solution of our problem of building the New Technology. He gave that problem much thought, but, unfortunately, changed conditions have rendered much of what he suggested unavailable to-day. Other means must therefore be found of keeping his name and memory in close association with the great school of architecture that he did so much to develop. Happily, after long years of association with such a man, a school gains something that remains after his removal. His spirit becomes part of that important though intangible thing, the spirit of the school. His ideals and his methods form a permanent portion of the tradition that is handed down to future generations. These are abiding possessions and are recognized as abiding, by students and their parents, as is shown by the fact that, although Professor Despradelle has not been active for some years and is now gone, the school of architecture was never so large and its students never more enthusiastic nor more promising than they are to-day.

There have been other losses in the Faculty during the year, but, happily, not through death. Professor Reginald A. Daly, after serving the Institute with great devotion for many years and adding distinction to its department of Geology, has been called to fill one of the most important chairs at Harvard University, the Sturgis Hooper Professorship of Geology. Professor Gilbert N. Lewis, of the Department of Physical Chemistry, has gone to the University of California to become the head of its department of chemistry; and the Department of Physical Chemistry has been further depleted by the loss of Assistant Professor William C. Bray who has also joined the staff of the University of California. Losses of this

kind are inevitable as the younger members of our instructing staff grow in reputation and are sought for by other institutions. The loss is partially compensated by the fact that it is the means of extending the Institute's influence by carrying its methods and its ideals into other portions of the great field of education.

Other changes have been brought about by the establishment of the Technology Volcano Observatory in Hawaii. This project has been made possible by the promised contribution to the Institute of $5,000 a year for the next five years from the Hawaii Volcano Research Association, by further contributions from friends in Boston, and by the income from the Caroline A. R. Whitney Fund, established at the Institute a few years ago for the encouragement of research in Seismology. Professor Jaggar has been relieved of other academic duties for a period of five years and despatched to Hawaii to direct the work of the Observatory. It is hoped that the researches that are carried on under his direction will advance the scientific knowledge of volcanoes and make practical contributions to the solution of the important problem of protecting human life and property from the destruction due to earthquakes and allied phenomena. Professor Jaggar's departure to Hawaii has made it necessary to appoint a new head of the Department of Geology and for this important position the Institute has been fortunate in securing Professor Waldemar Lindgren, Chief Geologist of the United States Geological Survey. Professor Lindgren being one of the most distinguished members of the National Academy of Sciences and one of the foremost economic geologists in the world, it seemed appropriate to associate his office with the name of William Barton Rogers, the founder of the Institute, who was a pioneer in economic geology in this country and a president of the National Academy of Sciences. For this purpose your Corporation in June last made provision for the establishment of the William Barton Rogers Professor-

ship of Economic Geology, and Professor Lindgren was appointed as its first occupant. We have high hopes that he will establish a tradition of scientific achievement that will be a powerful stimulus for generations to come. The Department of Geology has been further strengthened by the appointment of two younger men of high promise,—Dr. Frederick H. Lahee and Mr. John D. MacKenzie.

Reference has already been made to changes in the Department of Architecture. The Rotch Professorship of Architectural Design has not yet been permanently filled, but we have been fortunate in being able to fill it temporarily by the appointment of Professor Duquesne of Harvard University. He has expressed himself as being in thorough accord with the aims and methods of Professor Despradelle's teaching, so that there has been no discontinuity in the practices of the school. Professor Duquesne has entered easily into the spirit of Technology and been unsparing of his efforts to stimulate the students to the highest endeavor. His service to the Institute and the generous good-will displayed by the authorities of Harvard in permitting his sacrifice of time and energy in the interests of Technology should do much to strengthen the bond between the two institutions.

One of the most important permanent additions that has been made to the staff of the Institute for some time has been that of Professor James Knox Taylor, who has been appointed Director of the Department of Architecture. Mr. Taylor is a former student of the Institute who has already had a powerful influence on the architecture of the country through his occupation for fifteen years of the important position of Supervising Architect of the Treasury Department in Washington. From that point of vantage, he did much to raise the standard of design throughout the country, and in his present position he will be able to continue the work of improvement through his influence on the architects of the future. His thorough knowledge

of the conditions of practice in all parts of the Union and his wide acquaintance with leading members of the profession everywhere should enable him to keep the department that he directs in close touch with actual life.

In addition to what has already been recorded, there have been other changes in the Faculty. Professor Miller, who was made Acting Head of the Department of Mechanical Engineering on the retirement of Professor Lanza, has been made Head of that Department; he brings energy, enthusiasm and practical experience to the task of directing one of the largest and most important departments of the Institute, and he has the respect and good-will of his colleagues in carrying on this task.

The growth of the Department of Chemistry, and particularly that section of it devoted to Chemical Engineering and Industrial Research, has necessitated some lightening of the labors of the Head of the Department. Professor Talbot has, therefore, been relieved of the care and direction of the students pursuing courses in Chemical Engineering, and this burden has been assumed by Dr. William H. Walker whose enthusiastic devotion to the work has been one of the main factors in building up courses that are rapidly becoming amongst the most important of the Institute.

Well-merited promotions in grade have been granted, as follows:—

Associate Professor F. Jewett Moore to Professor of Organic Chemistry.

Associate Professor Charles L. Adams to Professor of Drawing and Descriptive Geometry.

Associate Professor Charles H. Warren to Professor of Mineralogy.

Associate Professor Charles E. Fuller to Professor of Theoretical and Applied Mechanics.

Associate Professor William A. Johnston to Professor of Theoretical and Applied Mechanics.

Associate Professor Charles F. Park to Professor of Mechanism.

Assistant Professor Warren K. Lewis to Associate Professor of Chemical Engineering.

Assistant Professor Hervey W. Shimer to Associate Professor of Paleontology.

Assistant Professor Charles W. Berry to Associate Professor of Heat Engineering.

Assistant Professor Harrison W. Hayward to Associate Professor of Theoretical and Applied Mechanics.

Assistant Professor Joseph C. Riley to Associate Professor of Heat Engineering.

Instructor Henry K. Burrison to Assistant Professor of Mechanical Drawing and Descriptive Geometry.

Instructor Robert P. Bigelow to Assistant Professor of Zoölogy and Parasitology.

Instructor Herman R. Kurrelmeyer to Assistant Professor of German.

Instructor Walter H. James to Assistant Professor of Mechanical Engineering Drawing.

Instructor Lawrence S. Smith to Assistant Professor of Theoretical and Applied Mechanics.

Instructor Newell C. Page to Assistant Professor of Physics.

Instructor Carle R. Hayward to Assistant Professor of Mining Engineering and Metallurgy.

Research Associate Charles A. Kraus to Assistant Professor of Physico-Chemical Research.

Assistant Franz Schneider, Jr. to Instructor in Biology.

Assistant Rufus E. Zimmerman to Instructor in Theoretical Chemistry.

Assistant Joseph P. Maxfield to Instructor in Physics.

Assistant Gordon B. Wilkes to Instructor in Heat Measurements.

Research Assistant Harry F. Thompson to Research Associate in Electrical Engineering.

The following new instructors have been appointed:—
Ralph H. White, Instructor in Inorganic Chemistry.
Clarence E. Morrow, Instructor in Architecture.
Herbert W. Smith, Instructor in English.
Orie W. Long, Instructor in German.
Paul R. Lieder, Instructor in German.
William R. Barss, Instructor in Physics.
Charles R. Cressy, Instructor in Inorganic Chemistry.
Frederick H. Lahee, Instructor in Geology.
John D. MacKenzie, Instructor in Geology.

## THE STUDENTS.

The report of the Registrar appended hereto contains interesting statistics as to the students, their number, distribution as to years, courses, origin, etc. From this it appears that the number of students on November the first was 1611, the largest in the history of the Institute. A much larger number presented themselves for admission, but more than usual were advised to withdraw during the first month of the year in pursuance of our policy of raising the standards wherever this can be done without injustice to deserving students. The statistics with reference to the origin of the students show that the Institute is steadily extending its national and international influence; all parts of the Union are represented and there is a considerable foreign contingent from widely separated parts of the world. According to statistics recently published in "Science," it appears that the educational institutions that attract any considerable number of foreign students may be arranged in an ascending scale according to the percentage of foreigners to the whole student body, as follows: Michigan 2.1; Yale 2.7, Northwestern 2.8, Illinois 3.0, Columbia 3.2, Harvard 3.3, Cornell 3.7, Pennsylvania 4.0, Technology 6.8. Thus the Institute has nearly twice as large a proportion of foreigners as any other institution in the country. As regards the students from the United States,

it is interesting to note that the center of population for them is now in the state of New York close to the borders of Pennsylvania and that it is steadily moving westward. Of those students from the United States beyond the borders of Massachusetts, the center of population is now a point south-west of Toledo. The number of college graduates pursuing courses here was 161 ten years ago and 186 five years ago; to-day the number is 230. By way of comparison it may be interesting to note that the numbers studying applied science or architecture at Harvard, Columbia and Yale (Sheffield Scientific School) are 107, 117 and 171 respectively. In addition to the 230 college graduates pursuing courses at the Institute, there are 200 other students here who have come from colleges before graduation.

### A MEMORABLE YEAR.

Within the Institute the year has been one of steady growth due as usual to the enthusiastic devotion of the instructing staff and hard work and earnestness of purpose on the part of students. This is fortunately the normal condition of affairs here, but in other respects the year has been so unusual as to render it memorable and indeed epoch-making in the history of the Institute. The chief events are so well-known to all the members of the Corporation that I need do little more than set them down briefly as a matter of record. The problem of obtaining a new site that has occupied your attention for a decade has been finally solved. The tract of nearly fifty acres on the Charles River embankment in Cambridge selected last year by the Site Committee has been secured and the price $775,000 paid. Of this price, $500,000 came from Mr. T. Coleman duPont, and the remainder from twenty public-spirited citizens, the majority of them like Mr. duPont being members of your Corporation. Our offer to purchase the new site was made conditional on the closing of certain streets that crossed the section. This called for action on the

part of the city government of Cambridge and raised some opposition from those who professed to believe that the location of the Institute in Cambridge would impose an additional burden upon the tax-payers of that city. It was difficult, however, for such opposition to be effective in view of that fact that numerous petitions had been received from prominent business men and organizations in Cambridge, not especially interested in education, urging the Institute to go there; that the Executive Committee of the Tax-payers Association had expressed its belief, "that it would be for the best interests of the city to have the Institute of Technology occupy this land"; that the Mayor of the city had assured us that he regarded such an institution as a blessing and not a burden upon the community and that he would welcome the Institute should it decide to cross the River; and that the City Council itself had ordered "that the City Council of the city of Cambridge wishes to record its approval of the movement to induce the Massachusetts Institute of Technology to locate on the land now vacant extending along the northeasterly side of Massachusetts Avenue between the Boston and Albany railroad tracks to the river front." These men doubtless saw clearly, as must all who care to study the question, that the loss in taxes is more apparent than real and that the compensating gain far more than makes good the loss. At any rate, the streets were closed.

Shortly after this question had been settled, I was happily in a position to announce that an anonymous donor had offered to subscribe the sum of two and one-half million dollars towards the fund for the building of the New Technology. The gift was great in itself, one of the greatest in this era of great endowment of education, and its value was greatly enhanced by the manner of its giving. It showed the modern business man at his best, ready to make a noble use of his wealth and anxious to do a great thing quietly and unostentatiously. The donor undertook

to pay the money whenever it was required to defray expenses that had actually been incurred on the new buildings. However, as a further evidence of his good-will, he sent in June last a check for a million dollars forestalling by this amount such expenditures as must soon be incurred.

Not long after the announcement of this anonymous gift, the death of Mr. Pratt revealed the fact that he had made provision in his will for the endowment of the Institute's Department of Naval Architecture and Marine Engineering. His property, valued at nearly $700,000 was left in the hands of trustees until it accumulated to $750,000, and was then to be transferred to the Institute for the purpose already indicated. The validity of the will is being disputed, but if it be upheld, the bequest will do much to develop a very important branch of applied science that is in great need of development in this country.

During the year there has been transferred to the Institute by two of its alumni real and personal estate amounting in value to nearly $40,000 for the summer camp in engineering. These gifts were referred to in my last Annual Report, so that it is unnecessary here to say more than that the camp has by this time been built and equipped, that it has been put to the test of actual use by seventy-two students and thirteen instructors during the past summer, that all who have had experience of it are loud in their praise of the foresight and skill of the group of alumni who planned it and supervised its construction, and that its establishment has greatly increased the efficiency of the Institute as an educational machine.

Of the numerous other gifts for which the donors deserve the thanks of this Corporation, time permits me to mention only two. The first of these is the gift of $50,000 for the establishment of the Samuel Cabot Fund,—a gift that serves admirably the double purpose of perpetuating the memory of one of the best friends that the Institute has had, and of encouraging one of the most important

branches of applied science, namely, research in the field of industrial chemistry. The other gift is that of the Dering library, made by the American Telephone and Telegraph Company. This library contains about thirty thousand volumes and in addition to a number of rarities of great historical value comprises practically all the books that have been published in Europe and America during the last half century, dealing with electricity and its applications. It forms a very valuable addition to the educational equipment of the Institute, and should do much to encourage amongst our students the habit of wide reading and thorough-going investigation.

Before passing from the subject of gifts, it may not be out of place to observe that of the gifts to the Institute within the last eighteen months considerably more than three million dollars has come from outside of Massachusetts. This gives emphasis to the fact that the Institute serves a national as well as a local purpose. It is one of the many compensations that Massachusetts receives for educating men coming from beyond her borders and may serve as a commentary on the arguments of those who would have her pursue a less enlightened policy.

## SOME PROBLEMS OF THE FUTURE.

The most pressing problem before your Corporation is, of course, the building and equipment of the New Technology. By vote of the Corporation in June last, I was empowered to appoint a committee to co-operate with the Executive Committee in making the necessary arrangements for building. It seemed expedient to select the members of this Committee as occasion demanded. The co-operation of others will probably be sought later, but at present the only two appointed are Messrs. James W. Rollins and John R. Freeman. Mr. Rollins is giving special attention to the problem of filling the land to the necessary grade, while Mr. Freeman is devoting his ener-

gies to the great task of studying the internal arrangement of the buildings so as to make them as efficient for the practical needs of education as are the best factories for the purposes for which they are designed. Mr. Freeman has had a corps of assistants but he has carried a heavy share of the work himself and has rendered a splendid service to his Alma Mater by the thoroughness and the skill with which he has undertaken his investigations. It must not be supposed that Mr. Freeman's work which is now well-advanced is intended to supplant the architect; that important officer must very soon be appointed. His labors should be greatly lightened by the preliminary work that has been done under Mr. Freeman's direction and he should consequently be able to proceed rapidly to the final solution of the problems presented.

Most of Mr. Freeman's work has been devoted to a study of the strictly educational buildings of the New Technology. This is the portion of the larger problem that was naturally attacked first because this was the only portion for which adequate financial provision had been made when the investigation was begun. It must be borne in mind, however, that an equally important part of the whole problem has as yet been only partially solved. This is the provision for adequate social and athletic facilities for the students, for the equipment of all the buildings and for the laying out of the grounds. Various committees of the alumni are studying different phases of this problem. The Walker Memorial Committee is making plans for a social center for students and for a gymnasium and swimming pool; the Committee on Student Housing is occupied with the study of the problem of dormitories; and the Alumni Fund Committee is busily engaged in obtaining the financial support of the alumni for the carrying out of the plans. It is estimated that to complete, in a satisfactory manner, the plans that have already been outlined more than two million dollars are needed beyond what has been

promised. Most of that must come from outside the alumni body, for that body is neither large nor rich, and has already within the last eighteen months subscribed more than a million dollars to provide for the New Technology.

Another problem that lies before us is the kind and the limits of the co-operation that should be encouraged with other educational institutions and particularly with Harvard University. There has been much friendly co-operation between Harvard and Technology, especially in the last few years and now that the Institute is going to Cambridge within a few minutes' journey from Harvard Square, the opportunities for such co-operation will be greatly increased. How far in this direction is it expedient to go? Fortunately, this is a question that it should be possible to consider calmly and to discuss patiently, now that there can be no thought of the Institute's dependence and no doubt in the minds of any of us that Technology is strong enough either to enter safely into alliances or to stand absolutely alone.

The duty of co-operation in educational effort wherever such co-operation is practicable has been most forcibly expressed by the Secretary of your Corporation, Mr. James P. Munroe. "It would be wise," he has said, "for the Institute to enlist all the higher educational forces of the Commonwealth in working out some plan through which, jointly, they may help Massachusetts to solve those perplexing problems of commercial growth and of industrial education which to-day confront her. Incidentally such a partnership would be of immense benefit to education itself, which suffers in few ways so much as through lack of co-operation among those colleges, universities, and schools of applied science which not only should be laboring together for the common good, not only should be avoiding by mutual agreement those duplications of resources and of effort that keep them all painfully poor,

but also should be devising some plan by which students may be transferred from one to another without loss of time and effort, and may be brought thereby under those varied stimuli of environment and teaching so beneficial to ambitious youth."

Unfortunately, the phrase "duplication of effort" has often been so misapplied to cases where there is no real duplication in the sense that is implied as to divert men's attention from cases that really call for a remedy. There is no regrettable duplication where different men or machines are employed in two institutions, even although they do exactly similar work, provided they are employed to *their full capacity*. Unfortunately, in a properly equipped school of applied science a great deal of costly machinery must be installed that is used only occasionally, and, especially in the higher branches, only by small numbers of students. The duplication of such machinery in neighboring institutions imposes a heavy financial burden on the community that furnishes it and no reasonable effort should be spared to avoid it. A few examples may give definiteness to these general statements. The Institute is planning to build and equip the most complete Mining and Metallurgical laboratories in existence. It would cost Harvard, and therefore the community, hundreds of thousands of dollars to duplicate these and yet all the students of Mining and Metallurgy at Harvard could easily be accommodated in the Institute's new laboratories without any detriment to the Technology students. On the other hand, it would cost Technology hundreds of thousands of dollars to duplicate the University Museum whose great collection of minerals, fossils, etc., might be open to the senior students at Technology without any over-crowding of, or interference with, the work of the regular students of Harvard. If the Pratt will be upheld, the Institute will probably undertake to increase the efficiency of its Department of Naval Architecture by building an experimental

tank. This is considered by competent authorities to be a necessary part of a department that is fully equipped to advance the science of ship-building. One such tank would suffice very easily for two or more neighboring institutions and it would cost upwards of a hundred thousand dollars. Such examples might easily be multiplied, but the above may suffice to indicate the kind of waste that would be saved if the duplication of machinery could be avoided. This duplication does not, however, represent the whole waste of the present system. More serious than any duplication of machines is the loss that falls upon the community by excluding advanced students of each institution from the benefit of coming under the influence of the pioneers of science in the other institution, men whose character and attainments make any suggestion of "duplication" absurd. For years, the advanced students of Geology at this Institute have been stimulated by Professor Daly's skill and enthusiasm as a teacher as well as by his scientific achievements. Now that he has gone to Harvard, it is regrettable that such students should be cut off from his influence, especially in view of the fact that the advanced students of Harvard and Technology together would not be too many for a man of his capacity to deal with effectively. Indeed in such cases, there is a loss rather than a gain in efficiency, merely from the educational standpoint, where the number of students is unduly small. I have already referred to the distinction of Professor Lindgren who now occupies the William Barton Rogers Professorship in Geology. Harvard is not likely to attempt the impossible task of "duplicating" such a man, but it would be a great advantage to the advanced students of that University if they could come within the range of his influence as a teacher.

All this is very well worn ground in academic circles. The fact that extensive co-operation along the lines suggested has been so rare proves that there are real difficulties

in the way of its adoption and, of course, no good can come of minimizing difficulties that are real and not imaginary. With regard to any scheme that might be proposed to meet the actual conditions at Harvard and Technology, I shall content myself here with laying down three propositions: (1) No extensive co-operation can be maintained with any satisfaction to either party and consequently with any chance of permanence unless the idea of competition between the institutions is eliminated. (2) The scheme to be worth much consideration must be broad enough to throw open the resources of both institutions (in equipment and in men) to at least some of the students of the other. (3) The obvious way to co-operate is in the treatment of the graduate students, leaving the greater part of Technology entirely alone. I do not suggest any scheme of co-operation for I should not think of committing myself to any such scheme until I had discussed the matter carefully with members of the Faculty and had the benefit of their criticism and suggestions.

I have already presumed too long upon your patience, but I ought not to close without referring, however briefly, to some other problems that lie before us. Most of the departments of the Institute are growing rapidly, the few exceptional cases being affected by conditions that are obviously temporary in their nature. Almost everywhere there is opportunity for further advancement, as a few examples may suffice to indicate. The course in Highway Engineering should be greatly strengthened to meet modern conditions when new means of transportation and new methods of construction have profoundly modified the problem of building and maintaining good roads, which are so essential to society and so vastly more costly than they would be if only scientific methods were employed. So much good has come to the community from the researches in sanitation that have been conducted at the Institute during the last decade that this branch of Tech-

nology's activity should be permanently endowed and provision made for the needs of the future in this direction. The Department of Chemical Engineering and of Research in Industrial Chemistry has expanded so rapidly and given so much evidence that it is to be an important factor in the industrial development of the nation that it should be encouraged as much as possible and permitted by adequate endowment to keep up with the demands of the community that it serves. Provision should also be made for a department of industrial physics, corresponding to that of industrial chemistry, a department, the nucleus of which is already in existence at the Institute and one that if properly nurtured should aid very materially in the improvement of industrial processes. Something, too, should be done to extend the *method* of engineering into various regions of the wider field of business, a problem referred to in the report of the Department of Electrical Engineering appended hereto, and one that is being carefully considered by a committee of the Alumni Council. These suggested extensions all call for further expenditure and larger endowment. A successful educational institution can never rest and the greater its success the greater its needs.

RICHARD C. MACLAURIN.

# Reports of Administrative Officers.

## REPORT OF THE SECRETARY OF THE FACULTY.

The plan for a course in Naval Construction (XIII B) for foreign students has been approved by the Faculty, and the schedule of studies for the first two years has been adopted. There are at present four students enrolled in this course.

The former schedule of studies for the Course in Geology (XII) has been abolished, and in its place a plan has been adopted, in accordance with which students desiring to specialize in Geology may do so on the basis of the first two years of Option 3 in the Course in Mining Engineering and Metallurgy, or on the basis of previous college work of similar character, and may become candidates for the degree of Bachelor of Science in Geology in two years, or, in the case of college graduates, for the Master of Science degree in three years.

The course schemes for other courses remain essentially as before, except that in the Courses in Civil Engineering, Mining Engineering and Sanitary Engineering the new schedules, contingent upon the required summer work, which went into effect during the past summer, have become operative.

A special committee appointed to consider the advisability of having at the Institute an honorary society whose membership should consist largely of students who give promise of doing original, creative work in science and engineering, recommended to the Faculty that a resolution be adopted favoring the establishment at the Institute of a chapter of Sigma Chi. The advantages and disadvantages of having such a society were discussed at length,

but the recommendation was not adopted, the majority believing that such a society would not be adapted to the policy of the Institute in regard to rating its students.

In June, 1912, the Faculty recommended six students for the degree of Doctor of Philosophy; twenty-one for the degree of Master of Science; and two hundred and fifty-eight for the degree of Bachelor of Science. One of the latter obtained the degree in both Civil and Sanitary Engineering.

One hundred and ninety students who had attended other colleges for one year or longer, were admitted to the Institute in October, 1912. Of these one hundred and one have already received the Bachelor's degree in the college previously attended.

ALLYNE L. MERRILL,
*Secretary.*

## REPORT OF THE DEAN.

During the past year the many movements for the betterment of the social life of students have begun to crystallize, and what were once innovations are now being accepted as traditions. The Institute Committee now has an assured position in its control of student activities; the Finance Committee receives and audits the accounts for the different organizations, and the actions of the different advisory boards are accepted without question. It is fortunate that the students' sanction of many of these desirable things has been secured before the move to the new site, for with this change will come a new lot of problems much more difficult of solution. The greatest credit for the working out of a satisfactory business organization among the undergraduates is due to the disinterested efforts of the Editor of the Technology Review, Mr. I. W. Litchfield, who ever since he has had his office in the Rogers Building has kept in touch with student life.

A new edition of the little book published by the undergraduates, "Concerning the Institute," has been brought out and placed in the hands of every member of the entering class. The new edition has as its frontispiece the portrait of President Maclaurin with a simple and dignified dedication. In this book all matters of student interest have been brought up to date, and one can hardly overestimate its value in fostering the best Technology traditions. In this connection we can bear in mind that Technology life has a distinct individuality and it will not be possible to solve all our problems by the formulae accepted in other colleges.

During the past year there have been a few unfortunate cases of individual student discipline, but in general there has been little that could be criticised in the attitude of the students as a whole. They have often voluntarily exercised much restraint under conditions tempting to disorder.

Since the discontinuance of the office of President's Assistant the work of conducting an employment bureau for undergraduates has devolved upon the Dean. At the beginning of the summer vacation one hundred and thirty-four students asked for employment; one hundred and ten were recommended; and from fifty-eight we received reports that positions had been secured. It is probable that most of the men who made application found work during the summer, but we have no official knowledge of the fact. The work of examining the boarding places, and publishing an accepted list of addresses was given to the paid Secretary of the Technology Christian Association, and I should like to call attention to the good work done by this more liberal form of the Christian Association which has lately been organized at the Institute. Under the direction of the Secretary weekly meetings have been held every Tuesday noon in the living-room of the Union, with an attendance of between one hun-

dred and two hundred students at each meeting. The students were addressed by some well-known man, not always an ordained minister, who spoke informally on subjects intimately connected with student life.

The Dean is ex-officio Chairman of Faculty Committees on the Employment of Graduates, on Conduct of Examinations, on First Year Students, and is in charge of the department of Physical Training. Detailed reports of these Committees have been sent to the Secretary of the Faculty, but it may be of interest to state that during the past year one hundred and twenty applications have been received from graduates who wish to be considered for new positions and two hundred and fifty-two demands for graduates have been received by the Chairman of Committee. The number of applications for students exceeds that of last year by fifty-six. The number of graduates applying for positions is considerably less.

Physical Training has been carried on under the able direction of Mr. Frank M. Kanaly, assisted by Mr. Calvin P. Eldred of the Class of 1912.

The following facts have been taken from Mr. Kanaly's report:

"The physical examinations for all first year students were made between October 1st and November 3rd. The first class-work in the gymnasium was held November 6th. The required twenty weeks of exercise ended April 12, 1912. During the first term three hundred and nineteen first-year men were registered for the course, and during the second term, two hundred and ninety-one.

By petition 15 men were excused from attendance on account of their age; 21 were excused on account of physical ailments; and 55 men were allowed to substitute athletic work; 41 took track athletics; 9, wrestling; 2, work on the hockey team; 1, work on the basket ball team; and 2, practise work with the Gym team. Thirty-three men failed to pass the course and were required to repeat.

The second physical examination of first-year students was made between April 12th and May 20th.

The Cabot Medals were awarded to the five students who made the greatest improvement in strength measurements, and gymnastic efficiency, as indicated by the physical examinations, and as shown in regular class work. The names of the students are as follows:—Charles A. Blodgett '15, William H. Smith '15, Ainsley C. McCurdy '15, Louis H. Zepfler '15, and St. Elmo T. Piza '15.

The following five students received Honorable Mention:—Benjamin Hurwitz '15, Edward H. Stelle '15, James D. McIntyre '15, Newell L. Foster '15, and Isadore Berenson '15."

Only one death among the students occurred during the year. Mr. Woodworth a second year man died after an operation for appendicitis. Mr. Woodworth was a student in the Civil Engineering Department and had an excellent record.

ALFRED E. BURTON,
*Dean.*

## REPORT OF THE MEDICAL ADVISER.

There have been no important changes in the work of the medical office for the year. The consultation hours have been the same, and the number of students coming for advice practically the same as last year. There has been considerable emergency work; many examinations for illness or disability, for excuse from military drill or physical training, for the filling out of civil service papers, and to decide for fitness for certain athletic work. However, the bulk of the work, as usual, has been treatment of a large variety of acute illnesses.

During office hours, free medical advice has been given to as many students as could be treated satisfactorily, preference being given to urgent cases, and to those who would find it hardest to pay a doctor. I believe that the

majority of those who come for treatment of illness are the students who are least able to pay.

The following table gives the number of office visits made, and the number of students seen. A few figures of the previous year are given for comparison:

| | 1911 | 1912 |
|---|---|---|
| Total number of office visits made | 332 | 305 |
| Total number of different students seen | 226 | 209 |
| Greatest number of students seen per day | | 11 |
| Least number of students seen per day | | 2 |
| Average number of students seen per day | | 5 |

Most men made only one or two visits, usually for treatment of some acute and promptly curable condition. Only four made six visits, and none over eight visits, in other words, no chronic invalids were seen and medical advice was well distributed. It is usually easy each year to find out early in the term the few men with organic troubles, and give them special advice and supervision.

A great variety of illnesses were treated, the most numerous being diseases of the digestive organs; of the nose and throat; of the skin; and minor surgical diseases. About twenty men were seen who had severe illnesses, such as appendicitis; scarlet fever; jaundice; pleurisy; tuberculosis; or diseases of the heart or kidney. Most of these were sent home or to one of our large hospitals for treatment. A considerable number of students were referred to specialists for treatment of the eye or throat. A moderate number of men were seen at my private office, and a small number at their residences. Fifteen men were examined for the United States civil service. The cases of contagious diseases, always small in number, have been fewer than usual this year, viz.: three cases of measles; one of scarlet fever; and one of tuberculosis. There have been no epidemics. Every year I am impressed with the rarity of accidents to students in the great laboratories of all kinds, and am happy to find how very little injury and disability results from the type of athletics cultivated at the Institute.

A talk on personal hygiene was given as usual to the freshman class, taking up bathing; exercise; sleep; care of the eyes; use of alcohol and tobacco; and the dangers of venereal diseases.

FRANKLIN W. WHITE,
*Medical Adviser.*

## REPORT OF THE LIBRARIAN.

The year 1911–12 has been an unusually busy one for the Library Department. The total receipts of the Library during the year have amounted to 5,021 items, exclusive of unbound periodicals. The sources of these accessions, whether by purchase, binding, or gift, are shown in the following table:—

TABLE I. TOTAL RECEIPTS, 1911–12.

| | | |
|---|---|---|
| By purchase | | 1,241 |
| By binding | | 1,012 |
| By gift, volumes | 1,357 | |
| By gift, pamphlets and maps | 1,411 | |
| | | 2,768 |
| Total | | 5,021 |

A comparison with previous years is given in the next table, which shows that the average total accessions for the past ten years has amounted to 4,680 items per annum.

TABLE II. TOTAL ACCESSIONS FOR TEN YEARS, 1902–12.

| | |
|---|---|
| 1902–3 | 4,768 |
| 1903–4 | 4,829 |
| 1904–5 | 3,915 |
| 1905–6 | 3,991 |
| 1906–7 | 4,890 |
| 1907–8 | 4,563 |
| 1908–9 | 6,423 |
| 1909–10 | 4,534 |
| 1910–11 | 3,874 |
| 1911–12 | 5,021 |
| Total ten years | 46,808 |

The cost of books and periodicals purchased, and of supplies for the Office, amount to $7,663.55, offset by the receipt of $20.10 for the sale of duplicates. These items are classified as shown in the following table:—

TABLE III. BILLS APPROVED, 1911–12.

| | |
|---|---|
| Purchase of books | $3,828.27 |
| Binding | 1,581.62 |
| Subscription to periodicals | 1,999.81 |
| Supplies | 253.85 |
| | $7,663.55 |
| Less receipt from sale of duplicates | 20.10 |
| Total | $7,643.45 |

After deducting from the total accessions 278 items for losses and obsolete books disposed of and the like, the total net increase of the libraries has been 3,380 volumes, 1,256 pamphlets, and 108 maps,—making the total contents of the libraries on June 30th, 1912, 95,528 volumes and 27,239 pamphlets and maps. The distribution of these items among the several departments, and the amount expended for each department for books during the year, together with the total contents of the libraries is shown in the following table:—

TABLE IV. NET INCREASE WITH THE COST OF THE SAME DURING THE YEAR 1911–12, AND THE TOTAL CONTENTS OF THE LIBRARIES OF THE INSTITUTE, JUNE 30, 1912.

| LIBRARIES. | NET INCREASE. | | | | TOTAL CONTENTS. | |
|---|---|---|---|---|---|---|
| | Volumes. | Pamphlets. | Maps. | Cost. | Volumes. | Pamphlets and Maps. |
| General Library: | | | | | | |
| General | 414 | 128 | — | $328.60 | 8,071 | 5,333 |
| English | 8 | — | — | 11.00 | 3,536 | 40 |
| Military Science | — | — | — | — | 367 | 9 |
| Walker Memorial | — | — | — | — | 485* | — |
| Other Departments | 3 | — | — | 9.30 | 79 | 1 |
| Totals General Library | 425 | 128 | — | 348.90 | 12,538 | 5,383 |
| Architecture | 122 | 14 | — | 398.75 | 4,732 | 288 |
| Biology | 79 | 101 | — | 180.78 | 4,014 | 1,193 |
| Chemistry | 437 | 448 | — | 1,102.28 | 12,878 | 3,299 |
| Electrical Eng'g | 220 | 5 | — | 384.36 | 2,110 | 113 |
| Engineering | 820 | 182 | 2 | 1,142.82 | 17,010 | 5,762 |
| Geology | 214 | 48 | 102 | 130.84 | 4,744 | 3,530 |
| Hist. & Econ. | 455 | 151 | — | 367.51 | 15,593 | 4,222 |
| Margaret Cheney Room | 44 | — | — | 33.35 | 867 | 15 |
| Mathematics | 8 | 23 | — | 150.09 | 2,282 | 331 |
| Mining | 233 | 74 | 4 | 493.79 | 5,708 | 987 |
| Modern Languages | 47 | 1 | — | 98.69 | 1,961 | 58 |
| Naval Architecture | 33 | 8 | — | 171.91 | 1,774 | 538 |
| Physics | 243 | 73 | — | 405.82 | 9,317 | 1,520 |
| Totals | 3,380 | 1,256 | 108 | $5,409.89 | 95,528 | 27,239 |

*Kept in the Reading Room of the Technology Union.

This table does not show the increase of the Library which will result from two gifts received during the year. A gift of an unknown number of books was made by Major Cole to the Technology Union, but as these books did not pass through the Librarian's Office, no record of them is made here. The other increase, not shown by the table, rises from the acquisition of the Dering Library, estimated at about 30,000 volumes. These books had not been enumerated at the end of the period covered by this Report.

As might be expected from the increased number of books received, the number of cards added to the catalogue is found to be greater than last year. The number of cards which have been written and added to the General catalogue is 4,830, and nearly the same number of copies

have been supplied to the departments. The General catalogue contained at the end of the year 117,857 cards.

The latest previous estimate of the value of the libraries of the Institute was published in the Report for the year 1905–6. That estimate has been extended in the table given below to June 30th, 1912. In making this table no account is taken of gifts, it being assumed that the value of the gifts will be balanced by the depreciation and losses of purchased books. According to this estimate the total value of the libraries of the Institute June 30th, 1912, was $202,814.52.

TABLE V. ESTIMATED VALUE OF THE LIBRARIES OF THE INSTITUTE, JUNE 30, 1912.

| LIBRARY | EXPENDED OCT. 1, 1906, TO JUNE 30, 1912 | | | TOTAL VALUE. | |
|---|---|---|---|---|---|
| | Dept. Acct. | Per. Acct. | Total. | 1906 | 1912 |
| *Rogers Building:* | | | | | |
| General Library . | $1,746.01 | $832.63 | $2,578.64 | $15,011.13 | $17,589.77 |
| Mathematics . . | 1,326.58 | 488.69 | 1,815.27 | 4,030.32 | 5,845.59 |
| Mining . . . . | 2,395.66 | 877.89 | 3,273.55 | 9,073.23 | 12,346.78 |
| History & Econ. . | 2,383.15 | 778.34 | 3,161.49 | 17,396.69 | 20,558.18 |
| *Walker Building:* | | | | | |
| Chemistry . . . | 5,782.93 | 1,510.62 | 7,293.55 | 23,185.07 | 30,478.62 |
| Physics . . . . . | 2,771.74 | 873.03 | 3,644.77 | 17,845.35 | 21,490.12 |
| *Engineering A.:* | | | | | |
| Engineering . . . | 6,626.39 | 1,734.86 | 8,361.25 | 28,443.32 | 36,804.57 |
| *Pierce Building:* | | | | | |
| Architecture . . | 2,178.68 | 858.82 | 3,037.50 | 22,394.78 | 25,432.28 |
| Biology . . . . | 1,605.13 | 1,630.34 | 3,235.47 | 8,320.01 | 11,555.48 |
| Geology . . . . | 1,355.16 | 654.27 | 2,009.43 | 5,639.51 | 7,648.94 |
| Margaret Cheney Room . . . . | 142.10 | — | 142.10 | 1,385.95 | 1,528.05 |
| *Engineering C.* | | | | | |
| Naval Arch. . . | 1,284.09 | 123.15 | 1,407.24 | 2,346.48 | 3,753.72 |
| *Lowell Building:* | | | | | |
| Electrical Eng. . | 1,598.67 | 544.34 | 2,143.01 | 2,919.25 | 5,062.26 |
| Modern Lang. . . | 363.81 | 480.82 | 844.63 | 1,875.53 | 2,720.16 |
| Total . . . . | $31,560.10 | $11.387.80 | $42,947.90 | $159,866.62 | $202,814.52 |

The periodicals are not counted among the accessions until bound, but, as will be seen from the tables which follow, they are received in a very considerable number.

The total number of serials, both periodical and annual, amount to 1004, exclusive of agricultural experiment station reports, railroad reports, and the like.

TABLE VI. TABLE OF PERIODICALS AND OTHER SERIAL PUBLICATIONS RECEIVED DURING THE YEAR 1911–12, CLASSIFIED BY DEPARTMENT AND METHOD OF PAYMENT.

| LIBRARIES. | NUMBER RECEIVED. | | | | ESTIMATED COST. | | |
|---|---|---|---|---|---|---|---|
| | Gifts. | Chgd. Dept. | Per. Acct. | Totals. | Dept. Acct. | Per. Acct. | Totals. |
| General | 69 | 5 | 33 | 107 | $23.86 | $134.44 | $158.30 |
| Architecture | 10 | 3 | 26 | 39 | 12.00 | 135.65 | 147.65 |
| Biology | 18 | 12 | 36 | 66 | 61.34 | 279.63 | 340.97 |
| Chemistry | 39 | 50 | 38 | 127 | 223.93 | 258.24 | 482.17 |
| Elec. Eng'g. | 7 | 13 | 26 | 46 | 48.68 | 104.01 | 152.69 |
| Engineering | 80 | 54 | 68 | 202 | 151.32 | 247.65 | 398.97 |
| Geology | 16 | 5 | 18 | 39 | 32.40 | 105.20 | 137.60 |
| History & Economics | 63 | 41 | 39 | 143 | 89.85 | 128.89 | 218.74 |
| Margaret Cheney Room | 1 | 8 | — | 9 | 25.45 | — | 25.45 |
| Mathematics | 4 | 3 | 21 | 28 | 11.55 | 82.61 | 94.16 |
| Mining | 38 | 12 | 33 | 83 | 54.03 | 149.29 | 203.32 |
| Modern Languages | 2 | — | 18 | 20 | — | 83.55 | 83.55 |
| Naval Architecture | 5 | 14 | 7 | 26 | 65.82 | 17.76 | 83.58 |
| Physics | 29 | 11 | 29 | 69 | 55.49 | 149.15 | 204.64 |
| Totals | 381 | 231 | 392 | 1,004 | $855.72 | $1,876.07 | $2,731.79 |

In order to show more clearly the richness of the Library in current periodical literature, the number of parts of periodicals received during the year 1912 has been estimated, showing a total of 15,352, as follows:—

TABLE VII. TOTAL NUMBER OF PARTS OF PERIODICALS RECEIVED, 1911–12.

| | |
|---|---|
| Quarterlies | 448 |
| Bi-monthlies | 294 |
| Monthlies | 4,452 |
| Semi-monthlies | 1,320 |
| Weeklies | 7,852 |
| Semi-weeklies | 624 |
| Dailies (Part of year) | 362 |
| | 15,352 |

The binding of periodicals and other books involved the issue of 1,854 orders covering 2,644 volumes. The expendi-

ture for binding by the several departments is listed below. The total is somewhat less than last year, being $1,581.62.

TABLE VIII. EXPENDITURES FOR BINDING, 1911–12.

| | |
|---|---|
| General | $122.95 |
| Architecture | 145.40 |
| Biology | 17.60 |
| Chemistry | 276.34 |
| Civil and Sanitary Engineering | 281.56 |
| Mechanical Engineering | 127.99 |
| Electrical Engineering | 154.47 |
| Geology | 19.55 |
| History | 7.90 |
| Economics | 91.76 |
| Mathematics | 28.35 |
| Mining | 146.76 |
| Modern Languages | |
| Naval Architecture | 32.03 |
| Margaret Cheney Room | 8.90 |
| Physics | 120.06 |
| Total | $1,581.62 |

The orders issued for the purchase of new books amounted to 1089 items as against 769 in the previous year.

At this time, great attention to office methods and problems of administrative efficiency is seen in academic as well as in commercial circles. It may, therefore, be of interest to put on record the scheme of division of labor which obtains at present in the Office of the Librarian. When analysed, it is seen that the operations in this Office may be classified into at least twenty-five processes, and, on account of the present proximity of the Office to the General Library, six more are added:—

TABLE IX. SCHEME OF DIVISION OF LABOR IN THE OFFICE OF THE LIBRARIAN.

| *Operations* | *by* |
|---|---|
| 1. Consultation | Librarian |
| 2. General supervision | Librarian |
| 3. Correspondence | Librarian and Secretary |
| 4. Inter-library loans | Librarian and Secretary |
| 5. Suggestions for purchase | Librarian and Assistant |
| 6. Buying books | Librarian and Secretary |

| | |
|---|---|
| 7. Subscriptions to periodicals | Librarian and Secretary |
| 8. Filing letters, receipts, and circulars | Secretary |
| 9. Auditing and accounting (approving bills) | Librarian, 1st Assistant, and Secretary |
| 10. Record and acknowledgement of gifts | Librarian and Secretary |
| 11. Sorting, checking, and disposal of duplicates | Librarian and 1st Assistant |
| 12. Care of books received for inspection | Librarian, 1st Assistant, and Secretary |
| 13. Examination, checking, and sorting of new books, pamphlets, and maps. | Librarian and 1st Assistant |
| 14. Record of accessions: books, pamphlets, and maps, and bound periodicals. | 1st Assistant |
| 15. Cataloguing and classification of the above | 1st Assistant |
| 16. Supervision and checking of the same | Librarian |
| 17. Filing cards and care of catalogue | 1st Assistant |
| 18. Filing "dead order slips" and care of "official catalogue." | 1st Assistant and 2nd Assistant |
| 19. Duplication of cards for departmental catalogues | 2nd Assistant *or* Secretary |
| 20. Examination, recording, and sorting periodicals (2nd-class mail) | Secretary |
| 21. Preparation, recording, and dispatch of books to bindery | 2nd Assistant |
| 22. Examination, checking, and sorting books returned from bindery | 2nd Assistant |
| 23. Shelf-listing, labeling, preparation and insertion of charging cards and pockets in books for General Library and for departmental libraries in charge of professors without clerical assistance | 2nd Assistant |
| 24. Recording, acknowledgement, and filing of college catalogues | 2nd Assistant |
| 25. Transportation to and from departmental libraries, and messenger service. | Office boy |

*General Library.*

| | |
|---|---|
| 26. Care of shelves | 2nd Assistant |

| | |
|---|---|
| 27. Reference work, answering questions, and helping readers to look up books or subjects | Librarian and 2nd Assistant |
| 28. Filing charging cards and keeping statistics of books borrowed for home use. | 2nd Assistant |
| 29. Checking and replacing returned books | 2nd Assistant |
| 30. Sending notices to delinquent borrowers. | 2nd Assistant |
| 31. Care of photographic negatives | 2nd Assistant |

The circulation of books for home use for the different libraries that have reported, is shown below:—

TABLE X. CIRCULATION OF BOOKS, 1911–12.

| | | | |
|---|---|---|---|
| General Library | | | 1,493 |
| Architecture | books | 3,566 | |
| | photos | 3,109 | |
| | | | 6,675 |
| Chemistry | | | 2,473 |
| Engineering | | | 1,814 |
| Mining | | | 689 |
| Physics | | | 1,650 |

The General Library is the only one that is open to readers after five o'clock in the evening. The statistics of evening attendance has been kept as usual. The Library was open during the year for 162 days, and the average attendance from five to seven was 7.6 and from seven to ten 3.8.

During the summer vacation the books in the Library of Electrical Engineering were entirely reclassified under the direction of the Librarian, in accordance with the scheme given in the latest edition of the Dewey Decimal Classification. In addition to this work, the Librarian and two assistants, spent a week in the Library of Naval Architecture overhauling the shelves and catalogue and putting them all in order.

One change has occurred in the Library staff. Miss Mirian S. Smith, S.B. has been appointed second assistant in place of Miss Minnie E. Burke, who resigned.

The year 1911–12 is a notable one in the history of the Library because of the receipt of a gift which exceeds in value and importance any previous one, and which is approached only by the bequest of Professor Nichols, made in 1886. It is impossible to state accurately at present the full extent of this gift, which required ninety-six cases for its shipment from London to Boston, and half of which consists of unbound periodicals. The collection was brought together by the late Mr. G. E. Dering, and it is probable that the number of volumes will be found to exceed 30,000. For this magnificent gift we are indebted to The American Telephone & Telegraph Co.

Major E. T. Cole, Prof. of Military Science, has presented the Institute with a valuable collection of unbound periodicals on photographic subjects. He has also given to the Technology Union a number of books on general literature.

From the Trustees of the Tod Fund sixty-seven volumes for the General Library have been received. This gift is a particularly welcome one as the funds available for purchase of books of this character have heretofore been very limited.

From the bequest of Mrs. William Barton Rogers one hundred and sixty-nine volumes on various subjects have been received.

Another important gift is a set of books for the Summer Camp of Surveying, given by the Massachusetts Institute of Technology Civil Engineering Society. The books chosen were the ones named in the list of summer reading, and therefore made a particularly suitable library for the camp.

Dissertations of candidates for Doctor's Degree have been received from the following universities and technical schools: Bryn Mawr College, University of Pennsylvania, Technische Hochschule zu Karlsruhe, Eidgenössische Technische Hochschule in Zürich, and Technische Hochschule zu München.

We have received from the Honorable W. Murray Crane thirty-four bound volumes of the Congressional Record, and many other valuable public documents. The Honorable Andrew J. Peters, M.C., has also been very kind in sending public documents to the Institute.

We have also received from Mr. Edwin I. Mellen eleven volumes, seven pamphlets and four maps on mining subjects; from Prof. C. R. Cross, a number of volumes on physical subjects; from the members of the Faculty, copies of their works as follows:—from Prof. W. T. Hall, translation of F. P. Treadwell on "Analytical chemistry;" from Prof. Daly, "Characteristics of existing glaciers;" from Prof. E. B. Wilson, "Advanced calculus." Among other gifts may be mentioned from Mr. G. W. Rolfe, thirty-nine pamphlets on sugar; from Profs. H. P. Talbot and A. H. Gill, a number of volumes on chemical subjects, and from Prof. H. W. Tyler, a number of volumes on mathematical subjects; from The United Fruit Co., two copies of "Loyd's Register of British and Foreign Shipping;" from The New Bedford Free Public Library, "Field Notes of Benjamin Crane, Benjamin Hammond, and Samuel Smith;" from The Technique Board, "The Technique, 1913;" from the editors of the "Harvard Architectural Quarterly," the Quarterly for the year; from James P. Munroe, Esq., "New Demands in Education;" from Mrs. Waldo O. Ross, "Bartram's Travels in the South," and Engelmann, "Botanical Works."

ROBERT P. BIGELOW,
*Librarian.*

## REPORT OF THE REGISTRAR.

The catalogue of the Institute this year contains 1611 names of students, an increase of 45 over the registration of last year, or a gain of 2.8 per cent.; in fact the number of

students this year is larger than ever before in the history of the School. Not only is the total number of students greater this year than formerly, but the number of college graduates attending the Institute is larger than ever before. When, in 1902, the registration was almost as large, the number of college graduates was 160 while today it is 230. The per cent. of the students who are graduates of this, or other colleges, has risen in ten years from ten to over fourteen. Only for the past three years has a count been made of students who have come to us after spending a year or more at another college but during this short period the number has risen from 347 to 430, or from 23 to 27 per cent. of the student body. While the number of Massachusetts students is, with but one exception, larger than ever before, and is larger than for nine years past, these students form no greater portion of the student body. These Massachusetts students, of whom there are 890, make 55 per cent. of the student body. It is interesting to note that when the Institute began, the per cent. of students from this state was 93. For twenty-five years this proportion decreased fairly uniformly until it reached 55 per cent.; the per cent. increased again until, in 1899, it reached 62. Since then the per cent. of Massachusetts students has diminished again and has been at 55 per cent. five times, where it is at present.

The distribution of the United States students among the states has not varied greatly during the past ten years, as shown by the table published here. It can be seen that the number from the North Atlantic states is fairly constant, that the number from the South Atlantic group has dropped somewhat as also that from the North Central group, but the number from the South Central, and Western states has in each case increased.

The students from foreign countries have increased in both number and in per cent. Twenty years ago they

numbered ten and now we have a hundred. In per cent. of the student body our foreign student population is greater than at any other large American college; it is over six per cent. and has been so for three years. The number of countries represented by students has risen, in ten years, from fifteen to twenty-three. Canada, ten years ago, sent us 13 students, the same number as this year, and it was at that time the largest from any country; China, this year, sends us 37, almost three times as many as any other country.

Not taking into account the hundred foreign students and the six from Alaska, the Canal Zone, Hawaii, Philippine Islands, and Porto Rico, the center of population of our student body is in New York State, west of the center and north of the Pennsylvania line; it is at a point just about twenty miles due south of Cornell University. Ten years ago it was due east of this point. Not taking into account our Massachusetts students this center of population is just southwest of Toledo, having moved, in ten years, west and a little south from a place east of Cleveland. Basing the calculation on figures published in "Science" for the registration of 1910–11, the center of population for Harvard students was just west of our present center. The center of United States students, omitting those from Massachusetts, was, however, in the case of Harvard students, east of our center. The center of population of our former students, according to their addresses published in the "Register of Former Students" of 1912, is in the most western part of Maryland. The change of these centers to the west and south suggests that the demand for technically trained men in the southern and western parts of the country is greater than the supply from these parts and that our former students are in part supplying their demand and are thus moving to places west and south of their homes.

We have this year fourteen women students in place of

seven last year. There are two women students in the first year; and above the first year, one in Architecture, five in Chemistry, of whom two are unclassified as to year, two in Biology without classification as to year and one in Chemical Engineering, also unclassified. Besides these there are three women special students.

With our increase in numbers the per cent. of new students has not increased. For the last five years, during which time there has been each year an increase in students the proportion of new students has in four of the five times diminished, showing that a larger part of our student body has returned to us in each of these four years. Although the number entering the fourth year class from other colleges is not very different from last year, the shrinkage in the change from the third year class to the fourth year is not as great this year as was the case last year. In looking over some earlier statistics of the school covering a period of fourteen years, it is found that six classes have been largest in attendance at school in their first year and five classes have been largest in their second year, while three have been largest in their third year.

Of the new students those who come to us from other colleges are a larger part of this group than they were five years ago. Up to the present time no uniform variation has been apparent.

The number in the Instructing Staff has risen from 245 to 254. Not taking into account the 16 lecturers the ratio of students to instructors is now 6.8 to one, compared with 7.5 to one, last year. The ratio has thus decreased even though the student number is larger.

The amount of undergraduate scholarship assistance given during the school year of 1912 was $21,550. The total number of students assisted from these funds was 187. In addition to this eighty students were aided by the state, there being a total of two hundred and sixty-seven students receiving scholarship aid, or 17.1 per cent.

of the whole number of students at the Institute. A larger number of awards from the Institute funds was made to second and third year students than to students in the other two years.

Our students do not register in their professional courses until after the first term of the first year and as our statistics are uniformly based on the registration as of November first, the tables showing the division of students among these departments does not include first year students.

Combining the engineering courses, Civil, Mechanical, Mining, Electrical, Chemical, and Sanitary Engineering, with Naval Architecture, and Electrochemistry, it is found that the per cent. of our students in these courses for the past seven years has varied but little from 82 per cent., which it was seven years ago; it is just over 81 per cent. now. The registration in Architecture has been fairly uniform but it is somewhat larger now. The group of Chemistry, Biology, Physics, and Geology has no marked variation in numbers during this period; it was just under 8 per cent. at the beginning of the period and is now just over 8 per cent.

Again Mechanical Engineering is the largest professional course, it has a gain of ten per cent. this year over last year, but a larger percentage gain is shown in the registrations in Chemical Engineering, in Naval Architecture, and in Electrochemistry, where in each case, however, the numbers are not as great as that of Mechanical Engineering. The increase in Naval Architecture from nineteen to twenty-nine is made up to a noticeable extent, of Chinese students. There is a marked decrease in the number of students who have elected the course in Mining Engineering.

A new duty assigned to the Registrar by the Faculty is to find the use in per cent. of each of the several literal records, C, P, L, F, etc., that are sent to the Registrar at the end of each term to report the standing of students.

With the per cent. of each letter used in the report of each subject, where there are fifteen or more students, the average per cent. of the use of each letter for the year in which the subject is taught has to be sent to each Instructor. The result of the first computation of the average use of each letter for each year, made by the Secretary of the Faculty, seemed, to the Committee charged with the consideration of this matter, to present a satisfactory condition. The results for the last term, it is planned, will be circulated a short time before the next examination period.

The Registrar presented, at the annual convention of the Association of Collegiate Registrars, a paper on the system of Registration used at the Institute, and as Chairman, reported for the Committee appointed to consider a standard form to be used by colleges for the transfer of records from one college to another.

With the usual tables of statistics, a plot of the registration and other statistics of the School, since its beginning, and also a map of the United States showing the centers of population mentioned above are presented.

## THE CORPS OF INSTRUCTORS.

| | 1907–08. | 1908–09. | 1909–10. | 1910–11. | 1911–12. | 1912–13. |
|---|---|---|---|---|---|---|
| Professors | 43 | 44 | 44 | 45 | 41 | 56 |
| Associate Professors | 18 | 18 | 14 | 20 | 17 | 16 |
| Assistant Professors | 25 | 33 | 32 | 31 | 33 | 35 |
| Research Professors | — | — | — | — | 4 | 16 |
| No. Counted Twice | | | | | | 11 |
| Faculty | 86 | 95 | 90 | 96 | 95 | 112 |
| Instructors | 72 | 62 | 69 | 66 | 64 | 67 |
| Assistants | 52 | 50 | 51 | 55 | 50 | 49 |
| | 124 | 112 | 120 | 121 | 114 | 116 |
| Faculty, Instructors and Assistants | 210 | 207 | 210 | 217 | 209 | 228 |
| Research Associates | 8 | 6 | 12 | 8 | 5 | *4 |
| Research Assistants | 3 | 1 | 1 | 5 | 6 | 7 |
| | 11 | 7 | 13 | 13 | 11 | 11 |
| Lecturers | 32 | 31 | 18 | 21 | 25 | 16 |
| Total members of staff | 253 | 245 | 241 | 251 | 245 | 254 |

*One is also an Instructor.

## YEARLY REGISTRATION SINCE THE FOUNDATION OF THE INSTITUTE.

| Year. | No. of Students. | Year. | No. of Students. | Year. | No. of Students. |
|---|---|---|---|---|---|
| 1865–66 | 72 | 1881–82 | 302 | 1897–98 | 1,198 |
| 1866–67 | 137 | 1882–83 | 368 | 1898–99 | 1,171 |
| 1867–68 | 167 | 1883–84 | 443 | 1899–00 | 1,178 |
| 1868–69 | 172 | 1884–85 | 579 | 1900–01 | 1,277 |
| 1869–70 | 206 | 1885–86 | 609 | 1901–02 | 1,415 |
| 1870–71 | 224 | 1886–87 | 637 | 1902–03 | 1,608 |
| 1871–72 | 261 | 1887–88 | 720 | 1903–04 | 1,528 |
| 1872–73 | 348 | 1888–89 | 827 | 1904–05 | 1,561 |
| 1873–74 | 276 | 1889–90 | 909 | 1905–06 | 1,466 |
| 1874–75 | 248 | 1890–91 | 937 | 1906–07 | 1,397 |
| 1875–76 | 255 | 1891–92 | 1,011 | 1907–08 | 1,415 |
| 1876–77 | 215 | 1892–93 | 1,060 | 1908–09 | 1,462 |
| 1877–78 | 194 | 1893–94 | 1,157 | 1909–10 | 1,481 |
| 1878–79 | 188 | 1894–95 | 1,183 | 1910–11 | 1,509 |
| 1879–80 | 203 | 1895–96 | 1,187 | 1911–12 | 1,566 |
| 1880–81 | 253 | 1896–97 | 1,198 | 1912–13 | 1,611 |

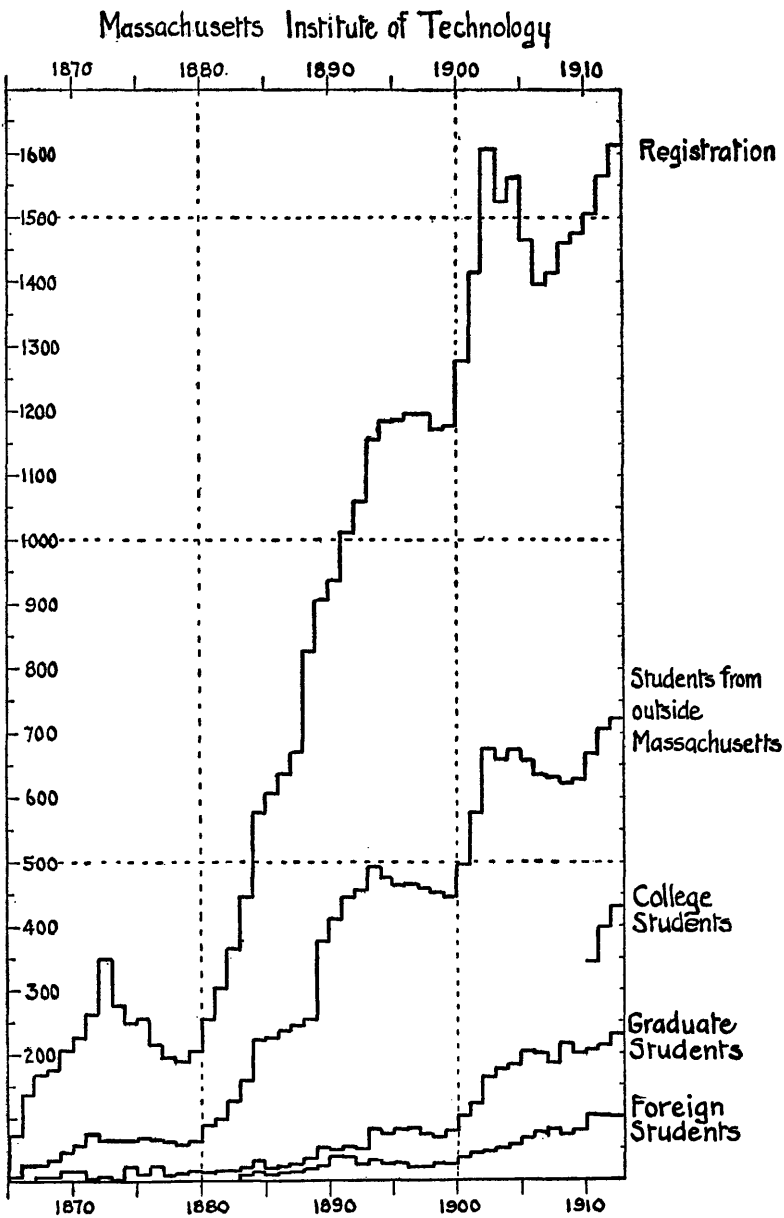
## THE STUDENTS.

| REGISTRATION BY CLASSES. | Classified. | Unclassified. | Total. |
|---|---|---|---|
| Non-Resident Fellows | 2 | — | 2 |
| Other Candidates for advanced degrees | 33 | — | 33 |
| Fourth Year | 295 | 47 | 342 |
| Third Year | 260 | 145 | 405 |
| Second Year | 230 | 168 | 398 |
| First Year | 327 | 62 | 389 |
| Special | — | — | 42 |
| Total | — | — | 1,611 |

## CLASSIFIED AND UNCLASSIFIED STUDENTS BY COURSES FOR THE CURRENT YEAR.

| YEAR. | Without Course Classification. | Civil Engineering. | Mechanical Engineering. | Mining Engineering and Metallurgy. | Architecture. | Chemistry. | Electrical Engineering. | Biology and Public Health. | Physics. | General Science. | Chemical Engineering. | Sanitary Engineering. | Geology. | Naval Architecture. | Naval Construction. | Electro chemistry. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Graduates | 2 | 1 | 3 | 1 | 6 | 5 | 6 | 2 | — | — | 7 | — | — | — | 2 | — | 35 |
| 4th C. | | 60 | 52 | 21 | 25 | 15 | 50 | 3 | — | 1 | 37 | 16 | 1 | 5 | 9 | — | 295* |
| 4th U. | | 13 | 7 | 3 | 3 | 3 | 7 | 3 | — | — | 4 | 3 | — | 1 | — | — | 47 |
| 3d C. | | 52 | 57 | 10 | 16 | 7 | 53 | 2 | 1 | — | 31 | 15 | — | 5 | 2 | 14 | 260* |
| 3d U. | | 21 | 31 | 6 | 16 | 10 | 21 | 9 | — | 2 | 12 | 8 | — | 5 | — | 4 | 145 |
| 2d C. | | 36 | 46 | 3 | 25 | 12 | 37 | 3 | 4 | — | 40 | 9 | — | 6 | — | 10 | 230* |
| 2d U. | | 28 | 47 | 5 | 20 | 5 | 24 | 5 | — | — | 17 | 4 | 1 | 7 | — | 5 | 168 |
| Special | 10 | 1 | — | 1 | 16 | 3 | 3 | 6 | — | 1 | 1 | — | — | — | — | — | 42 |
| Total C. | 2 | 149 | 158 | 35 | 72 | 39 | 146 | 10 | 5 | 1 | 115 | 40 | 1 | 16 | 6 | 33 | 838 |
| Total U. | | 62 | 85 | 14 | 39 | 18 | 52 | 17 | — | 2 | 33 | 15 | 1 | 13 | — | 9 | 360 |
| Total Sp. | 10 | 1 | — | 1 | 16 | 3 | 3 | 6 | — | 1 | 1 | — | — | — | — | — | 42 |
| | 12 | 212 | 243 | 50 | 127 | 60 | 201 | 33 | 5 | 4 | 149 | 55 | 2 | 29 | 6 | 42 | 1,222 |

*Deducting names counted twice.


Massachusetts Institute of Technology
1870
1880
1890
1900
1910
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
Registration
Students from outside Massachusetts
College Students
Graduate Students
Foreign Students

TOTALS OF THE SAME CLASSIFICATION FOR FIVE YEARS.

| YEAR. | Civil Engineering. | Mechanical Engineering. | Mining Engineering. | Architecture. | Chemistry. | Electrical Engineering. | Biology. | Physics. | General Science. | Chemical Engineering. | Sanitary Engineering. | Geology. | Naval Architecture. | Naval Construction. | Electro-chemistry. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1906–07 . . . . | 210 | 214 | 100 | 102 | 51 | 193 | 10 | 18 | 0 | 55 | 32 | 2 | 43 | 18 | — |
| 1907–08 . . . . | 210 | 227 | 118 | 84 | 53 | 202 | 17 | 21 | 2 | 59 | 39 | 0 | 37 | 16 | — |
| 1908–09 . . . . | 197 | 197 | 104 | 91 | 60 | 209 | 20 | 19 | 4 | 71 | 52 | 2 | 41 | 13 | — |
| 1909–10 . . . . | 207 | 204 | 99 | 109 | 44 | 203 | 22 | 4 | 4 | 84 | 60 | 1 | 41 | 14 | 14 |
| 1910–11 . . . . | 220 | 198 | 90 | 113 | 44 | 210 | 19 | 7 | 2 | 128 | 46 | — | 26 | 9 | 26 |
| 1911–12 . . . . | 217 | 214 | 79 | 112 | 56 | 203 | 20 | 4 | 3 | 129 | 57 | 2 | 19 | 8 | 35 |
| 1912–13 . . . . | 212 | 243 | 50 | 127 | 60 | 201 | 33 | 5 | 4 | 149 | 55 | 2 | 29 | 6 | 42 |

NUMBER OF STUDENTS PURSUING CERTAIN LEADING BRANCHES OF STUDY.

| | First Year. | Second Year. | Third Year. | Fourth Year. | Total. | Total Student Hours. |
|---|---|---|---|---|---|---|
| Chemistry . . . . . | 404 | 144 | 141 | 121 | 810 | 9,889 |
| English . . . . . | 377 | 349 | 34 | — | 760 | 1,531 |
| Geology . . . . . | — | 8 | 132 | 21 | 161 | 708 |
| History and Economics . | — | 315 | 389 | 105 | 809 | 2,327 |
| Languages . . . . . | 445 | 288 | 97 | — | 830 | 2,093 |
| Mathematics . . . . . | 416 | 387 | 186 | 2 | 991 | 3,305 |
| Physics . . . . . | — | 393 | 353 | 70 | 816 | 3,424 |

STATISTICS OF ADMISSION.

| | *Classified.* | *Unclassified.* | *Total.* |
|---|---|---|---|
| Admitted clear . . . . . | 165 | 1 | 166 |
| " with one condition . . . . . | 72 | 9 | 81 |
| " with more than one condition . . . | 37 | 20 | 57 |
| " on examination . . . . . | 274 | 30 | 304 |
| Total First-year Class . . . . . | 327 | 62 | 389 |

| | |
|---|---|
| Admitted but did not enter . . . . . | 37 |
| Candidates at June Entrance Examinations . . . . . | 626 |
| Candidates in September for Entrance and Advanced Standing Examinations . . . . . | 326 |
| Certificates of the College Entrance Examination Board submitted . . . | 119 |

## Total Registration and Number of New Students for Ten Years.

| Year. | (1) Total No. of Resident 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 regular 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 | 1,561 | 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 |

## New Students from Other Colleges by Years.

| Class Joined at Institute. | Years Spent at College. | | | | Total. |
|---|---|---|---|---|---|
| | One. | Two. | Three. | Four, or more. | |
| First Year | 15 | 3 | 1 | 6 | 25 |
| Second Year | 12 | 23 | 6 | 21 | 62 |
| Third Year | 1 | 11 | 18 | 45 | 75 |
| Fourth Year | — | — | 2 | 19 | 21 |
| Graduate Year | — | — | 1 | 6 | 7 |
| Total | 28 | 37 | 28 | 97 | 190 |

## Graduate Students.

### *American Colleges and Universities Represented.*

| | 1911–12 | 1912–13 | | 1911–12 | 1912–13 |
|---|---|---|---|---|---|
| Alabama | 1 | 2 | Columbia | — | 1 |
| Allegheny | — | 1 | Cornell | 2 | 1 |
| Amherst | 2 | 3 | Dalhousie | 1 | — |
| Bates | 1 | 3 | Dartmouth | 6 | 9 |
| Baylor | 1 | 1 | Dennison | 2 | 2 |
| Beloit | — | 2 | De Pauw | 1 | — |
| Boston College | 2 | 4 | Drake | 1 | 2 |
| Boston University | 3 | 3 | Franklin and Marshall | — | 1 |
| Bowdoin | 2 | 2 | Georgetown | 2 | 1 |
| Bradley Polytechnic Inst. | 1 | — | George Washington | 1 | — |
| Brown | 3 | 3 | Georgia | 1 | — |
| Bryn Mawr | 1 | 1 | Gonzaga | — | 1 |
| California | 2 | — | Grinnell | 2 | — |
| Canisius | — | 2 | Grove City | 1 | 1 |
| Case School of App. Science | — | 1 | Hamilton | 2 | 3 |
| Central | 1 | — | Hamline | — | 1 |
| Chicago | — | 1 | Harvard | 8 | 8 |
| City of New York | 3 | 4 | Haverford | 1 | — |
| Clark | — | 1 | Holy Cross | 1 | 1 |
| Colby | 1 | 1 | Illinois | 1 | 2 |
| Colorado | 2 | 1 | Iowa State | 1 | — |
| Colorado School of Mines | — | 1 | Johns Hopkins | 2 | 2 |

GRADUATE STUDENTS—*Continued.*

*American Colleges and Universities Represented.*

| | 1911–12 | 1912–13 |
|---|---|---|
| Kansas | 1 | 2 |
| Lafayette | 1 | 2 |
| Lehigh | 1 | – |
| Leland Stanford Junior | 3 | 1 |
| Maine | 1 | – |
| Marietta | 2 | – |
| Maryland Agriculture | 1 | – |
| Mass. Institute of Technology | 6 | 17 |
| Michigan | 2 | 3 |
| Michigan Agricultural | – | 1 |
| Middlebury | 1 | 1 |
| Minnesota | – | 2 |
| Mississippi | 1 | 1 |
| Mississippi Agricultural | 1 | – |
| Missouri | 1 | – |
| Missouri Sch. Min. & Met. | 1 | – |
| Montana | 1 | 1 |
| National | 1 | 1 |
| Nebraska | 1 | 2 |
| New Mexico | – | 1 |
| New York University | – | 3 |
| North Carolina | 2 | 1 |
| North Dakota | 2 | 2 |
| Oberlin | 4 | 3 |
| Occidental | 2 | 2 |
| Ohio State | – | 1 |
| Oregon | 2 | 1 |
| Oregon Agricultural | 1 | 1 |
| Otterbein | 1 | 1 |
| Park | – | 1 |
| Pennsylvania Military | 2 | 2 |
| Pennsylvania State | 2 | 1 |
| Pittsburgh | – | 1 |
| Pomona | 1 | – |
| Princeton | 7 | 3 |
| Richmond | 1 | – |
| Rochester | 2 | – |
| Rutgers | 1 | – |
| Saint Johns | – | 2 |
| Saint Louis | 6 | 3 |
| Saint Mary | 1 | 1 |
| Saint Olaf | – | 1 |
| Saint Xavier | 3 | 1 |
| Sacred Heart | 1 | – |
| Sheffield Scientific Sch. | – | 2 |
| Simpson | – | 2 |
| Smith | – | 1 |
| South Carolina Military | 1 | – |
| South Dakota State | – | 1 |
| Spring Hill | 4 | 4 |
| Syracuse | – | 1 |
| Tarkio | – | 1 |
| Tennessee | – | 1 |
| Texas | 2 | 4 |
| Agr. & Mech. Coll. of Tex. | – | 1 |
| Tulane | 1 | – |
| U. S. Military Academy | 2 | 1 |
| U. S. Naval Academy | 9 | 6 |
| Virginia | 2 | 2 |
| Virginia Military | 1 | 1 |
| Wabash | 1 | 1 |
| Washburn | 1 | 2 |
| Washington | – | 1 |
| Washington & Jefferson | 3 | 2 |
| Washington & Lee | 1 | 2 |
| Wellesley | – | 2 |
| Whitman | 2 | 1 |
| Whitworth | 1 | – |
| Williams | 5 | 11 |
| William and Mary | 1 | 1 |
| Wisconsin | 1 | – |
| Wooster | – | 1 |
| Worcester Polytechnic | 1 | – |
| Yale | 7 | 5 |
| Yankton | 1 | 1 |

*Foreign Colleges and Universities Represented.*

| | | |
|---|---|---|
| Annhui Provincial (China) | 2 | 2 |
| Cambridge (England) | 1 | – |
| Chili Provincial (China) | 1 | 1 |
| Chinese Naval | 1 | 1 |
| Ecole Polytechnic (Montreal) | 1 | – |
| Escuella Industrial (Buenos Ayres) | 2 | 1 |
| Euphrates (Turkey) | – | 1 |
| Greece National (Athens) | 1 | – |
| Havana | 1 | 3 |
| Heidelberg | 1 | – |
| Imperial Polytechnic (Shanghai) | 8 | 8 |
| Japanese Naval Engineering (Tokio) | 1 | 1 |
| Maimi (China) | 1 | – |
| McGill (Montreal) | 1 | 2 |
| Melbourne (Australia) | 1 | 1 |
| Nanking (China) | 3 | 3 |
| New Brunswick | 2 | – |
| Oxford | 1 | 1 |
| Paris (France) | 1 | – |
| Queens (Canada) | 1 | – |
| Royal Military (Canada) | 1 | 1 |
| Scientific & Lit. Inst. | – | 1 |
| Shantien (China) | 1 | – |
| Syrian Protestant | 3 | 4 |
| Valparaiso | 1 | – |
| Wuchang (China) | 1 | 1 |
| Poly. Col. of Zurich | – | 1 |

Graduates who are candidates for Advanced Degrees . . . . 33
Graduates who are pursuing undergraduate work . . . . . 197
Colleges and Universities represented . . . . . 109

## College Students Among the Courses.

| Graduates and Students From Colleges. | Specials. | 1st Year. | 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. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Graduates | 1 | 6 | 38 | 29 | 8 | 25 | 21 | 39 | 15 | — | — | 21 | 12 | 1 | 8 | 6 | 1 | 231 |
| Non-graduates | — | 22 | 34 | 44 | 9 | 24 | 7 | 29 | 3 | 1 | 2 | 16 | 2 | — | 7 | — | 2 | 202 |
| Total | 1 | 28 | 72 | 73 | 17 | 49 | 28 | 68 | 18 | 1 | 2 | 37 | 14 | 1 | 15 | 6 | 3 | 433* |
| Proportion, in per cent., of these students in the courses. | | | | | | | | | | | | | | | | | | |
| Graduates | | | 11 | 12 | 16 | 20 | 35 | 20 | 39 | — | — | 14 | 22 | — | 28 | 100 | 12 | 19 |
| Non-graduates | — | — | 16 | 28 | 18 | 19 | 12 | 15 | 9 | — | — | 11 | 4 | — | 24 | — | 5 | 16 |

*Deducting names counted twice.

## Ages of Students.

### The Graduating Class, June, 1912.

| | |
|---|---|
| Under 20 | 1 |
| Between 20 and 21 | 11 |
| " 21 and 22 | 35 |
| " 22 " 23 | 87 |
| " 23 " 24 | 53 |
| " 24 " 25 | 27 |
| " 25 " 26 | 20 |
| 26 and over | 24 |
| Total | 258 |

The average age was 23 years

## Classified First-Year Students.

| Period of Life. | 1911-1912. | | 1912-1913. | |
|---|---|---|---|---|
| | Half-year Groups. | Yearly Groups. | Half-year Groups. | Yearly Groups. |
| 16 to 16½ years | — | — | — | — |
| 16½ to 17 " | 3 | 3 | 5 | 5 |
| 17 to 17½ " | 16 | — | 29 | — |
| 17½ to 18 " | 31 | 47 | 33 | 62 |
| 18 to 18½ " | 48 | — | 55 | — |
| 18½ to 19 " | 57 | 105 | 56 | 111 |
| 19 to 19½ " | 61 | — | 44 | — |
| 19½ to 20 " | 35 | 96 | 28 | 72 |
| 20 to 20½ " | 20 | — | 18 | 1-1 |
| 20½ to 21 " | 11 | 31 | 11 | 29 |
| 21 to 22 " | 7 | 7 | 18 | 18 |
| | 289 | 289 | 297 | 297 |

Repeating the first year . . . . . 17
Students of unusual age . . . . . 13
Average age, omitting these 30 . . . . . 18 years, 10 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 | 8 | 2 | 5 | — | 2 | — | — | — | — | — | — | — | — | — | 17 |
| 1872 | 3 | 1 | 5 | — | 3 | — | — | — | — | — | — | — | — | — | 12 |
| 1873 | 12 | 2 | 3 | 1 | 7 | — | — | — | 1 | — | — | — | — | — | 26 |
| 1874 | 10 | 4 | 1 | 1 | — | — | — | — | 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 | — | 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 | 1 | — | — | 133 |
| 1893 | 25 | 30 | 5 | 2 | 8 | 41 | 2 | — | 6 | 8 | — | 2 | — | — | 129 |
| 1894 | 21 | 31 | 4 | 14 | 11 | 33 | 1 | 3 | 5 | 12 | 3 | — | — | — | 138 |
| 1895 | 25 | 30 | 3 | 15 | 14 | 33 | — | 2 | 4 | 11 | 4 | — | 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 | 16 | — | 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 | 46 | 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 | 13 | — | 3 | 3 | 258* |
| Totals | 945 | 1,118 | 478 | 416 | 433 | 857 | 71 | 57 | 102 | 264 | 111 | 14 | 185 | 36 | 5,079* |

| | |
|---|---|
| Names counted twice, students graduating in two different years | 20 |
| Bachelors of Science | 5,059* |
| Masters of Science, not included in the above | 80 |
| Doctors of Philosophy and of Engineering, not included in the above | 8 |
| Total | 5,147* |

*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 1912.

| | |
|---|---|
| Number receiving degree at end of one year | 5 |
| " " " " " " two years | 35 |
| " " " " " " three " | 38 |
| " " " " " " four " | 156 |
| " " " " " " five " | 24 |
| Total number of degrees of S. B. awarded | 258 |
| Number entering from other colleges | 89 |
| " of graduates among these | 44 |
| " of non-graduates among these | 45 |

### Further Statistics of the Students from Other Colleges of the Graduating Class, June, 1912.

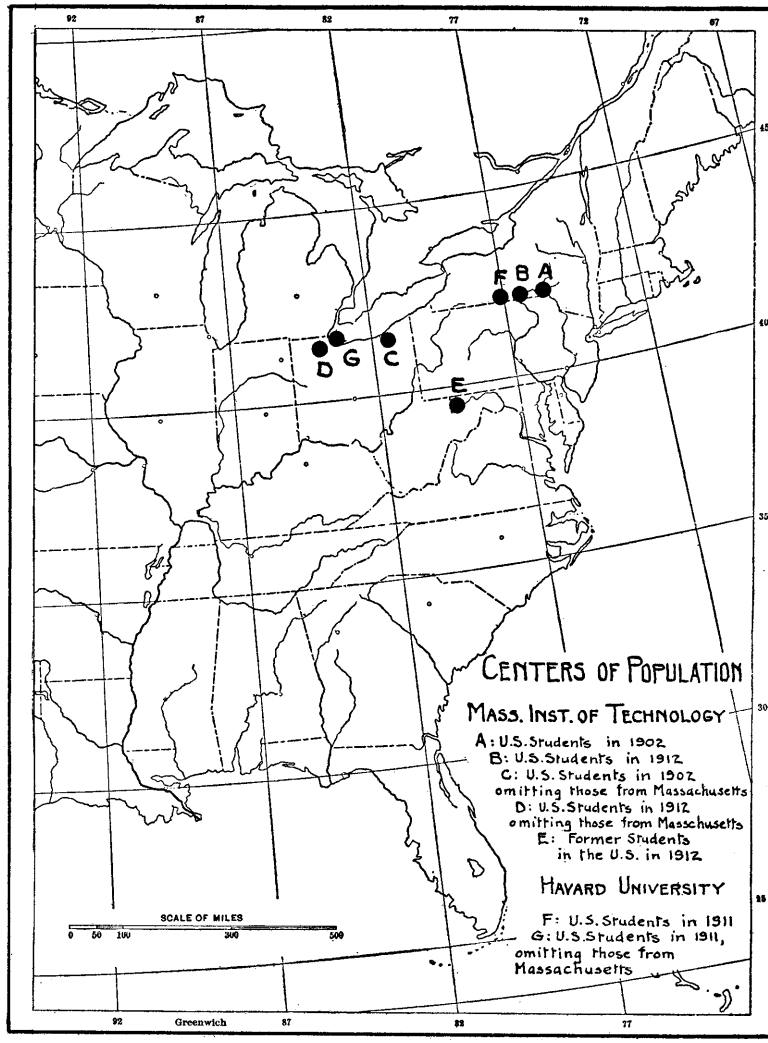
| *Yrs. at the Inst.* | *Graduate.* | *Non-Graduate.* | *Total.* |
|---|---|---|---|
| 1 | 3 | 1 | 4 |
| 2 | 20 | 15 | 35 |
| 3 | 19 | 16 | 35 |
| 4 | 2 | 11 | 13 |
| 5 | | 2 | 2 |
| | 44 | 45 | 89 |

## SUMMER SCHOOL.

| | 1911. | 1912. |
|---|---|---|
| Number from other colleges and schools attending | 49 | 49 |
| Number not referring to any other school or college | 2 | 1 |
| Number from Massachusetts Institute of Technology | 228 | 303 |
| | 279 | 353 |
| Registrations for failures or deficiencies | 190 | 292 |
| Registrations to anticipate work | 324 | 334 |
| Number who attended Summer School but did not return for Registration | 52 | 47 |

### Number of Students Registered in Each of the Courses of the Summer School for this Year and the Year Before.

| | 1911. | 1912. | | 1911. | 1912. |
|---|---|---|---|---|---|
| Alternating Currents | 9 | 5 | Mathematics 2 | 22 | 33 |
| Applied Mechanics | 18 | 25 | Mathematics 3 | 2 | 0 |
| Astronomy | 0 | 7 | Mechanical Drawing | 9 | 11 |
| Carpentry | 9 | 6 | Mechanical Engineering Drawing | 21 | 25 |
| Chemistry, Inorganic and Analytical | 49 | 86 | Mechanism | 16 | 24 |
| Chipping and Filing | 3 | 7 | Metal Turning | 6 | 2 |
| Descriptive Geometry | 27 | 36 | Organic Chemical Laboratory | 7 | 0 |
| Design | 12 | 15 | Pattern Work | 9 | 11 |
| English | 12 | 12 | Physical Laboratory | 9 | 7 |
| Fire Assaying | 5 | 0 | Physics | 25 | 34 |
| Forging | 5 | 5 | Precision of Measurements | 5 | 12 |
| French | 8 | 7 | Shades and Shadows | 5 | 9 |
| German | 18 | 24 | Structures | 10 | 9 |
| Industrial Chemical Laboratory | 0 | 25 | Surveying | 34 | 3 |
| Machine Tool Work | 18 | 18 | Wood Turning | 10 | 6 |
| Mathematics 1 | 22 | 21 | | | |


92
87
82
77
72
67
45
40
35
30
25
F
B
A
D
G
C
E
CENTERS OF POPULATION
MASS. INST. OF TECHNOLOGY
A: U.S. Students in 1902
B: U.S. Students in 1912
C: U.S. Students in 1902 omitting those from Massachusetts
D: U.S. Students in 1912 omitting those from Masschusetts
E: Former Students in the U.S. in 1912
HAVARD UNIVERSITY
F: U.S. Students in 1911
G: U.S. Students in 1911, omitting those from Massachusetts
SCALE OF MILES
0 50 100 300 500
92
Greenwich
87
82
77

## 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. |
|---|---|---|---|---|---|---|---|---|---|---|
| *North Atlantic.* | 1,178 | 1,189 | 1,080 | 1,025 | 1,049 | 1,116 | 1,126 | 1,118 | 1,152 | 1,212 |
| Connecticut | 44 | 48 | 50 | 36 | 29 | 31 | 32 | 33 | 45 | 44 |
| Maine | 34 | 26 | 22 | 18 | 23 | 22 | 20 | 24 | 25 | 24 |
| Massachusetts | 869 | 889 | 807 | 764 | 781 | 839 | 852 | 840 | 860 | 890 |
| New Hampshire | 23 | 36 | 32 | 26 | 27 | 24 | 27 | 27 | 29 | 28 |
| New Jersey | 13 | 16 | 11 | 15 | 17 | 14 | 14 | 18 | 33 | 34 |
| New York | 104 | 94 | 71 | 84 | 82 | 99 | 99 | 106 | 90 | 108 |
| Pennsylvania | 52 | 56 | 58 | 55 | 57 | 53 | 46 | 37 | 39 | 43 |
| Rhode Island | 28 | 19 | 24 | 23 | 28 | 28 | 30 | 27 | 25 | 33 |
| Vermont | 11 | 5 | 5 | 4 | 5 | 6 | 6 | 6 | 6 | 8 |
| *South Atlantic.* | 63 | 52 | 53 | 52 | 48 | 51 | 44 | 41 | 49 | 45 |
| Delaware | 3 | 2 | 1 | 2 | 1 | — | 1 | — | 1 | 2 |
| Dist. of Columbia | 15 | 17 | 13 | 12 | 10 | 10 | 8 | 5 | 13 | 12 |
| Florida | 2 | 4 | 3 | 3 | 3 | 6 | 5 | 1 | 2 | 3 |
| Georgia | 4 | 6 | 8 | 4 | 2 | 3 | 4 | 5 | 3 | 3 |
| Maryland | 25 | 18 | 19 | 17 | 18 | 17 | 12 | 14 | 8 | 8 |
| North Carolina | 7 | 1 | — | 1 | — | 1 | — | — | 1 | 2 |
| South Carolina | — | — | 1 | 3 | 2 | — | 2 | 1 | 3 | — |
| Virginia | 7 | 4 | 7 | 8 | 9 | 11 | 10 | 12 | 15 | 13 |
| West Virginia | — | — | 1 | 2 | 3 | 3 | 2 | 3 | 3 | 2 |
| *South Central.* | 33 | 33 | 30 | 32 | 36 | 38 | 37 | 37 | 48 | 46 |
| Alabama | 1 | 1 | 1 | 2 | 4 | 3 | 5 | 4 | 6 | 3 |
| Arkansas | 1 | — | 1 | — | 2 | 1 | 2 | 2 | 2 | 2 |
| Kentucky | 9 | 8 | 5 | 5 | 5 | 4 | 4 | 2 | 8 | 7 |
| Louisiana | 2 | 5 | 1 | 2 | — | 3 | 2 | 5 | 4 | 4 |
| Mississippi | 4 | 4 | 4 | 5 | 3 | 3 | 3 | 6 | 8 | 7 |
| Tennessee | 5 | 2 | 2 | 3 | 6 | 8 | 8 | 5 | 3 | 2 |
| Texas | 11 | 13 | 16 | 15 | 16 | 16 | 13 | 13 | 17 | 21 |
| *North Central.* | 155 | 168 | 174 | 153 | 142 | 121 | 123 | 140 | 141 | 137 |
| Illinois | 44 | 43 | 42 | 37 | 31 | 23 | 24 | 33 | 30 | 25 |
| Indiana | 6 | 10 | 10 | 15 | 12 | 9 | 11 | 10 | 9 | 10 |
| Iowa | 6 | 9 | 13 | 14 | 16 | 14 | 5 | 4 | 9 | 8 |
| Kansas | 1 | 4 | 7 | 6 | 5 | 4 | 6 | 9 | 7 | 8 |
| Michigan | 9 | 9 | 10 | 7 | 8 | 7 | 10 | 9 | 9 | 7 |
| Minnesota | 9 | 11 | 13 | 14 | 8 | 8 | 10 | 8 | 7 | 14 |
| Missouri | 22 | 25 | 29 | 17 | 14 | 6 | 7 | 13 | 12 | 13 |
| Nebraska | 4 | 5 | 4 | 2 | 3 | 2 | 4 | 6 | 8 | 8 |
| North Dakota | 1 | 1 | — | 3 | 4 | 3 | 3 | 3 | 3 | 3 |
| Ohio | 37 | 35 | 34 | 30 | 26 | 30 | 27 | 33 | 37 | 32 |
| South Dakota | 3 | 2 | — | 1 | 3 | 3 | 5 | 3 | 2 | 2 |
| Wisconsin | 13 | 14 | 12 | 7 | 12 | 12 | 11 | 9 | 8 | 7 |
| *Western.* | 46 | 54 | 55 | 52 | 49 | 54 | 59 | 53 | 57 | 65 |
| Alaska | — | — | — | — | — | — | — | — | — | 1 |
| Arizona | — | — | — | — | — | — | — | 1 | 1 | 1 |
| California | 19 | 18 | 23 | 21 | 14 | 20 | 25 | 21 | 23 | 22 |
| Colorado | 11 | 16 | 17 | 12 | 10 | 5 | 6 | 9 | 11 | 14 |
| Idaho | — | — | — | — | — | 1 | — | — | — | — |
| Montana | 2 | 5 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 4 |
| Nevada | — | — | 1 | 1 | 1 | 1 | — | — | — | — |
| New Mexico | 1 | 2 | — | — | 1 | 1 | 1 | — | — | 1 |
| Oklahoma | — | — | — | — | 1 | 1 | — | — | — | 1 |
| Oregon | 7 | 8 | 5 | 2 | 3 | 4 | 7 | 8 | 11 | 14 |
| Utah | 3 | 3 | 2 | 3 | 3 | 5 | 5 | 3 | 3 | 2 |
| Washington | 3 | 2 | 2 | 5 | 12 | 13 | 11 | 9 | 6 | 6 |
| Wyoming | — | — | 2 | 5 | 1 | 1 | 1 | — | — | — |

| | 1903. | 1904. | 1905. | 1906. | 1907. | 1908. | 1909. | 1910. | 1911. | 1912. |
|---|---|---|---|---|---|---|---|---|---|---|
| DISTRICT. | 3 | 9 | 8 | 7 | 6 | 9 | 11 | 15 | 11 | 6 |
| Canal Zone . . . | — | — | — | — | — | 1 | 1 | 1 | — | — |
| Hawaii . . . . | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 3 | 2 |
| Philippine Islands | — | 4 | 2 | 3 | 1 | 1 | 1 | 4 | 3 | 1 |
| Porto Rico . . . | 2 | 4 | 5 | 2 | 3 | 6 | 7 | 8 | 5 | 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 |

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

| | 1903. | 1904. | 1905. | 1906. | 1907. | 1908. | 1909. | 1910. | 1911. | 1912. |
|---|---|---|---|---|---|---|---|---|---|---|
| FOREIGN COUNTRIES. | 50 | 56 | 66 | 76 | 80 | 72 | 79 | 102 | 101 | 100 |
| Argentine Republic | — | — | — | 1 | 2 | 2 | 4 | 5 | 2 | 1 |
| Armenia . . . . | 1 | 1 | 3 | 2 | 2 | 2 | — | — | — | — |
| Australia . . . . | — | — | — | — | — | — | — | — | 1 | — |
| Austria . . . . | 3 | 1 | 3 | 3 | 3 | — | — | 2 | 1 | 2 |
| Belgium . . . . | — | — | — | 1 | 1 | — | — | — | — | — |
| Bermuda . . . . | 1 | — | 1 | 1 | — | — | — | — | — | — |
| Brazil . . . . . | 3 | 3 | 1 | — | 2 | 3 | 1 | 2 | 3 | 5 |
| Bulgaria . . . . | — | — | — | — | — | — | 1 | — | — | — |
| Canada . . . . | 14 | 13 | 12 | 15 | 9 | 15 | 20 | 18 | 19 | 13 |
| Cape Colony . . | — | — | — | 1 | 1 | 1 | — | — | 1 | — |
| Central America | — | 1 | — | — | — | 1 | — | — | — | 2 |
| Chile . . . . . | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | — |
| China . . . . . | 2 | 8 | 8 | 7 | 9 | 10 | 11 | 27 | 36 | 37 |
| Colombia . . . . | — | — | — | — | — | — | — | — | — | — |
| Costa Rica . . | — | — | — | — | 2 | 3 | 2 | 1 | 1 | — |
| Cuba . . . . . | 3 | 4 | 4 | 4 | 4 | 2 | 7 | 5 | 3 | 6 |
| Denmark . . . | 1 | 1 | 1 | 1 | 1 | — | — | 1 | 1 | — |
| Ecuador . . . . | — | 1 | — | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| Egypt . . . . . | — | — | 1 | 2 | 2 | 2 | 1 | 1 | 2 | 1 |
| England . . . . | 4 | 4 | 5 | 6 | 4 | 3 | — | 1 | 1 | — |
| Finland . . . . | — | — | — | — | — | — | — | 1 | — | — |
| France . . . . . | — | 1 | 1 | — | — | — | — | 2 | 2 | 3 |
| Germany . . . . | 2 | — | — | — | — | — | 1 | 1 | 2 | 3 |
| Greece . . . . . | — | — | — | — | — | — | — | — | 1 | 1 |
| Honduras . . . . | — | — | — | 1 | — | 1 | 3 | 3 | 2 | — |
| India . . . . . | 1 | 1 | 2 | 1 | 1 | 2 | 1 | — | — | 2 |
| 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 | — |
| Korea . . . . . | — | 2 | — | — | — | — | — | — | — | 2 |
| Malta, Island of . | 1 | 1 | — | — | — | — | — | — | — | — |
| Mexico . . . . | 8 | 4 | 7 | 12 | 12 | 6 | 10 | 9 | 5 | 4 |
| Newfoundland . | — | — | — | — | — | — | — | — | 1 | 1 |
| New Zealand . . | — | — | — | — | — | — | 1 | 1 | 2 | 1 |
| Norway . . . . | — | — | — | — | — | — | — | 1 | — | — |
| Panama . . . . | — | — | — | — | 1 | — | — | — | — | — |
| Paraguay . . . | — | — | — | — | 1 | 1 | 1 | 1 | 1 | 1 |
| Peru . . . . . | — | — | 1 | 1 | 2 | 2 | 1 | 2 | 1 | — |
| Poland . . . . . | — | — | — | — | 1 | — | — | — | — | — |
| Russia . . . . | — | — | — | — | 2 | 2 | 2 | 2 | 3 | 4 |
| South African Republic . . . . | — | — | — | — | — | — | — | — | — | 1 |
| Scotland . . . . | 1 | 2 | 1 | 1 | 1 | — | — | — | — | — |
| Sweden . . . . . | — | 1 | — | — | — | — | — | — | — | — |
| Switzerland . . | — | — | — | — | — | — | 1 | 1 | 1 | — |
| Syria . . . . . | 1 | 1 | — | — | — | — | — | 1 | 2 | 3 |
| Transvaal . . . | — | 1 | 3 | 3 | 3 | 2 | 1 | 2 | — | — |
| Turkey . . . . . | — | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 5 |
| 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 |

MASSACHUSETTS CITIES WHICH SEND FIVE OR MORE STUDENTS.

| | | | |
|---|---|---|---|
| Boston | 241 | Concord | 8 |
| Cambridge | 43 | Haverhill | 8 |
| Newton | 37 | Holyoke | 8 |
| Brookline | 28 | Needham | 8 |
| Somerville | 24 | Salem | 8 |
| Malden | 22 | Weymouth | 8 |
| Lawrence | 20 | Winchester | 8 |
| Newburyport | 20 | Arlington | 7 |
| Quincy | 16 | Braintree | 7 |
| Lynn | 15 | Woburn | 7 |
| Medford | 15 | Andover | 6 |
| Manchester | 14 | Beverly | 6 |
| Melrose | 14 | Bridgewater | 6 |
| Waltham | 14 | Fall River | 6 |
| Lowell | 13 | Natick | 6 |
| Springfield | 12 | Swampscott | 6 |
| Brockton | 10 | Dedham | 5 |
| Everett | 10 | North Adams | 5 |
| Framingham | 10 | Revere | 5 |
| Chelsea | 9 | Taunton | 5 |
| Wakefield | 9 | Worcester | 5 |

WALTER HUMPHREYS,
*Registrar and Recorder.*

# Reports of Departments.

## DEPARTMENT OF CIVIL AND SANITARY ENGINEERING.

The opening of the summer surveying camp occurred during the past summer and was the most important incident of the year for the Department. The attendance consisted of seventy-two students and the following instructing force: Professors Allen, Burton, Breed (half-time), Hosmer, and Russell, and Messrs. Cremer, Holbrook, Richardson, and Sawyer, all members of the regular Institute staff; Messrs. Ell and Huxley, both of whom received from the Institute in June the degree of Master of Science; and Mr. Carl T. Humphrey, M. I. T. '05, Professor of Civil Engineering at Villanova College, Villanova, Pa., who served a portion of the session. A physician, Dr. G. E. Harmon, was also in attendance during the entire session. The writer made several trips to camp during the season and spent in all about three weeks either at the camp or in its immediate vicinity upon matters relative to the camp administration.

The location and climate proved to be admirably adapted to our purposes, and many excellent results were obtained, including a plane-table survey of the hitherto unsurveyed lake, the location of a proposed railroad line several miles in length, the determination by soundings of the depth of a portion of the lake, and the determination of its discharge by stream measurements at its outlet at Chase's Mills. Base-line measurements were also made to serve as a basis for local triangulation and some progress was

made towards the connection of the camp station with the United States Coast and Geodetic Survey stations in the vicinity. Besides this more advanced work, surveys were made of some of the parcels included in the camp property and field data were secured sufficient to make a good contour map of the land immediately adjoining the camp buildings.

In the report of the Department last year, attention was called to the fact that the effect of the establishment of this compulsory summer course would be to lengthen the period of instruction for students required to take it, and to increase their expenses somewhat, but it was predicted that attendance would not be decreased by this action. The attendance at the camp during this year was entirely voluntary, it being thought desirable to make this arrangement partly to prevent possible injustice to those choosing courses in Civil, Sanitary, or Mining Engineering before this new requirement involving some additional expense could be advertised, and partly to make the operation of the camp during the opening year less difficult for those in charge. The number of students thus voluntarily attending the camp indicates that compulsory attendance hereafter will cause no great hardship. The following statistics show the registration for the last ten years of second year students in Civil and Sanitary Engineering at the end of the first five weeks of the first term; the figures indicate no perceptible change in registration in these courses due to the establishment of the camp. It is believed by the Department that the advertising received from the camp will tend gradually to increase the registration in these courses.

| Year | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 |
|---|---|---|---|---|---|---|---|---|---|---|
| Course I. | 62 | 66 | 69 | 51 | 62 | 54 | 70 | 69 | 64 | 66 |
| Course XI. | 7 | 11 | 6 | 10 | 19 | 20 | 19 | 6 | 20 | 11 |
| Total | 69 | 77 | 75 | 61 | 81 | 74 | 89 | 75 | 84 | 77 |

The necessary additional expense to students attending the camp this year was as follows:

| | |
|---|---|
| Transportion Boston to camp and return, | $14.51 |
| Living expenses at the camp, | 56.79 |
| Total, | $71.30 |

Sleeping car accommodations at a minimum price of $1.80 each way, and meals en route are not included in this statement.

A number of the students in attendance were engaged as waiters and the expenses of these men were thereby much reduced.

Changes in the instructing staff during the year consist of the resignation of six assistants, Messrs. Benton, Ireland, Manley, Morrison, Parker, and Vose. Of these assistants, Mr. Morrison continues in teaching, having been appointed Instructor in Civil Engineering, University of Alberta, Strathcona, Alberta, Canada. All the others accepted positions in active practice. The following six new assistants, all graduates of the class of 1912, were appointed to take their places: Messrs. William H. Coburn, William L. Collins, Randall Cremer, Edwin C. Holbrook, William E. Richardson, and George S. Sawyer.

Mr. John W. Howard, Instructor in Civil Engineering, was granted on January 11th, leave of absence for the remainder of the school year in order that he might go to Central America to participate in the running of the boundary line between Costa Rica and Panama, his duty being to represent on the ground one of the commissioners appointed by Panama. The work lasted somewhat longer than was anticipated, and he did not return until October 16th. During Mr. Howard's absence, his work was conducted by Mr. Walter N. Charles, Civil Engineer, 6 Beacon Street, who gave a portion of his time during the entire term, and by Messrs. Carl W. Dwight and Earl W. Pilling, who also gave us a portion of their time.

A reasonable amount of apparatus has been added during the year to properly provide for the increasing number of students and to make up for breakage and depreciation in rods, tapes, and other minor pieces of apparatus. The most important piece of new equipment consists of an apparatus for making photographic surveys. This apparatus was made specially for use in the Costa Rica-Panama boundary survey, and was purchased by us from the Commission after the completion of the survey at a reasonable sum. We expect to make considerable use of it at the summer camp in future years.

Applications for our graduates received by the Department have continued to exceed the number of men available. We have received since January 1st one hundred and forty applications for men. Thirty of these were for men more experienced than members of our graduating class, but the remainder were all for positions suitable for any recent graduate.

The Department has felt during the year the desirability of increasing the amount of instruction in highway engineering. This has come about partly by the requests of students for advanced instruction in the subject, and partly by the realization that the great amount of highway construction work now under way or projected throughout the country will require the services of many trained engineers. In order to accomplish this result, Professor Breed is offering to advanced students this year for the first time a course entitled Roadway Construction, and Professor Gill has kindly consented to offer a laboratory course entitled Road Bitumens and Binders. An exhibit consisting of charts, photographs, and student drawings is being prepared at the time of writing for exhibition at the American Road Builders' Association convention in Cincinnati during the early part of December. A portion of the time set free by the transfer of field-work to the summer has also been assigned to the third year course in highway

engineering required of all civil engineering students.

The following changes in the curriculum were made possible by the transfer of field-work to the summer camp: Course I.—The addition of one term each of Scientific German and Precision of Measurements in the second year; two terms of work in the electrical laboratory in the third year; two hours a week of thesis work in the first term of the fourth year. Course XI.—The addition of one term each of Scientific German, Topographical Drawing, and Precision of Measurements in the second year; one term of Stratigraphic Geology in the third year; one term of work in the engineering laboratory in the fourth year. In addition to the above, the highway engineering given to students in Course I has been increased as previously noted.

Close relations have been preserved during the year with practising engineers both amongst alumni and others. Special thanks are again due to Messrs. Sanford E. Thompson, Frederic H. Fay, Charles W. Gow, and Henry E. Warren, who have voluntarily given a series of lectures to our students, and to the Proprietors of Locks and Canals on the Merrimack River for the use of the canals at Lowell for stream gaging.

CHARLES M. SPOFFORD.

## MECHANICAL ENGINEERING.

The President's Report for 1912 called attention to certain changes in the schedule of studies for Course II which the Department had recommended to the Faculty for adoption. The changes proposed went into effect for the second year students at the beginning of the second term, February, 1912.

The third year class is now following the new schedule. Temporary changes have been made in a few of the fourth year subjects in order to enable the seniors to get the

benefit of some of the new material which is to be given regularly to classes coming after 1913.

The extra time gained for Machine Design by moving the Boiler Design (formerly given as a part of Machine Design) back into the third year, has enabled the class to complete the calculation and design of three complete machines. Such work, bringing in as it does the application of mechanism, statics, dynamics, strength of materials, and at the same time requiring a familiarity with shop practice, is particularly valuable to the men. A new method of teaching Mechanical Engineering Drawing has been tried this fall. The students are taught first, how to make a drawing in perspective or in isometric. They are then given an orthographic projection of some simple piece and asked to show this piece in perspective or in isometric. A working drawing of some fairly complicated casting is next redrawn in perspective. After a student has made a number of such drawings it is believed that he will visualize a drawing more quickly and that the drawing will mean more to him than a series of lines in one plane. To facilitate the instruction in this work Professor James and Mr. Mackenzie during the summer prepared a set of notes which are now in use.

As had been anticipated, the introduction of a series of lectures on Factory Construction, given to all of the seniors, has reduced the number of students applying for the option in Mill Engineering.

During the last three or four years there has been a small but steadily increasing demand for instruction in the subject of aviation. During the present year Mr. Albert A. Merrill is to give a course of six lectures on this subject. It is intended in these lectures to give a brief résumé of the early experiments with gliders; to discuss at some length the research work of Langley, Lillienthal, Maxim, Hargraves and Eiffel; to explain in detail Eiffel's experiments on the coefficient of resistance and the appli-

cation of these coefficients to specific cases; also to take up different methods of control and to consider the relative efficiency of each. Students taking these lectures will be given problems to be worked out from data obtained from blue prints of a modern biplane. The lectures will be supplemented by printed notes, line cuts, and lantern slides of the different machines.

Professors Fuller and Johnston have been preparing a text-book on Applied Mechanics, which is now in press. Advance copies of the first chapters have been given the students for use until the completed edition is ready.

The definite assignment of hours on the tabular view for Applied Mechanics Laboratory has enabled the work to be better systematized than heretofore and has enabled the students to cover a greater range of experiments.

By rearranging the cement mixing laboratory it has been possible with a little crowding to accommodate twelve students at one time, whereas formerly but six could work. A small space back of the boiler house is now used for the mixing of large specimens of concrete and for the storage of such.

The Westinghouse Parsons turbine and its equipment have been put into regular service in connection with the Institute power plant, two motor generator sets each of 150 k. w. capacity having been installed in order to supply the demand for direct current. This use of the turbine does not interfere in any way with the experimental work on the turbine, but the loss of the use of the condenser and its circulating pump has compelled the Department to abandon certain experiments for which the above are needed.

The list of new apparatus added to the equipment of the Engineering Laboratories during the past year includes a standard brick rattler, which will be used also for testing road materials; an Alpha Brinell hardness testing machine, which will be used both by the testing laboratory and the

mechanical laboratory in connection with the determination of the properties of heat treated steels; a mechanical sifter with sets of screens for both sand and cement; a Dudgeon pressure pump for pressures of 20,000 lbs. per square inch; additional cement molds; two Berry extensometers; and other measuring apparatus of special design; a seven horse power Fairbanks Morse gasolene engine; also a 50,000 lb. Dudgeon hydraulic jack presented by the manufacturers.

A No. 2 Becker Brainerd universal milling machine has been added to the repair shop connected with the Engineering Laboratories. This repair shop, besides doing all of the machine work for the Mechanical Department, does also a large amount of work for other departments which will benefit by this addition to the equipment. Through the courtesy of Mr. Becker this machine was obtained for about one-half its value.

The number of students receiving instruction in the Mechanical Laboratories during the past year has been unusually large. This has been due partly to an increase in the size of the classes and partly to the introduction of the new schedule of studies for Course II, which has made it necessary in some subjects to give at the same time instruction to students of both the second and the third year classes.

Although the time devoted to Forging has been shortened considerably it does not appear that the amount of work completed will be reduced in proportion to the reduction of hours. The gain here has been made through more efficient instruction, made possible by increasing the number of sections, thus giving each student more time for individual instruction which is so necessary particularly in this subject.

The instruction in Foundry work has been increased in amount and made to precede the course in Pattern Making. Students now having a knowledge of foundry

work and understanding the use of patterns not only take hold of pattern making with more interest but are able also to make patterns for more complicated castings than was possible heretofore.

The Corporation has given the Department a special appropriation to be used in the purchase of two moulding machines for the foundry and a drop-forge.

A motor-driven wood turning lathe has been purchased for the pattern shop. As this lathe is to be used primarily for demonstration purposes it has been mounted in the lecture room on a bench which may be rotated by the instructor so as to give each student a clear view of the different operations.

There has been presented to the Mechanical Laboratories during the past year by the Kinread Manufacturing Co., apparatus for aligning and levelling shafting by the transit method; by the Richmond Iron Works—three eighths of a ton of pig iron in six grades; by the Russell, Burdsall and Ward Bolt & Nut Co.—400 blank nuts; by J. H. Williams & Co.—sample boards of drop-forgings exhibiting an assortment of special forgings and illustrating the different steps in the production of a standard piece; and by the Russell Jennings Manufacturing Co.—a precision brace and bit set, a solid head expansion bit and a universal precision bit brace.

There have been but few changes in the teaching staff of the Department during the past year; Messrs. Denzil M. Taylor, S.B., II., '06, David J. McGrath, S.B., I., '12, Kenneth C. Robinson, S.B., II., '12 and Ralph F. Symonds, S.B., II., '12 having been engaged to fill vacancies caused by the resignation of Messrs. Gardner, Robb, Waterfall and Beamensderfer.

EDWARD F. MILLER.

## DEPARTMENT OF MINING ENGINEERING AND METALLURGY.

*Advanced Students and Undergraduates.*—Mr. Waldimir Wanjukoff, a graduate of the Metallurgical Department of the Tomsk Politechnic Institute, as mentioned last year, came to study our methods of laboratory instruction, and to carry on some research work. The subject of his research was an investigation upon the "Decomposition of Metallic Sulphates by Heat," which has been presented before the Eighth International Congress of Applied Chemistry in New York City, and the American Institute of Mining Engineers.

Mr. Charles R. Hill, E. M., Colorado School of Mines, is a candidate for M. S. degree. He is making special research in cyanide work. Mr. Arthur F. Taggart, A. B., E. M., Leland Stanford, and instructor in Ore Dressing at Yale, is spending the first term with us carrying on special study and research in ore dressing without working for an advanced degree.

*Summer School.*—A very interesting trip was made this year under Professors Locke and Hayward. Places visited and operations seen are as as follows: Port Henry, N. Y., iron ore mining and magnetic concentration; Chrome, N. J., copper smelting and refining; Franklin Furnace, N. J., zinc ore mining and concentration; Pottsville, Pa., coal mining, washing and briquetting, and open hearth steel manufacture; Northampton, Pa., cement making, Palmerton, Pa., smelting for spelter, zinc oxide and spiegeleisen; Cobalt, Ontario, mining and milling of silver ores; Porcupine, Ontario, mining and milling of gold ores. The trip occupied three weeks. Everywhere the party met with a most cordial reception, and our appreciation is hereby expressed for the many favors received.

*Theses.*—Mention might be made of (a) Ruben Bermudez, Jr. on "Fine Free Mineral in Wilfley Table Products."

(b) Three theses on mill design were made, one by John L. Bray and Stalker E. Reed together, one by James H. Morley, and one by Emory M. Marshall. (c) Harold H. Sharp and Frank E. Starr on "Richards Pulsator Jig." (d) Paul M. Tyler and Oscar K. Wiessner on "Pyritic Smelting," to adapt this process to laboratory purposes. (e) Boyd Dudley, Jr., on "Separation of Copper and Nickel by Chloridizing Roast." (f) Robert E. Whipple on "Treatment of White Pine Ore."

*Demand for Men.*—All men of the graduating class secured positions with very little delay, and at the present time it is impossible to supply the needs of employers. We could place a dozen young mining graduates if we had them.

*Organization.*—As indicated last year the course in Metallurgy has been rearranged, and Professor Hofman has been relieved of part of his work. Professor Bugbee now gives the lectures on metallurgy of gold and silver, and Professor Hayward has been given full charge of the courses in metallography and metallurgical calculations, and the metallurgy of zinc, aluminum and refractory materials, in addition to his other regular duties. Owing to the increased use of the cyanide process in gold metallurgy, our laboratory work has been somewhat rearranged to give the students more experiments in this line of work.

*Changes in Staff.*—Mr. Carle R. Hayward has been made Assistant Professor of Mining and Metallurgy. Mr. Thomas G. Chapman has resigned to go on the instructing staff of the Michigan College of Mines, and Mr. Marcus A. Grossman has entered the employ of the Pittsburgh Testing Laboratory, Pittsburgh, Pa. Their places have been filled by Mr. Ralph L. Bartlett, S.B., 1910, and Mr. Robert E. Whipple, S.B., 1912.

*Professional Work.*—Professor Richards has had the usual amount of ore dressing work and has made extended trips West and to Lake Superior in connection therewith.

Professor Hofman visited last summer, by the help of the Austin fund, the leading copper smelting plants of Texas, New Mexico, Arizona, Nevada, Utah and Montana, in order to inspect the latest phases of copper smelting and converting before issuing his treatise on the "Metallurgy of Copper." Last winter he had visited for the same purpose the principal electrolytic copper refining plants in the neighborhood of New York and Baltimore. The book will go to press early in the Spring. It will be preceded by a treatise on "General Metallurgy," which will be in the hands of the printer about January first.

*Course Scheme.*—The course in Option 2, has undergone some changes, the principal one of which is that students in this division take a full course of Theoretical Chemistry instead of the shorter course of Thermo-Chemistry and Chemical Equilibrium given to students of Options 1 and 3. A change has been made in the instruction of metallurgy. Formerly in the first term fourth-year, there was given non-ferrous metallurgy two hours a week and metallurgy of iron one hour a week, and in the second term three hours a week non-ferrous metallurgy and general metallurgy. Since only students of Course III are taking courses in metallurgy, it has seemed advisable to change the order of instruction somewhat, in order to bring closer together the class-room and laboratory work. Thus there is given in the first term metallurgy of lead, copper, silver and gold, subjects which form the basis of the laboratory work in the first term. The second term is devoted to metallurgy of zinc and aluminum, to the metallurgy of iron and steel, and to general metallurgy. As silver and gold form the metals which are treated in the individual work of the metallurgical laboratory, and as this work is in charge of Professor Bugbee, it has seemed advisable for him to give the class-room instruction on these two subjects. Professor Hayward, who for the last two or three years has given the course on silver and gold, will this year give

zinc, aluminum and refractory materials. We feel confident that the changes thus inaugurated in the general instruction of metallurgy will be favorable for the advancement of the work in the Department.

*Library.*—The Library of the Department has become so crowded that some standard works will have to be removed to the overflow shelves in Rogers 11. The subject card catalogue, which has been kept in the Department for the last twenty years, has grown so that new cases to hold the cards have become an absolute necessity.

*Visitors.*—Two prominent German metallurgists have visited the Department to become acquainted with the general equipment of the Laboratory, and the methods of laboratory instruction. One was Mr. R. Hoffman, Professor of Metallurgy of the Prussian School of Mines, Clausthal. The other was Mr. R. Franke, Metallurgical Director of the Copper Works of Mansfeld, Germany. Also we had Professor G. W. Petersen of Stockholm, Sweden visit us.

*Gifts.*—Professor Richards has continued his gifts of periodicals this year as in the past and has also donated some books to the library and some ores to the laboratory. A new shallow bed pulsator jig, and a new open spigot hindered settling classifier, both designed by Professor Richards, have been given to the Department, and are in use for class and thesis work.

The library has received a valuable miscellaneous collection of books on mining and metallurgy from Mr. Edwin D. Mellen. Mr. A. B. Emery sent a bountiful supply of pure chalcocite ore from the Bonanza mine, Alaska. Mr. A. G. Anthony has given some books and minerals. A supply of auriferous concentrates was received from Mr. W. L. Libbey, and a supply of Nova Scotia gold ore from Mr. E. J. Foster of the Great Bras d'Or Mining Company. Mr. E. D. Mellen sent a valuable supply of gold ore in addition to his gift of books. The

Tyler Wire Company gave us a complete set of samples of mounted wire screens.

*New Apparatus.*—For Mr. Wanjukoff's work, mentioned elsewhere, an electric resistance furnace was constructed, also for ore dressing laboratory, the shallow pocket pulsator jig and the hindered settling classifier above mentioned. A little rotary compressor with electric motor has been connected to a new Pachuca tank for cyanide agitation tests. A new electric stereopticon is a material addition to the lecture room. In view of the great importance of converting copper matte, the Department has for some time considered the erection of a small converter for the metallurgical laboratory. The design for it was finished some time ago; the iron parts and the lining have been received; the whole will be put together shortly, and made the subject of a thesis in the Spring term for 1913. For grinding ore samples a new Braun Planetary Pulverizer has been bought, and an Iler foot power cupel machine has been installed in the assay laboratory. Minor improvements are—new power saw, new muffle retort, and changes on the big Wetherill magnetic separator. It is impossible on account of our crowded condition to install new apparatus of any size in the Mining Laboratory.

*New Site.*—The Department has been busy collecting data for a mining building. Professor Richards and Professor Hofman visited various mining schools throughout the United States. Furthermore, the Department as a whole worked on the details of our requirements for space and equipment in conjunction with the Geological Department, and a tentative plan was submitted of a building to be used by the Mining and Geological Departments together. Such an arrangement seems logical for two departments so closely allied. The hope is here again expressed that the pressing need of space in the Mining Department will receive early recognition when the buildings on the new site are once under way.

ROBERT H. RICHARDS.

## DEPARTMENT OF ARCHITECTURE.

It gives us great pleasure to be able to report that the work of the Department of Architecture for the present year opens with every promise of success, not only in number but in the type and quality of students as well.

Although deprived by death of the leader in the branch of Design, through the courtesy of the authorities of Harvard University, the services of Professor Duquesne of the Harvard School of Architecture have been secured to at least partially continue that course. In this it is felt that the Department is particularly fortunate as Professor Duquesne is a former atelier associate and student with Professor Despradelle, and will therefore in all probability continue the methods that made the latter's teaching of such note. Coming as the death of Professor Despradelle did, almost at the opening of the school year, it would have been more than difficult, if not quite impossible, to in any other manner secure a substitute in time to take up the work. This condition alone, if any confirmation were needed, fully indicates the wisdom of the action taken.

In this connection, while the writer of this was not personally intimately acquainted with Professor Despradelle, from his reputation, both outside as well as in the Department, it is felt that in his death not only the Department of Architecture of the Institute but the cause of education generally has suffered an almost irreparable loss. Eminently fitted by training, temperament, and tireless enthusiasm for his work, and adding to these qualities the years of experience as a teacher, the task of selecting his successor will be one of greatest difficulty. The arrangement with Professor Duquesne is of a temporary nature only, and being only partial it is bound to be more or less unsatisfactory in that the students are deprived of the complete instruction and attention to which they

are entitled, and which they would receive from a permanent instructor. It is therefore urgently recommended that steps be taken at the earliest possible date looking toward the selection of a successor to Professor Despradelle so that the announcement of his appointment may be made early in the coming summer, and that also he may be in position to take up his work at the commencement of the next school year.

The enrolment for this year exceeds all previous records, showing a total of one hundred and thirty-one,—seventeen more than ever before. Of those entering the Department in 1912–13 nine are graduates of other colleges and five of the Institute; fifteen others have had partial college training.

There are nine students in Advanced Design, six of whom are candidates for the Master's degree. There are twenty-nine candidates for the Bachelor's degree, eleven of whom are taking the Option in Architectural Engineering.

As the writer's connection with the Department is comparatively recent it is believed that in no better way can the needs of the Architectural Engineering Option be presented than to incorporate as a part of this report a statement obtained from Professor Lawrence who is in direct charge of that branch.

"Option II. Mr. Marcus M. Cory half-time instructor of last year, has been succeeded by Mr. Clarence E. Morrow, who devotes all of his time to the work of the Department. We have long needed this additional assistance, and its benefit is already apparent, especially in connection with the structural work given to the students of Option I.

"We have one more student in the senior class this year than last, in all thirteen,—the largest number in the history of the Option. The junior class shows a small decrease, being eight this year against ten last year; the

second year, however, shows a very marked increase over any previous one, about twenty men having already signified their intention of taking the work in Architectural Engineering.

"It is interesting to note that in the senior class eleven of the thirteen men are working for the degree of the Institute; and with the exception of four, each member of the class already holds a degree of B. A. or B. S. from another institution. Eight different states and the territory of Hawaii are represented,—one man coming from Massachusetts, one from New York, and all of the remainder from west of the Mississippi.

"The differentiation of the Options, which originally occurred at the middle of the third year, now takes place at the beginning of the third year. We feel that the course of instruction could be improved materially by commencing some of the special work of Option II at the middle of the second year. While the desirability of giving both Options the same fundamental training in Architecture cannot be emphasized too strongly, and while it is absolutely essential that the course in Architectural Engineering should give sufficient training in Design and in the fundamental conceptions of art to insure sympathy and understanding between the student who makes a specialty of Engineering and he who studies general Architecture; yet there are some subjects now given to both Options in the second year which are so distinctly for the aesthetic man that they might well be modified for the engineering student, or omitted altogether from his curriculum. The courses in Water-color and History of Ornament will serve as illustrations. While these courses are both important from the point of view of general training, they are otherwise of little use to the engineering student. He does not take kindly to them, and with the limited time at his disposal they are studied by him only at a sacrifice of preparation along his own lines of interest. This con-

dition is perfectly natural, as the Option in Architectural Engineering is an offshoot from the general course in Architecture. It seems, however, that the Option has arrived at sufficient dignity to have a curriculum arranged on the basis of its own requirements. For instance, we need very much a short course in Surveying to give the students some experience in the use of the transit, etc., which might well be put in the second term of the second year.

"Separating the Options early in the course would, I I think, work no hardship as conditions are at present. Option II is becoming well known, and very few students now enter our Department without having decided which Option they will select.

"With the development of this Option comes an increasing demand for adequate training in the fundamental principles of Design in Reinforced Concrete. A course similar to that now being given by Professor Hayward and Mr. Rockwood has become a necessity, and should be still further developed in the near future. Many of the students in the senior year, especially those coming from the western states, desire to select for their theses, subjects involving design or experimental work in Reinforced Concrete. It is almost imperative that the facilities for carrying on this work should be improved. The services of Mr. Rockwood, who gives the instruction in Concrete Design, must end under the present arrangement after the first five weeks of the second term. His services should be continued to some extent throughout the second term to enable him to assist and supervise some of the thesis designs. This would involve a comparatively small additional amount of time on the part of Mr. Rockwood, and would at least serve as a temporary solution of our difficulty. So far as experimental work connected with the theses is concerned, the Department of Applied Mechanics has been most courteous in offering to co-operate with us to the fullest possible extent.

"We have had recently a number of applications for advanced work in Option II which would lead to the Master's degree. It is perhaps desirable that such a course should be arranged at an early date. The list of studies should include work in Advanced Theory of Design and in Advanced Concrete Laboratory Design. The work would necessarily be so specialized and so distinctly removed from that of general Architecture that the degree conferred might take the form of Master of Science of Architectural Engineering."

Through the generosity of its friends the Department has been favored during the year with several valuable additions to its equipment:—

Mrs. Ellen H. Ross presented a file of articles and illustrations of architectural and allied subjects that had been collected and arranged by her son, the late Frederick Haven Ross. The selection and arrangement have been made with great care, and forms a valuable acquisition.

Mr. R. S. Peabody donated the amount of his fee for a lecture given by him on Sketching, with the suggestion that it be applied to offering three prizes for the three best sketches by students in Course IV. The suggestion was adopted and in a competition held Messrs. G. I. Edgerton, F. H. Kennedy, L. H. Hall were successful. The subject of the sketch was "The Tower of the New Old South Church," and the prizes offered were copies of Mr. Peabody's "An Architect's Sketch-Book."

The Boston Society of Architects announced the establishment of an award in money, to be called "The William E. Chamberlain Prize," in memory of the architect by that name, himself a graduate of the Institute in 1877. This prize will be available for award in competition among the fifth-year students.

The Boston Society of Architects also donated one hundred and three lantern slides of miscellaneous subjects, which form a very useful addition to our collection.

Mr. Guy Lowell very generously asked to have the amount of his fees for three lectures on Landscape Architecture, credited to the Department, with the suggestion that it be expended for some addition to the equipment in the way of casts or other objects of art for the gallery.

The one thousand dollar Traveling Fellowship made possible through the generosity of the Corporation, was awarded to Mr. John H. Scarff, '10, in competition with ten others. The jury of award were Professors Chandler, Despradelle and Gardner, Messrs. Cox, Mead, Codman, and Bellows.

The Rotch Prize of two hundred dollars for the regular student having the best record in four years was awarded to Mr. Sidney L. Day; and a similar prize for the special student with the best record for two years was awarded to Mr. Thomas H. Mace, Jr.

The two annual prizes of fifty dollars each given by the Boston Society of Architects were awarded to Mr. Theodore R. Prouty, regular student, and the other divided between Messrs. Thomas H. Mace, Jr. and George B. Brigham, Jr., special students.

The two "Class of 1904" Competition Prizes of ten dollars each were awarded to Mr. Henry O. Glidden, regular student, and Mr. George W. Dyer, special student.

It is understood that the fund established in honor of Professor Chandler last year, to be known as "The Francis Ward Chandler Prize" will be available this year for award among the students of the fifth-year, but no definite information has yet been obtainable.

The Architectural and the Architectural Engineering Societies continue to exercise a marked and beneficial influence on the student body, and do much to stimulate the work of all connected with them.

It is felt that the Technology Architectural Record, the quarterly publication of the Department, and those who have charge of it are entitled to congratulations because

of its improved financial condition. Its value is evidenced by the fact that both Harvard and Pennsylvania University Schools have recently inaugurated similar publications,— inspired without doubt by the success of our paper.

The proposed Interscholastic Competition between the leading architectural schools of this country was successfully inaugurated during the past year, those participating being Harvard, Pennsylvania, Columbia, Cornell, and the Massachusetts Institute of Technology. It is proposed to continue this feature this year, and steps are already in progress to complete the arrangements.

While it is recognized that no relief can probably be granted at present, still it is felt that the necessity for increased space is so urgent that no report would be complete without some reference being made to that subject. This plea has in previous years been taken up, but there is an even stronger necessity for it this year than ever before. The large numerical increase of students, and the requirements that they should be properly housed and provided with the facilities for doing their work under sanitary and healthful conditions, would seem to demand that this be given early consideration. These features are now recognized very generally in commercial life by the introduction of many provisions for the comfort and health of their employees which formerly would not have been considered any part of the duty of an employer; and this is largely because employers are realizing more than before that favorable conditions for production produce more than correspondingly better results in quality and quantity. If this is the attitude of business how much more ought it to be that of an educational institution.

The present crowded condition of our quarters prevents a satisfactory and economical handling of the work. Classes which from the character of the work or because of conflicting schedules cannot be divided into sections, are so

large that none of the classrooms will accommodate them, and they are compelled to spread through two or three adjoining rooms, greatly to the disadvantage of the work. This same condition is true of the "en loge" work, there not being a sufficient number of "loges," nor can the students be isolated in them as they should be to secure the best results. In this connection the recommendation seems apropos that in the planning of the buildings for the "New Tech" an entirely separate and ample structure be provided which can be arranged and planned with careful reference to the work of the Department, and its successful and convenient conduct as well as provide for its future growth.

For many years the drawing rooms of the Department have been open evenings from 6:30 to 10 for the students of the fourth and fifth years. We think that a further extension of the opportunities for evening work in the Department should be made, and recommend that our library, under proper supervision, should be open during these same hours to all of our students. We believe, however, in limiting the kind of work for the evening hours in the library to research work in Design and to reading, etc., in connection with the courses in Architectural History and European Civilization and Art. It is necessary to make this restriction in order to continue our policy of not affording facilities in the evening for drawing room work in Design in the second and third years. Supervision of the library evenings can be provided for by engaging one of the present janitors, or, preferably, one of our former students, who would be glad of a chance to study combined with a comparatively small remuneration. We make this recommendation believing that it is wise to provide our students with the fullest opportunities for the study of their profession, and because we feel that the Department of Architecture at the Institute ought not

to offer less than do the other well-known schools of Architecture.

Mr. Walter B. Kirby, '07, the holder of the 1901 Traveling Fellowship, has recently returned. He now has on exhibition in the Department many exceedingly interesting drawings that formed part of his work during his stay abroad. Mr. John H. Scarff, who was the successful competitor in 1912, will leave shortly to take up his study under that Fellowship.

This again raises the question of putting this Fellowship on a more permanent basis. The Department feels that it can only reiterate and endorse by repetition the strong appeals that have been made in past years, urging that either by endowment or by some form of administrative enactment some plan be found that will assure a continuance of the offer as a yearly one. During the past years, except those in which the income from the Willard B. Perkins Fund was available, the award has had to depend on the securing of aid from private sources, supplemented by such assistance as was voted by the Corporation. This private generosity cannot be expected to continue indefinitely, and it would be most deplorable if because of its failure the Fellowship should lapse on account of lack of funds.

To a great extent the success of the advanced course in Design is dependent on the ability to offer such a prize. Nothing is more discouraging as well as humiliating to all connected with the work than to receive, as has repeatedly happened, requests from other schools to lay before our graduates statements of inducements which they can offer to advanced students, and with which we cannot compete. There is not another architectural school in the country, of the standing of the Institute, that does not have the assured means of offering its students the opportunity for foreign travel as a reward. Early action on this should be taken as, to make it effective, the fact should be ad-

vertised well in advance of the date of the competition; in fact, should be stated in the annual catalogue as one of the inducements to come here rather than go elsewhere.

The Department therefore again appeals in the strongest possible manner to the Corporation and urges most earnestly that such action be taken as will settle the question of the permanency of this Fellowship at the earliest possible date. It also renews its recommendation made last March that a provision be incorporated in the conditions governing the award of this Fellowship, making it an obligation on the part of the recipient to return to the Department upon his completion of his term of travel as an assistant in the instruction of Design, at a salary to be fixed for at least a part of the year succeeding his return.

JAMES KNOX TAYLOR.

## CHEMISTRY AND CHEMICAL ENGINEERING.

During the past year an important transfer of immediate responsibility for the development of the Course in Chemical Engineering, and the care of the students registered in this course, has been effected by placing both these interests in the charge of Professor William H. Walker. While the changes made in the curriculum during recent years have been the outcome of departmental conferences in which all have shared, many of the suggestions which have ultimately been incorporated into the course schedule have originated with Dr. Walker, and he also has charge of the subjects of instruction and the laboratories most closely connected with chemical engineering in its professional sense. It is, therefore, both fitting and fortunate that the future of the instruction in this new and vitally important branch of engineering should be guided by one whose experience lends itself so admirably to this end. The necessary conferences with so many

students as now select the courses in Chemistry and Chemical Engineering had made an undue demand upon the time of the head of the Department, and this divided responsibility will, it is hoped, result in additional opportunity for attention on his part to the Course in Chemistry and the needs of the Department of Chemistry and Chemical Engineering as a whole.

Another matter of much importance to the future of the Courses in Chemistry and Chemical Engineering is the approval on the part of the Faculty and the Corporation of a required Summer course in Qualitative Analysis, of five weeks duration, to be given for the first time next Summer. This innovation corresponds, for these Courses, to the introduction of Surveying as a required Summer course in certain other of the professional courses. The instruction is mainly that of the laboratory, and comparatively little outside study is required. The time thus gained in the Course in Chemistry is devoted to additional analytical chemistry and to the better development of existing subjects, rather than the introduction of new ones, while in the Course in Chemical Engineering the time is allotted mainly to courses in the mechanic arts, to drawing, and to an additional course dealing with the problems of chemical engineering. It is the belief of the Department that the curricula of both Courses have been distinctly strengthened by this additional requirement and that it can be carried out without unreasonable demands upon the students.

The change just referred to has helped to make possible a desirable revision of the work required in the option of the Course in Chemistry (Option 1) which aims toward research. A series of three courses designated as "Experimental Problems" in "Inorganic, Theoretical and Organic Chemistry," respectively, has been introduced into the two terms of the third year and the first term of the fourth year, the purpose of which is to encourage independence

of thought and to develop power of initiative and ability to attack new problems through actual trial on the part of the student. While men trained along the lines laid down for chemical engineers are much in demand in the industrial field, there is also an increasing call for men who have devoted themselves more extensively to chemistry and have also the aptitude and spirit of the investigator. It is to educate such men as these, who are also fitted for teaching or for the more abstract phases of chemical research, that this option has been designed. The modified Option takes effect in the first year only, for the present year. The other options remain essentially unchanged in their general characteristics.

The opportunities for postgraduate study for students in Chemical Engineering have been much enlarged by the graduate subjects offered by Professors Walker and Lewis and announced in the last Programme. This has had the immediate effect of inducing six of our graduates of last year to return, a result which is gratifying in view of the obvious difficulties in meeting adequately the demands in the education and training of a chemical engineer within a period of four years. The advanced courses are of such a character as to require the applications of the principles of both chemistry and engineering acquired in the undergraduate years to problems in engineering connected with chemical or semi-chemical industries, including questions of design of apparatus and operating plants. The number of graduate courses in Chemistry offered this year is somewhat less than usual on account of the smaller staff of the Research Laboratory of Physical Chemistry. It is, however, planned to supplement these courses by those in other branches of chemistry in the near future.

Another innovation of the year has been the offering of the course in Industrial Chemical Laboratory during the last three weeks of the vacation. This was attended

by nearly twenty-five students, which will fortunately relieve the over-crowding of the laboratory during the second term of the present year. The course was offered by Professor Warren K. Lewis.

The suitable development of the instruction in Industrial Chemistry to meet the needs of the students of Chemistry and Chemical Engineering has been the subject of much discussion of late in the journals and, in particular, at the meetings of the Institute of Chemical Engineers. The trend of these discussions is plainly toward the introduction of an increasing proportion of experience with processes carried out on a semi-industrial scale,—always recognizing the necessary limitations of the operating conditions which must obtain in such a laboratory. For some years past there has been a gradual addition to the equipment of our laboratory of Industrial Chemistry of apparatus suitable for such instruction, and, with the opportunities for expansion which it is hoped are not far away, provision for work of this character, especially investigation work for undergraduates and graduate students as well as research associates will have to be made. It is, therefore, a matter for much congratulation that the Institute has recently received the gift of a fund of $50,000, to be known as the Samuel Cabot Fund, the income of which will soon be available for the purchase of apparatus and supplies to be employed in the conduct of research work in Industrial Chemistry. This fund will ensure the steady development of investigation work on the part of our students and the gradual building up of an equipment which will afford unexcelled opportunities for work of an advanced character. It is doubly gratifying to the Department that the fund bears the name of one who had its interests so closely at heart for a long series of years, and to whom it owes much for timely advice and assistance.

The announcement has also been made very recently

of the completion of a fund of $15,000, to be known as the Ellen H. Richards Fund, the income to be used for the promotion of research along the lines of chemical sanitation, in which Mrs. Richards was so keenly interested. The details of this gift will probably appear in a later report.

The traveling Summer School of Industrial Chemistry for 1912 was organized with sixteen students in attendance, and left Boston on June 5th for a trip of sixteen days, to inspect manufacturing plants employing chemical processes. Eleven of the students were from the class of 1912, and these, together with five undergraduates from the Junior and Senior classes made up the party, which was in charge of Professors Frank H. Thorp and Warren K. Lewis. Professor Walter H. James of the Department of Mechanical Engineering also accompanied the party.

The following places were visited:—B. P. Clapp Ammonia Co. and the U. S. Finishing Co., both at Providence, R. I.; American Brass Co. (two plants), Ansonia, Conn.; Warner Sugar Refinery, Edgewater, N. J.; National Lead & Oil Co. (Atlantic Works), Brooklyn, N. Y.; B. T. Babbitt Co. (Soap), Babbitt, N. J.; Atlas Portland Cement Co., Northampton, Pa.; Wyoming Chemical Co. (Luzern Works), Long Eddy, N. Y.; Hammond Leather Co. (Light Leathers), Port Jervis, N. Y.; Cattaraugus Tanning Co. (Sole Leather) and Acme Bottle Co. (Glass Works), both at Olean, N. Y.; Atlantic Refining Co. (Eclipse Oil Works), Franklin, Pa.; Youngstown Sheet & Tube Co. (Steel works), Youngstown, O.; Goodyear Tire & Rubber Co. and Robinson Clay Products Co. (Pottery), both at Akron, O.; Cleveland Salt Co., Cleveland & Sandusky Brewing Co. (Fischel Branch), National Carbon Co., American Agricultural Chemical Co. (Fertilizers) and American Chicle Co. (Chewing Gum), all at Cleveland, O. In all some twenty-three plants were inspected by the

party. By special invitation, about ten of the party visited the White Automobile Works after the close of the regular trip. In every instance the party was cordially received and given full opportunity to inspect the various processes, and at several plants special courtesies, such as lunches, transportation, or the gift of mementoes and samples, were extended to the party.

At many of the plants former students of the Institute were found, and to their interest and efforts much of the success and pleasure of the trip is due. Especially are we under obligations to Messrs. Harry E. Smith, '87; Thomas F. Stimpson, '77; William H. Bassett, '91; Lewis J. Seidensticker, '98; James W. Loveland, '88; Emerson F. Lyford, '08; Charles S. Robinson, '84; Paul W. Litchfield, '96, and his numerous force of Tech men at the Goodyear plant; John W. Brown, '00; and Daniel L. Ordway, '01.

At Akron, O., the party was entertained by the local Technology Club at one of the pleasure resorts some miles out of town. Here a large number of former students were met in a social way and a most pleasant evening was passed.

Excellent discipline and attention prevailed throughout the trip, and but one case of illness occurred among the students. Seven completed reports upon the trip have been already handed in by students participating. The actual expense of the trip was about $96, as against an estimate of $105.

The promotion of Associate Professor F. Jewett Moore to a Professorship of Organic Chemistry at the close of last year was a deserved recognition of professional attainment and loyal service. Mr. Rufus E. Zimmerman was promoted to be instructor in Theoretical Chemistry for merit. Messrs. Eugene L. Connolly, Paul S. Fiske and Ludwig Rosenstein resigned at the close of last year and Messrs. Ralph H. White (Worcester Polytechnic Institute) and Charles R. Cressy (Lehigh University) have joined

the staff as instructors. There have been the usual changes in assistants.

Mrs. Stinson, whose retirement was noted last year, died in April after a brief illness.

There have been monthly departmental conferences of the Faculty members throughout the past year, which have been productive of much good and give promise of additional usefulness in the broad development of departmental policies.

The year has been one of continued general prosperity and of loyal activity and interest on the part of all the members of the Department, which will doubtless be further stimulated as the plans for new buildings assume their final shape.

H. P. TALBOT.

## RESEARCH LABORATORY OF PHYSICAL CHEMISTRY.

The laboratory was unfortunate in losing from its research staff at the end of the last school year Professors Gilbert N. Lewis and William C. Bray, two unusually competent investigators, who have accepted positions in the chemical department of the University of California. With them are associated Dr. Richard C. Tolman and Dr. Merle Randall, who received their doctors' degrees from this Institute, and Mr. Ludwig Rosenstein, who was previously instructor in Theoretical Chemistry at the Institute.

Dr. Charles A. Kraus has been made Assistant Professor of Physico-Chemical Research in recognition of his exceptional ability as an investigator. Dr. F. G. Keyes, who is also highly successful in research work, and who last year was instructor in theoretical chemistry, has been transferred to the research staff.

Progress has been made during the past year in the fol-

lowing lines of research. The investigations of Professor Lewis and his coworkers on the free energy of chemical substances have been worked up and in part published. A comprehensive critical study of existing data relating to the electrical conductance of non-aqueous solutions has been carried out by Professors Kraus and Bray and prepared for publication. The concluding part, devoted to the detection of the acidic constituents, of the new system of qualitative analysis which has been under investigation in the laboratory for several years has been published by Professor Noyes.

Two investigations having an important technical bearing have also been in progress. One of these, carried out by Professor Charles A. Kraus and Mr. Roy D. Mailey and referred to in last year's report, has resulted in the development of an efficient mercury-arc alternating-current metal rectifier. The other, undertaken at the suggestion of Professor Edward F. Miller and carried out by Dr. Keyes with the assistance of students of the Mechanical Engineering Department, consists in the accurate determination of the thermodynamic constants of ammonia, a better knowledge of which is of much importance in the refrigerating industry.

Reference is made to these technical investigations since it is desired to again emphasize the fact that this Research Laboratory affords opportunity for educational training and research in physical chemistry on the industrial, no less than on the scientific side.

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

A. A. NOYES.

## RESEARCH LABORATORY OF APPLIED CHEMISTRY.

As mentioned in our report for last year, the demand for greater facilities in the Laboratory of Industrial Chemistry, incident to the increased number of students taking the course in Chemical Engineering, made it necessary to curtail the activities of the Research Laboratory of Applied Chemistry so that but two assistants devoting their entire time to experimental work could be accommodated. This decrease in the number of Research Assistants has been somewhat offset by the fact that seven post-graduate students in Chemical Engineering are pursuing research work in this laboratory. Of the problems mentioned in last year's report the investigation relative to finding an alloy highly resistant to acids for making digestor valves and fittings, and also the study of the relative life of iron and steel pipe as found in service in New England, have been brought to a successful conclusion. A preliminary paper has been published on the new method developed in this laboratory for measuring the total oxygen content of iron and steel, a most important determination for which there is at present no accurate method available. The paper has aroused a very general interest and we are now receiving the hearty co-operation of a number of manufacturing organizations in perfecting the method and rendering it more generally applicable to industrial conditions. The study of the bacteriacidal properties of the higher phenolic acids is being continued, while the new investigations undertaken include a search for a furnace lining capable of withstanding strong alkaline fusions at high temperatures; a study of the materials available for electric furnace construction adapted to the preparation of lime and carbon dioxide; determination of the co-efficient of heat transfer 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; a

study of the mechanism of absorption of acid and alkali by gelatine and hide substance; the properties of lamp black as related to the structure of the organic compounds from which it is made.

It is more than ever evident that the scope of the work of the laboratory can be greatly widened as soon as increased laboratory facilities can be obtained.

WILLIAM H. WALKER.

## DEPARTMENT OF ELECTRICAL ENGINEERING.

*Instructing Staff.*—During the leave of absence granted Professor Jackson for the first three months of the present school year, Professor Pender has been the Acting Head of the Department. Professor Jackson's lectures have been ably given by Professor C. A. Adams and T. W. Sprague of Harvard University.

Professor Smith has returned after a year's leave of absence, spent in Sarawak. Mr. Gorton, who was appointed last year to fill the temporary vacancy caused by Professor Smith's leave of absence, has been retained as an additional instructor in the Department. Mr. Thompson was promoted last June from Research Assistant to Research Associate.

The increase in the research work undertaken by the Department during the past year has necessitated the appointment of an additional research assistant. Mr. Calvin P. Eldred, '12, was appointed to fill this position. Three of the assistants, namely, Messrs. Ralph M. George, Edgar P. Slack and Vernon S. Foster withdrew at the end of the Institute year to go into other employment. The positions thus vacated have been filled by the appointment of Messrs. Robert J. Wiseman, M. I. T., '12, Alfred P. Kitchen, Pennsylvania State College, '12, and Norman Osann, University of Wisconsin, '12, as Assistants for the present year.

The effectiveness of the laboratory work would be greatly increased were it possible to pay larger salaries to the assistants. With the salaries now offered it is becoming increasingly difficult to retain the better men for more than one or two years.

*Undergraduate Instruction.*—The number of undergraduate students in the Department continues to increase. Last June fifty-two bachelor's degrees were conferred on students graduating from Course VI. This year there are fifty-three candidates for the bachelor's degree.

The undergraduate course in Dynamo Design, formerly given by Professor Derr of the Physics Department, is now given by Mr. Green of this Department. Mr. Green is now also in charge of the Dynamo Laboratory. Two additional elective courses have also been added this year, a course on storage batteries and their Applications, by Professor Lawrence, and a course on the Electric Wiring of Buildings, by Mr. Hudson.

The demands on the Dynamo Laboratory have been greatly increased this year by the addition of a course in this laboratory to the curriculum of Course X (Chemical Engineering). Work in this laboratory is now included in Courses I, II, III, VIII, X, XIII, XIIIA, and XIV, in addition to VI. As the result of this demand, the capacity of the laboratory in student hours has reached its limit. With the present equipment and number of assistants any further increase in students will necessitate a corresponding increase in apparatus, and also additional laboratory assistants, in order that the standard of work may be maintained in the future as it has been in the past.

During the year the notes for use in the Standardizing Laboratory have been revised and much new matter added. These notes are printed for the use of the students of the Institute, but several other institutions have been granted the permission, at their request, to use these notes in their laboratories. The Standardizing Laboratory for

its best development urgently needs an instructor who will remain a term of years so that he may acquire the necessary experience for the satisfactory development of the work.

Professor Lawrence has issued during the past year for the use of the students of the Institute a set of lecture notes covering part of his course on Alternating Current Machinery, and is now extending these notes to cover the entire course.

Professor Wickenden has issued during the year a complete set of notes covering his course on Central Stations.

*Graduate Work.*—Last June two graduate students were awarded the degree of Master of Science. This year six graduate students are enrolled in the Department, three candidates for the Master's degree and three candidates for the degree of Doctor of Engineering.

Two new lecture courses have been added to the graduate curriculum, a course on advanced Alternating Current Machinery, by Mr. Lyon, and a course on Electric Phenomena in Insulating Media, by Mr. Gorton. Mr. Green has also taken over the course on Advanced Dynamo Design formerly given by Professor Derr of the Physics Department.

Original investigations at present being carried out by graduate students in the Department include a study of the nature of the phenomena involved in the rupturing of insulating materials under high potential stresses, the construction of an artificial transmission line and the experimental study therewith of the "surges" which take place in transmission lines and connected apparatus, an investigation of the rates charged for light and power by public service companies with the object of determining a rational basis for rate making, a study of the wind pressure and ice formation on transmission lines, and an investigation of the cost of substituting electric trucks for horse drawn vehicles in the forwarding of freight.

*Additions to Laboratory Equipment.*—No important additions have been made to the Dynamo Laboratory equipment. Minor changes have been made in the arrangement of the apparatus to increase the usefulness of the various machines, there being now very few pieces of apparatus which are not in use during the entire school year.

The most important addition to the equipment of the Standardizing Laboratory made during the past year is a Drysdale-Tinsley alternating current potentiometer, with the necessary auxiliary apparatus. During the year this Laboratory has received gifts from the Sangamo Electric Company of two watt-hour meters of their latest pattern; from the Kinney Pump Company, a rotary pump and its mounting; from the Pittsburg Transformer Company two instrument transformers.

*Department Researches.*—Through the courtesy of the Edison Electric Illuminating Company of Boston, the important investigation of the economic field for electric commercial vehicles, which the Department began in the spring of 1911, is being continued through the present year. Mr. Thomson is devoting his entire time to this work under the direction of Professor Pender. Two reports of progress have been issued, the first in March and the second in October of this year.

Another investigation of a similar nature has been put in our hands by the New York, New Haven & Hartford and Boston & Maine Railroad Companies. These companies have undertaken to support the cost of a comprehensive study of the adequacy of the facilities for handling both in-bound and out-bound freight at the Boston railroad terminals. One of the committees of the Boston Chamber of Commerce is also lending financial assistance in the gathering of data upon this important subject. Mr. Eldred is devoting his entire time to the conduct of this work under the direction of Professor Pender.

These investigations, though not strictly "engineering"

in the narrow sense in which this word is frequently used, nevertheless involve the *methods* of engineering. They are really special problems in what might be called "business engineering." In modern business numerous problems of a similar kind, which require for their satisfactory solution the "engineering method," are continually arising. It therefore seems desirable that in the near future there should be established at the Institute a Department of Business Engineering, in which students will be trained to apply the engineering method to the economic problems that arise in various lines of business. As modern business problems are becoming more and more associated with some phase of engineering, the instructing staff of the Department of Business Engineering should be formed largely of representatives from the various Engineering Departments. Investigations of the kind enumerated above would naturally be transferred to such a department.

*Gifts.*—In addition to the gifts to the Standardizing Laboratory noted above, other valuable donations have been received by the Department.

Through the good offices of Mr. Theodore N. Vail a library consisting of approximately 25,000 volumes has been given to the Department by the American Telephone & Telegraph Co. This library is said to contain practically every book of importance on Electrical Engineering subjects since 1860, and is particularly rich in technical periodicals in various languages. Such a library will prove invaluable, particularly in electrical engineering research, and it should be placed in a safe and accessible place as soon as practicable.

The Stone and Webster Engineering Corporation has presented the Department with a complete span (approximately 600 feet) of a 150,000 volt transmission line of the type being built by them for one of the power companies on the Pacific coast. This span includes the steel towers, cables and insulators, and will offer numerous opportu-

nities for the investigation of high voltage phenomena on transmission lines and also for studies of the mechanical design of such lines.

Mr. Philip P. Barton, Vice-President of the Niagara Falls Power Company, has presented the Department with one of the original governors used in connection with the water wheels in the Niagara Falls Power Company's power house. This governor has been transferred to the Mechanical Engineering Department, where it can be rendered available for tests by the students.

Additional photographs of power developments in various parts of the world have also been given to the Department.

*Professional Work of the Staff.*—Professor Jackson has spent the major part of his leave of absence in England, completing the investigation on the British telephone systems for the British Government, in which work he has been engaged for the last two years.

Professor Pender spent two months of the summer vacation in New York City doing consulting work for the firm of L. B. Stillwell. He has also been retained for the last two years by John Wiley and Sons of New York City as Editor-in-Chief of the American Electrical Engineers' Handbook, to be published by that firm. In addition he has, with the assistance of Mr. Harry F. Thomson, made for the Boston Chamber of Commerce a study of vehicle and pedestrian traffic in Boston streets.

Professor Laws has been conducting for the Board of Gas and Electric Light Commissioners an investigation of the demand indicators used by the Edison Electric Illuminating Company in Boston; the results of this investigation have been published in full by the Board. He has also, in collaboration with Mr. C. H. Daws of Harvard University, developed a simplified form of oscillograph designed primarily for the determination of the maximum voltage in tests of insulated cables.

Professor Lawrence spent several weeks during the past

summer vacation in the Consulting Engineering Department of the General Electric Company at Schenectady. Mr. Charles W. Green also spent part of the summer in the Electrical Engineering Department of the same company.

HAROLD PENDER.

## DEPARTMENT OF BIOLOGY AND PUBLIC HEALTH.

The staff has been strengthened by the advancement of Mr. Franz Schneider, Jr., from an Assistantship to an Instructorship, and by the promotion of Robert P. Bigelow, Ph.D. who has long and faithfully served as Instructor in Zoölogy and cognate subjects to an Assistant Professorship of Zoölogy and Parasitology. Dr. Bigelow has contributed materially to the advancement of Science through his publications and public services especially in connection with the International Zoölogical Congress and with various local Associations of Naturalists. His promotion strengthens the Department on the side of pure science in the direction of the broad foundations of applied biological science.

In January Assistant Professor Gunn became the Managing Editor of The American Journal of Public Health, the official organ of the American Public Health Association. In May he was invited to assist in the organization and administration of the International Congress of Hygiene and Demography which was to hold its first meeting on the western continent at Washington in September and soon after was appointed its Assistant Secretary-General. Accordingly he removed to Washington on June first and devoted his entire summer to that important work. At the same Congress the Head of the Department and Professor Gunn served as delegates from the Institute, participating in the meetings and in the presentation of

papers. The annual meetings of the American Public Health Association, of the New England Water Works Association, and of the Association of State and Provincial Boards of Health, were held in Washington at about the same time and were similarly attended. An exhibit of the work of the Department in Public Health and especially in Sewage Purification, occupied a prominent place in the general Exhibition held in connection with the International Congress, a special alcove having been allotted for the purpose. To this exhibit (which has since been on view at the Boston Public Library and is now being shown in other cities of the State) was awarded a diploma of merit.

Associate Professor Prescott made during the winter a short trip to Costa Rica for the purpose of investigating a banana-plant disease supposed to be of bacterial origin. He was able to study the diseased plants, to isolate various suspected microbes, and to make test inoculations which it is hoped will lead to the discovery of the principal parasites with the ultimate finding of preventive measures.

Dr. P. G. Stiles, Instructor in Physiology and Personal Hygiene published in September an extended and original treatise on the physiology of nutrition, a subject always important and today especially timely.

Perhaps the most notable feature of the year has been a sudden and large increase in the number of college graduates at present registered in the Department, namely fourteen. Of these, three are intending to take degrees while the rest expect to spend from one to two years in preparation for Public Health Service of some sort. This increase has imposed upon the Department a new and grievous phase of an old problem, namely, how to secure adequate room for good work. If we can carry on our work during the present year without loss of efficiency in instruction or research, we shall be fortunate, but it will be almost impossible to do this a second time. Some

provision must therefore be made for more working space before September next. The trend of the times toward an almost universal interest in Biologic and Public Health problems is doubtless responsible for much of our growth in attendance, and as this public interest seems to be increasing rather than diminishing, it will probably be wise to count on larger demands upon the Department for some time to come.

W. T. SEDGWICK.

## SANITARY RESEARCH LABORATORY AND SEWAGE EXPERIMENT STATION.

Less attention has been paid during the year to problems of sewage and purification than at any time since the Experiment Station work began, for two reasons, first, because successful sewage treatment is now rapidly becoming an established and recognized branch of applied science, and, second, because of the urgency of other sanitary problems in the solution of which less progress has been made.

Chief among these latter may be mentioned the science and art of ventilation, in which our knowledge has lagged far behind that in some other branches of public health science. Assistant Professor Phelps and Mr. Franz Schneider, Jr. have accordingly planned and begun a series of experiments designed to furnish certain fundamental information required before any real progress in the art can be made. To this end they have built special pieces of apparatus for determining the rate of evaporation from moist surfaces, the rate of heating and cooling of various materials under fixed conditions of temperature, moisture and air flow, and other preliminary data. During the summer the work progressed rapidly but their results are not yet ready for publication.

A favorable opportunity having arisen for an attack upon the problem of the proper organization and work of Boards of Health in small towns, Professor Phelps and Mr. Schneider have also recently undertaken an interesting experiment in conjunction with the Board of Health of the Town of Wellesley, concerning the work of which a paper was published in the last volume of the Contributions from the Sanitary Research Laboratory and Sewage Experiment Station (Vol. VIII) by the local Health Officer, Mr. Cecil K. Blanchard (a former student of the Institute). Reference to this paper will show that the work in Wellesley has been already for some time of an especially interesting character, and the present experiment is an extension of an idea which I have long entertained, namely, to encourage coöperation between local Boards of Health in towns of small size so that a strong force which shall carry on the laboratory and inspection service of each local Board may devote a part of its time and energies to the work of neighboring Boards and the service of two or more contiguous communities. This principle is already in successful operation in the Public School Service, in which one well equipped Superintendent divides his time between several towns, each contributing to his adequate support. Excepting the single obstacle of local pride in exclusive possession, there is no good reason why this plan should not be carried into many other departments of civic activity; and there is probably no place in which it is more needed than in the work of local boards of Health. The Wellesley experiment, therefore, which is directed to this end deserves to be followed with interest.

The bacteriological investigation of eggs has been continued during the year, the contributor of the original fund having made further donations for the purpose. A special investigation has been recently conducted by Professor Keith and his assistants upon the vexed question of the effect of low temperatures upon the viability of

bacteria in frozen eggs and similar food materials. Results have already been reached which promise to be of very great scientific interest and importance.

Another volume of Contributions, consisting of thirteen papers and one hundred and fifty pages and constituting the eighth of the series, has been published and widely distributed during the year. The demand for these Contributions is now large and their sale considerable, and much appreciation is expressed of the practical and scientific value of their contents.

It is a pleasure to acknowledge once more with gratitude our continued obligation for the steadfast interest and unfailing generosity of the same generous donor whose personal interest, friendly criticism and strong financial support have now for a decade maintained our work.

W. T. SEDGWICK,

*Director.*

## DEPARTMENT OF PHYSICS.

The lectures and class room exercises in General Physics have been of substantially the same character as in previous years; though the increasing number of students combined with the enlarging demands upon the limited number of rooms available for recitations tend to neutralize to a very appreciable extent the most earnest labors of the instructors. Still more is this the case with the larger part of the class-rooms so far away from the cabinets of apparatus that this is not available for examination in the class exercises.

In consequence of the re-arrangement of other lectures it has become feasible to hold the lectures in General Physics of the second year for both lecture sections in the same lecture room, No. 22 Walker, throughout the whole year which greatly facilitates the preparation of these

lectures and reduces the liability to injury either temporary or permanent arising from the frequent transfer of large quantities of delicate apparatus from one lecture room to another.

The division into two sections of the Third Year Class attending the lectures on Heat given by Professor Norton, to which reference was made in the Report of last year, continues to work satisfactorily, and obviates the difficulty from excessive overcrowding of the lecture room which was so strongly felt for several years prior to this change, but of course at the expense of an additional demand for that purpose upon the time and strength of the lecturer.

The introduction of fifteen additional exercises in the Physical Laboratory in the first term of the second year, which permits the inclusion of work in the Electrical Laboratory in the second term concurrently with the lectures and recitations in Physics has proved so satisfactory to Courses VI, VIII, and XIV for the past two years that, acting upon the urgent request of this Department, other departments have introduced the same changes in the recent revision of their course schedules. The new schedules will go into effect for Courses II, III (option 2), VII, and XIII this year, and for Course V next year.

As a result of this additional work, provision will have to be made in the laboratories of General Physics for nearly four hundred students in each week throughout the entire year. To handle this number of students, laboratory exercises must be held almost continuously throughout the week from nine to five. Among the most serious difficulties to be met in running the laboratory at such high pressure is that of keeping the apparatus in good order for immediate use. To do this properly another instructor will be necessary to relieve the time of the present assistants for additional preparation and adjustment of apparatus.

The value of the laboratory work would be greatly

enhanced if it were possible to introduce for the whole class in the second term of the second year a series of conferences like those now held with Courses VI and VIII. This work, in charge of Professor Page, has been of great benefit to the students taking it, although the lack of an available class-room near the laboratory to which instruments might be carried and studied at close range seriously hampers the work.

A revised edition of his text-book on the Precision of Measurements is now in preparation by Professor Goodwin, and will be ready at the beginning of next term. Since this important subject has become a part of the curriculum for all Courses except that in Architecture, from which work in the Physical Laboratory is also absent, the number pursuing it has been extremely large. It was not possible at first to arrange for instruction of so many in sections, but the experience of a year showed that a lecture course was highly unsatisfactory. It was feared however that no other method would be practicable for the past year, on account of deficiency in the class-room facilities which would be necessary to accommodate the large number of sections called for. But it was found possible to place these exercises in the afternoon, when the recitation rooms are less occupied, so that the desired plan was not interfered with. Although this procedure involved giving instruction to fourteen additional sections for the ten exercises of the course, all the members of the Department who were concerned assisted cheerfully in carrying out this extra work for the sake of the better results to be obtained.

Much has been done during the past year to bring the equipment of the Electrical Laboratory up to its proper standard. There have been added among other valuable instruments a compound oscillograph after the design of Professor Laws, with accessories, a portable wave-meter, with apparatus for its calibration, a small rotary converter which may be used in connection with a tuning

fork to maintain constant frequency, a switch-board in connection with storage cells for purposes of calibration, giving currents up to 300 amperes, and several portable ammeters and voltmeters. Besides the apparatus needed for new work, however, additional equipment is imperative in the duplication of standard apparatus to meet properly the demands of the increasing number of students to be cared for.

The Laboratory Notes are in process of revision by Professor Page, his intention being to provide experiments adapted to the special needs of each Course taking the work.

In connection with the development of a laboratory course in high-frequency measurements an electric wave-meter has been designed by Professor Page and constructed by the mechanician of the Department. The study and calibration of this instrument were made the subject of a thesis last year by two students of Course VIII who found it to be a valuable addition to existing devices of the kind.

The instruction work of the Laboratory of Heat Measurements is gradually extending in scope though no particular development has occurred during the past year which calls for special mention. Of new apparatus should be noted a very satisfactory temperature control apparatus for the low-temperature testing room, devised by Professor Norton and now in operation. Most important, however, in this direction is a modern and safe apparatus for the liquefaction of air now in process of installation. The compressor to be used with this is a four-stage pump made by the Norwalk Iron Works Co., of South Norwalk, Connecticut. It is to be driven by a fifteen horse-power Westinghouse motor and should be capable of furnishing at least three liters of liquid air per hour. It is hoped later to add to this the apparatus necessary for the liquefaction of hydrogen. This machine will fill a long and

severely felt want of the Physical Department. It is paid for in part by the Jaques Fund and in part from other sources.

Very material additions have been made to the apparatus of the Department both for demonstration and research. Besides that already referred to in other connections should be mentioned several valuable pieces of demonstration apparatus from Kohl of Chemnitz and Stöhrer of Leipzig, and also a number of vacuum tubes of novel types from Müller-Uri of Brunswick; likewise a high-voltage transformer particularly adapted for producing discharges through vacuum tubes, as a substitute for an induction coil. A complete set of electrically-driven Lissajous' tuning-forks has been obtained, the manually operated set, purchased by President Rogers in 1867 from the gift for physical apparatus of the late Mrs. Augustus Hemenway, and used regularly up to the present time having become somewhat antiquated. A pair of Weston instruments, an engine-room ammeter and voltmeter, of sufficiently large size to be read from any point of either of the physical lecture rooms duplicates those of larger pattern which we have had for several years and also provides both rooms with these necessary instruments so that the need and danger of transfer of such heavy and yet delicate apparatus is avoided. To the cabinet of optical apparatus has been added a large number of crystal sections, to be used in the study of the phenomena of polarization. From the Katharine Bigelow Lowell Fund has been purchased a Schmidt and Haensch spectrometer with complete photographic attachments, and also a photographic microscope from Zeiss which will be of great service in the course in Photomicrography.

In connection with the additions made to the apparatus of the Department it may be well to call attention to a matter which at times has been and is likely again to be of considerable importance. It is always to be desired

that members of the instructing staff should be encouraged to devote such time as may be available to study and research. The exceptionally severe demands of routine teaching upon the time and strength of the instructors, leave them much less freedom than could be wished for such labors. But difficulty is met with, even when the hindrances referred to are overcome since there is no provision made to meet the pecuniary demands of such work, which in the subject of Physics is often considerable. The Department is fairly well supplied with the standard apparatus that should properly be found in a well-equipped physical laboratory, but there are no funds available for the purchase or construction of apparatus of special design which is frequently an absolute necessity in the prosecution of a research. The annual appropriations do not cover such expenses which indeed cannot always be estimated or even foreseen when the appropriations are made; and they are too heavy to be borne by the instructor making the investigation. Funds for scholarships and fellowships have been provided in liberal measure, but it would seem to be a very wise procedure to set apart as available a certain sum for the purpose under consideration. Under such circumstances a question which arises whenever a research of any seriousness is planned would readily be answered.

In the latter part of the second term of the past year a new elective course of lectures on Electrolysis, six in number, was given by Professor Goodwin to such students of the Second Year Class as desired to attend. The lectures were designed to extend the brief treatment given to that subject in the course on General Physics. No outside study was required and no examination was held. A very considerable number attended and the success of the lectures was such that they will hereafter be given every year.

A new course intended primarily for graduate and other

advanced students is offered this year by Dr. Hollnagel. The subject of the lectures is the mathematical theory of radiation and its applications in modern physics.

In connection with lectures like the foregoing, attendance upon which is voluntary, attention should be called to the general earnestness shown by our students to train themselves in the use of all instruments and devices of such character as are likely to be of general aid to them in their work. A number of years since, at a time when the real value of the instrument in question was quite unappreciated, Professor Derr instituted a combined lecture and problem course devoted to the slide rule, which was extended to include the principal forms of computing and calculating machines. The use of the slide rule in the Institute soon became common and in the Courses in Naval Architecture and Electrical Engineering ability to employ it was assumed. At present almost all the students make use of it in their computations. The average attendance upon the course just closed was about seventy-five.

As pointed out in last year's Report, the increasing number of students in the Course in Electrochemistry in charge of Professor Goodwin has made it necessary to enlarge the capacity of the Fourth Year Laboratory. At the expense of a room previously devoted to research, four additional fully equipped desks have been added, making now a total of sixteen. As there remains no room for further expansion in the laboratory, it is to be hoped that the present accommodations will meet the needs of classes until the new laboratory is ready for occupancy. This seems doubtful, however, as the present Third Year Class contains twenty students. Since it is essential that each student be provided with a desk equipped for electrochemical work, which he may use at all times, it has been considered necessary to state in the catalogue that places cannot be guaranteed for students unless they shall have been registered in Course XIV for at least

one year. Others will be admitted to the laboratory as far as the accommodations permit, but it has seemed advisable to make the above provision in order to safeguard the interests of our own students, giving them precedence over students entering from other colleges without previous notification.

No material changes have been made in the curriculum during the past year. It has been thought best to postpone, for the present at least, the requirement of Chemistry in the summer school. A revised set of Laboratory Notes on Electrochemical Measurements has been prepared by Professors Goodwin and Thompson during the summer. An elective course in "Manipulation of Glass" offered by Professor Thompson to Fourth Year students in Course XIV has been chosen by the whole class. As glass-blowing is as important an accomplishment for the electrochemist as lathe-work is for the engineer, it is probable that this course will be offered hereafter as a regular elective to the Fourth Year men.

The facilities of the laboratory of Applied Electrochemistry have been extended to students in Mining Engineering, a special course in Electric Furnaces being given by Professor Thompson. The general equipment of the laboratory has been improved by distributing mechanical power to each desk from a single large electromotor instead of small individual motors. High frequency alternating current from a central generator has also been distributed to each desk, thus doing away with individual induction coils. Several new instruments, including the latest type of Wanner pyrometer have been added to the equipment of the Electric Furnace Laboratory.

The principal change which has been made in the Department staff since the last Report is the well-deserved promotion of Mr. Newell C. Page to the position of Assistant Professor of Physics. Mr. Page has given most skillful and devoted service to the Institute in the Elec-

trical Laboratory as Assistant and Instructor for the past nine years, and has an expert knowledge of wide range and high value of the various branches of the science of electrical measurement. At the close of the last term Mr. Henry H. Marvin who had given great satisfaction during his year of service as an Instructor resigned to become the head of the department of Physics in Tufts College. The position thus left vacant was filled by the appointment of Mr. William R. Barss, who holds the degree of S.B. from Acadia College and A.B. and Ph.D. from Yale University. Messrs. Joseph P. Maxfield and Gordon B. Wilkes previously assistants also have been promoted to the rank of Instructor.

CHARLES R. CROSS.

## DEPARTMENT OF GEOLOGY.

*Instructing Staff.* Several important changes have taken place in the Instructing Staff of the Department, Professor T. A. Jaggar, Jr. resigned as Head of the Department, but remains as a Professor of Geology in the Institute. For the next five years he will assume the Directorship of the Hawaiian Volcano Observatory. Professor Reginald A. Daly has resigned, and was appointed in June, 1912, to the Sturgis-Hooper Professorship at Harvard University. Dr. Gerald F. Loughlin has likewise resigned, and was appointed as Assistant Geologist in the United States Geological Survey in May 1912. Mr. Waldemar Lindgren, Chief Geologist, of the United States Geological Survey, was appointed as Head of the Department and as William Barton Rogers Professor of Economic Geology. Dr. Frederick H. Lahee, formerly instructor in Economic Geology at Harvard University, and John D. MacKenzie, formerly instructor in Economic Geology

at Cornell University, were appointed Instructors in the Department.

*Course Scheme.* Owing to the departure of Professors Jaggar and Daly the courses in Glacial Geology, Experimental Geology, Topographic Geology, and Volcanology and Seismology have been discontinued for the present. A new course on Optical Crystallography and Its Applications has been offered by Professor Warren, which will be especially valuable to advanced students in Chemistry and Physics. Dr. Lahee has taken up the courses in general and Dynamic Geology. Messrs. Lahee and MacKenzie will undertake the courses in Field Geology and Geological Surveying, and Mr. MacKenzie will give a new course on the Geology of the Materials of Construction. Changes have been made in the course in "Geology" (XII) which will render it more suitable to the needs, both of college graduates who desire to specialize in geology and the students of the Institute. The latter are now required to take the studies of the first and second years as in Course III and IIIa, while the studies of the third and fourth year will be arranged in consultation with the Department. Two students, the first in several years, are now taking this course.

Evening conferences for the presentation of geological investigations by instructors and advanced students have been held at intervals throughout the academic year, and these conferences are open only to men having a professional interest in Geology.

*Advanced Students.* During the year passed the Department has had three advanced students, candidates for the Doctor's Degree, Messrs. Norman L. Bowen, John A. Allan, and Stuart J. Schofield. At the close of the year the Doctor's Degree was conferred on these three candidates. Mr. Bowen completed the experimental work necessary for his thesis at the Geophysical Laboratory at Washington; Mr. John A. Allan pursued field studies

in British Columbia in the Ice River district under the direction of the Geological Survey of Canada; Mr. Stuart J. Schofield completed the study of the structure of the Purcell Mountain Range in British Columbia. Mr. Schofield was likewise employed as Geologist by the Geological Survey of Canada.

*Students.* During the year nineteen students of Mining Engineering, candidates for the Degree of Bachelor of Science as well as large classes from the Departments of Civil Engineering and Architecture attended the lectures of the Department. In addition there were special students in several of the courses.

*Library.* A considerable number of new books have been obtained for the Geological Library, but it is still deficient in many respects and efforts will be made during the coming year to supply the deficiencies.

*Collections and Instruments.* A number of smaller donations have been received for the geological collections. During the coming year it is expected that these collections, especially those relating to economic geology, will be rearranged and relabelled, although of course it is not advisable to make final arrangements for the display of the material until the new building of the Institute shall be completed. The collection of nonmetallic minerals relating to economic geology is also deficient at present, and attempts will be made to remedy this condition.

The mineralogical collections have been enlarged and rearranged so as to render them more efficient. A number of additions have come through gifts by alumni and others. Among these may be mentioned an anonymous gift of some fine celestite, witherite, cryolite and stibnite specimens. Another considerable gift of laboratory material was received from the National Museum. Perhaps the most important addition is the "Rosenbusch" collection of rock thin-sections, purchased from the firm of Voigt & Hochgesang of Göttingen. This collection fully illus-

trates the Systematic Petrography of Professor Rosenbusch and will be of great value for purposes of comparative study. Many additions have also been made by the staff to the general rock collection. The instrumental equipment has been increased by the purchase of a "Herbert Smith" total-refractometer, which will be used in the courses of Optical Crystallography and Petrography.

*Professional Work.* Professor Jaggar in assuming the important position as Director of the Hawaiian Volcano Observatory visited Hawaii in the early part of 1912 in order to perfect the arrangements for the Observatory, and began active work there in the summer of the same year. Professor Daly continued his investigations of igneous rocks, and of the Geology of British Columbia. He published a paper entitled, "Reconnaissance in the Shuswap District of British Columbia" in the Annual Report of the Geological Survey of Canada for 1911. During the coming year his course on the Geology of the Igneous Rocks, which he will offer at Harvard University, will by special arrangement become available to students of the Institute.

Professor Waldemar Lindgren continued his work as Chief Geologist of the United States Geological Survey until the beginning of the fall term. During the year he published two papers in the Journal of Economic Geology, entitled, "Some Modes of Deposition of Copper Ores in Basic Rocks," and "The Nature of Replacement." In addition Professor Lindgren was engaged in the completion of a textbook on "Mineral Deposits."

During the summer Professor Warren was engaged in completing a petrographical and chemical study of the rocks of the Blue Hills and Quincy, in working on the Institute's collections, and also in making several trips chiefly for the purpose of collecting suites of rocks for the petrographical collections. He has published two papers during the year, the first entitled, "The Ilmenite

Rocks near St. Urbain, Quebec; A new occurrence of Rutile and Sapphirine," in the American Journal of Science, and the second, "The Barite Deposits near Five Islands, Nova Scotia," in Economic Geology.

Professor Shimer was engaged during the summer in preparing a textbook called "Introduction to Fossils," to be used in the Department. During the year he published papers relating to the Geology of Arizona and of Europe as follows:—"The Small Cave Houses of Arizona" in American Anthropologist; and the "Geology of the Rhine Valley" in Science Conspectus.

Dr. Loughlin continued laboratory studies of the collections made at Tintic, Utah, obtained during the summer of 1911 in work for the United States Geological Survey.

Dr. Lahee during the summer undertook a study of certain metamorphic rocks of New Hampshire. In addition he has published during the year in the American Journal of Science, two papers on the metamorphic rocks of Rhode Island; one entitled, "Crescentic Fractures of Glacial Origin," and the other, "Relations of the Degree of Metamorphism to Geological Structure and to Acid Igneous Intrusion in the Narragansett Basin, Rhode Island," in three parts.

During the summer of 1912 Mr. MacKenzie was engaged in a geologic investigation of the coal fields south of the Crowsnest Pass, in Southwestern Alberta, for the Geological Survey of Canada.

W. LINDGREN.

## DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING.

During the past year there has been substantial progress in the Department, partly by a revision of the theoretical instruction making use of new developments in the profession, and partly by growth of work in the Department and by transfer of certain work to the Department. There has resulted both an extension and a consolidation of the curriculum. Thus, there has been added a course in Ship Drawing in the second half of the second year, supplementing the course of lectures on Ship Construction already provided. The provision for work in the Department during the second year stimulates the interest of students and fits them better for working in shipyards during the summer. Again the Department by special request, has begun this current year to read aeronautics with students of the Course for Naval Constructors, now that construction of aeroplanes for the Navy is under the supervision of that Corps.

The instruction in Marine Engineering for the regular Course, including steam-turbines, has been extended and improved (1) by the transfer to the Department of all instruction in the dynamic action of moving parts of reciprocating engines and (2) by the provision of a course in the Application of Steam-turbines to Marine Propulsion.

The Department has been carrying two options for the Department of Mechanical Engineering, (1) Marine Engineering and (2) Steam-turbine Engineering. In consequence of certain changes in that Department and especially of a reduction of time available for the option it has been found advisable to change the title of the first option to Engine Design and to provide for it within the Department of Mechanical Engineering. Students desiring instruction in marine engineering can get it in Course XIII in connection with naval architecture. The option of

and tested in the summer. The work of the past summer has been presented to the Society of Naval Architects etc. and need not be detailed farther than to say that positive information has resulted for the design of tow boats of both harbor and sea-going types. The means for this investigation were provided by Messrs. Arthur C. James and Clinton H. Crane of New York and Messrs. William Endicott, Jr., and Henry A. Morss of Boston. The continuance of such work now appears to depend on the munificence of individuals, but much would be gained if investigation along this or some similar line could be made permanent, with provision for laboratory work for students. In 1910 we substituted tests on the *Froude* for part of the work of our students in the engineering laboratory, and have desired to do the same the present year but being short handed we were unable to do so. The experiments were made under the direction of the head of the Department by Professor Everett assisted by Mr. Pulsifer; Mr. Keith concurrently computed results from the data.

An exceptionally interesting series of experiments was made by Assistant Naval Constructor R. T. Hanson and J. C. Hunsaker as the basis of their graduation theses on the U. S. S. *Sterett*, which was sent to Boston for that purpose. The vessel is of the type known as a torpedo-boat destroyer having the speed of twenty-eight knots per hour; the experiments consisted in determining the twisting moment on the rudder-head while the vessel was turning at various speeds and with several assigned helm-angles. The several elements required for the tests, such as time, revolution of the propeller, helm-angle and pull on the rudder-chains were automatically recorded on a strip of paper by a recording device like that devised for the *Froude*. A special dynamometer was applied to the rudder chain, without disturbing the normal arrangements, and a helm-angle indicator was attached to the rudder-

Steam-turbine Engineering is to be continued by the Department.

The tendency of the growth of classes in the Department noted last year is being realized this year and it is likely to be permanent in consequence of the completion of the Panama Canal and also in consequence of legislation affecting the conditions of owning and building ships in the United States. With this return to normal conditions comes the need of the appointment of an instructor in marine engineering, which appointment has been withheld for the two past years.

Though the Department has not made formal propositions for a summer school, work of that nature has been given for many years, both in mould-loft work and in model-cutting. At request of the Navy work of both kinds has been given to students of naval construction. Though it perhaps cannot be recognized as instruction in the Course, there has always been opportunity for students to work during the summer in shipyards and many have profited by it. The friendly relations which the Institute has had with shipyards has kept open such opportunity for practically all who desired it. It is expected that more formal arrangements can be made if required.

The Department has always been alive to the importance of experimental investigations and has had many important opportunities along this line in conjunction with the merchant marine, the Navy and the Revenue Cutter Service. Material for a large portion of graduation theses has been afforded from such opportunities, but the Department has sought such cooperation whether or not it could be so used. More recently as related in previous reports the Department has been able to carry on systematic investigations during the summer in the Charles River Basin on the *Froude* and the *Fulton*. The latter was built in the Institute shops during the winter

head. All the apparatus was tested and rated in the laboratories of the Institute and when installed on the *Sterett* worked correctly so that the experiments were made with precision and rapidity; seventy-four turning tests were completed in seven hours of a single day.

By a concerted understanding the principal yacht clubs and racing associations of Massachusetts individually appointed Professor Everett yacht measurer for the past season, his appointment being influenced by the fact that he is a member of the Department. This arrangement proved so satisfactory that it has been continued for next year and may be put on a permanent basis. Special interest attaches to the yachting season next year because there is to be held the fifth series of International Sonder Class Races off Marblehead under the joint management of the Kaiserlicher Yacht Club of Kiel, and the Eastern Yacht Club of Boston.

C. H. PEABODY.

## DEPARTMENT OF MATHEMATICS.

During the two years covered by the present report, the principal changes in the Department of Mathematics have been the following:

In the first year Professor George has completed a revision of Wells' Trigonometry, which renders it better adapted to our use than the text previously employed.

First-year work in mathematics has been made uniform for all regular students by the discontinuance of the abridged course in the second term for students in chemistry and biology.

In the third year the time for mathematics has been increased for students in Mechanical and Electrical Engineering from 30–60 to 45–75. For the former group the new work consists mainly of applications of mathe-

matics to miscellaneous problems in mechanics, collected in a special pamphlet by Professor Bailey. For the Electrical students, as well as for those in Physics and the Naval Constructors, Professor Wilson's new Advanced Calculus is employed, the time being devoted to approximate computations by series, the elements of vector analysis, etc. in addition to the former work in differential equations. It has thus become unnecessary to continue the previous fifteen-hour course in vector analysis.

There has been a gradual increase in the sizes of undergraduate classes, particularly in the third year. This year, for example, after starting with seven third-year sections, it became necessary, mainly on account of accessions from other colleges, to form three additional sections. It is to be hoped that the pressure of class work, particularly in the first term, may be relieved by an additional appointment in the near future.

During the year conference has been had with the Departments of Physics and Mechanics with a view to correlating our second-year work more closely with theirs and enabling them to avail themselves of all the mathematical preparation the students have previously had.

To our list of elective advanced courses there have been added Statistical Methods in Theoretical Physics, and Analytical Mechanics, by Professor Wilson; Curve Tracing, and Elementary Theory of the Potential Function, by Dr. Hitchcock; Thermodynamics, by Dr. Phillips. It has seemed best to make the first-term work in Fourier's Series somewhat complete in itself, leaving the second-term work optional with certain other mathematical subjects.

Professor Webster Wells has retired, after long service in the Department, on account of protracted ill health. Professor Wells graduated at the Institute in the Department of Civil Engineering in 1873, becoming at once instructor in mathematics. After subsequent study in

Europe he was appointed Assistant Professor in 1883, Associate Professor in 1885, and Professor in 1893. Since 1900 he has been able to do but little teaching and has had continuous leave-of-absence since 1906. He has rendered in the past notable service to mathematical education by his numerous and widely-used text books, prepared as they had been with extreme care and attention to details. He has also served the Institute as Secretary of the Faculty, and, for a time, as Bursar.

Professor Moore of the Department spent the summer in part at the University of Bonn and also attended the International Mathematical Congress at Cambridge.

H. W. TYLER.

## DEPARTMENT OF DRAWING AND DESCRIPTIVE GEOMETRY.

During the past year Associate Professor Adams was advanced to the rank of Professor of Drawing and Descriptive Geometry, and Mr. Henry K. Burrison was promoted to Assistant Professor of Drawing and Descriptive Geometry.

Professor Burrison is a graduate of the Civil Engineering Department in the Class of 1875, and has been connected with the instruction in the Department of Drawing and Descriptive Geometry since 1877. Professor Burrison, during this same period, has taught Mechanical Drawing and Free-hand Drawing in the free evening drawing schools of the City of Boston, and is the author of a text book on "Elementary Mechanical Drawing and Projections."

Mr. George W. Duncan was again engaged as half-time assistant.

At the mid-years Mr. Samuel E. Gideon was granted a leave of absence until the end of the second term, to engage in special work at the University of Texas. During

his absence his class work was divided between Professors Bradley and Kenison.

There were no marked changes in the course of instruction during the past year. Several new Descriptive Geometry plates have been designed and printed.

The number taking first year Mechanical Drawing and Descriptive Geometry was 388. The number taking first year Freehand Drawing was 396. In the second year 255 students were taking Descriptive Geometry. 106 were taking advanced Freehand Drawing. 57 students attended the special class in Descriptive Geometry given for the benefit of students entering from other colleges with advanced standing. The total number of students taking Mechanical Drawing and Descriptive Geometry was 700. The total number taking Freehand Drawing was 502. Last year the corresponding totals were 663 and 480. The increase has been almost entirely in the first year classes.

The fifth year architectural students added a number of decorative figures to the Huntington Hall frieze. This completes the decoration of the hall, which has been under the charge of Professor Brown for the last five or six years.

Frequent meetings of the Instructors in this Department were held during the second term to discuss the equipment of quarters for the Drawing Department in the new Institute buildings in Cambridge. Floor plans and estimates were submitted early in the summer.

ALFRED E. BURTON.

## DEPARTMENT OF ENGLISH.

The work of the English Department has during the year been continued along the same lines as before. The work of the special section for foreign students has been thoroughly organized, and is proving of much efficiency. Since it is the policy of the Institute to admit men of satisfactory standing in mathematics and professional subjects despite their inability to use the English language with accuracy and address, such a section had become a necessity. It is, of course, a burden to the Department, but the Instructors in charge of Freshmen have carried the additional load uncomplainingly.

The example set by the Institute in the matter of English entrance examinations is being followed not only by technical schools but by the universities. The theory is that the object of this examination is solely to ascertain whether a candidate is or is not in a condition to take up Institute work in English with advantage. What the candidate has done, the means by which he has arrived at this end, is of no consequence except as shown in results. The effort to make an examination paper which shall be purely a test of what a student really and effectively knows, how far his mind has been developed, may not have been ideally satisfactory; but the Department, after half a dozen years of trial, is confirmed in the belief that the theory of its departure from old forms, although at first rather daring, has been amply justified.

The only change in the personnel of the Department during the last year has been the replacing of Mr. Gunn by Herbert W. Smith, A. M.

ARLO BATES.

## DEPARTMENT OF MODERN LANGUAGES.

During the past year some notable changes have been made and the general efficiency of the Department increased. Course II now has a foreign language requirement in the second year. The modern language work in the second year of the various courses, has been more closely articulated with the professional aims of the students, and now Courses IV, IX and XIII are the only ones which have no foreign language requirement in the second year.

The work in German is this year distributed among six instructors in thirty-six sections, averaging twenty-two students to each section, and fifteen hours of instruction to each instructor per week. There are five sections in French (including one in conversation just formed, optional for the Architects, and at their request, giving two half hours per week practice in speaking), one in Spanish and one in Italian, all assigned to one instructor, giving thirteen hours of instruction per week, with an average of fourteen students in each section.

One hundred and forty-seven applicants for admission to the Institute from other colleges have either wholly or partially satisfied our German requirements for the respective Courses which they wished to enter by records from the institution from which they came, also one hundred and twenty-five have similarly satisfied our French requirement.

Dr. Herman R. Kurrelmeyer has been promoted to be Assistant Professor of German, and Mr. Blachstein has been granted a leave of absence on account of his health. Mr. Paul R. Lieder, A. M., also Mr. Orie William Long, A. M., who have had successful experience in teaching and are now candidates for a higher degree at Harvard, have been appointed Instructors in Modern Languages for part time.

FRANK VOGEL.

# The Society of Arts.

During the year 1911–12 forty-six new members were admitted to the Society of Arts. Four lectures have been given as follows:—

677th meeting, January 22, 1912. "The Modern Aeroplane with some Personal Reminiscences." By Earl E. Ovington.

678th meeting, February 7, 1912. "Anticipating Business Conditions by the Study of Statistics." By Roger W. Babson.

679th meeting, February 20, 1912. "The Sun's Radiation." By Charles G. Abbott.

680th meeting, March 7, 1912. "Color Photography." By Louis Derr.

The attendance at the meetings of the Society of Arts has ranged from about two hundred to five or six hundred.

The magazine, Science Conspectus, which is published by the Society, continues to be very kindly received and although somewhat limited in its scope, it is filling an educational field not covered by any other similar publication.

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. XLVII., No. 2. Boston, January, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Summer Courses. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVII., No. 2, extra number. Boston, March, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Register of Former Students. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVII., No. 3. Boston, March, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Summer Surveying Camp. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVII., No. 3, extra number. Boston, May, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Programme. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVII., No. 4. Boston, June, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Officers of Instruction, 1912–13. Boston, November, 1912.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—Catalogue. *Bulletin of the Massachusetts Institute of Technology*, Vol. XLVIII., No. 1. Boston, December, 1912.

## ADMINISTRATIVE OFFICERS.

RICHARD C. MACLAURIN.—The Main Elements of Success. *Youth's Companion*, June, 1912.

RICHARD C. MACLAURIN.—The Sore Need of Aviation. *Aero Club of America Bulletin*, August, 1912.

RICHARD C. MACLAURIN.—Presidential Candidates and the Trust Problem in America. *The Contemporary Review*, November, 1912.

ROBERT P. BIGELOW—Guide to the Libraries of the Massachusetts Institute of Technology. 3rd Edition, 1912.

## CIVIL AND SANITARY ENGINEERING.

CHARLES M. SPOFFORD.—Our New Summer Camp. *Technology Review*, November, 1912.

CHARLES B. BREED.—Track Construction and Maintenance Details. Chapter IV. of "Freight Terminals and Trains" by J. A. Droege.

CHARLES B. BREED.—The Elimination of Grade Crossings on the Boston & Maine Railroad in Worcester. *Worcester Magazine*, December, 1912.

LEWIS E. MOORE.—The Cambridge Subway. *Engineering News*, Vol. LXVII., 1912.

LEWIS E. MOORE.—Comments upon Various Engineering Subjects. *Science Conspectus*, Vol II., Nos. 1, 2, 3, 4, and 5.

## MECHANICAL ENGINEERING.

CECIL H. PEABODY and EDWARD F. MILLER.—Steam Boilers. 3d edition, revised and enlarged. New York. John Wiley & Sons, 1912.

CHARLES E. FULLER and WILLIAM A. JOHNSTON.—Applied Mechanics. New York. John Wiley & Sons. 1912.

ROBERT H. SMITH.—Text book of the Elements of Machine Work. Industrial Education Book Co., 1912.

ROBERT H. SMITH.—Text book of the Principles of Machine Work. Revised and enlarged. Industrial Education Book Co. 1912.

ROYAL R. HEUTER.—The Engineering Laboratories of the Royal Technical University at Charlottenburg. *Bulletin of the Society for the Promotion of Engineering Education.* New York. John Wiley & Sons. 1912.

## MINING ENGINEERING AND METALLURGY.

ROBERT H. RICHARDS and CHARLES E. LOCKE.—Progress in Gold Milling in 1910. *Mineral Industry*, Vol. XIX., 1910.

ROBERT H. RICHARDS and CHARLES E. LOCKE.—Progress in Ore Dressing and Coal Washing in 1910. *Mineral Industry*, Vol. XIX., 1909.

HEINRICH O. HOFMAN (With CHING Y. WEN).—Heats of formation of some ferro-calcic silicates. *Transactions American Institute Mining Engineers*, 1910, XII., p. 495.

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# MASSACHUSETTS INSTITUTE OF TECHNOLOGY

## TREASURER'S REPORT

FOR THE YEAR ENDED JUNE 30, 1912

# Treasurer's Report.

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

The Treasurer submits herewith the Annual Statement of the financial affairs of the Institute for the year ended June 30th, 1912.

The following gifts and legacies amounting to $1,573,817.38 have been received during the year and call for the sincere thanks of the Institute.

| | |
|---|---|
| Anonymous donor, account of New Buildings, 1st installment | $1,000,000.00 |
| Mr. T. Coleman Du Pont, account of New Site, 1st installment | 100,000.00 |
| Mr. George Wigglesworth, account of New Site, 1st installment | 10,000.00 |
| A friend of the Institute, account of New Site, 1st installment | 10,000.00 |
| Estate of Nathaniel Thayer | 50,000.00 |
| Mr. Charles C. Jackson, account of New Site | 25,000.00 |
| Messrs. Kidder, Peabody, Co., account of New Site | 20,000.00 |
| Mr. Galen L. Stone, account of New Site | 10,000.00 |
| Mr. Frederick P. Fish, account of New Site | 5,000.00 |
| Mr. F. L. Higginson, account of New Site | 5,000.00 |
| Mrs. J. Malcolm Forbes, account of New Site | 1,000.00 |
| Messrs. Freeman & Lawrence, account of New Site | 50.00 |
| Estate of Emma Rogers | 106,582.84 |
| Estate of Frances M. Perkins | 99,794.67 |
| Real estate in Dorchester assessed | 5,500.00 |
| Real estate mortgages | 17,275.00 |
| Mrs. Helen Cabot, toward Samuel Cabot Fund | 45,000.00 |
| Jonathan Whitney Fund | 21,000.00 |
| Alumni Committee on Summer Camp-land ($7,123.40) and cash | 15,000.00 |
| A friend of the Institute, for Sanitary Research Fund | 6,000.00 |
| Messrs. H. J. Keith Co., for Egg Investigation | 5,000.00 |
| Dr. A. A. Noyes for Physico-Chemical Research Fund | 3,000.00 |
| Edison Research Fund | 2,000.00 |
| Mr. Arthur C. James, for the Weld Fund | 1,750.00 |
| Mr. Clinton H. Crane, for the Weld Fund | 250.00 |
| Estate of Susan E. Dorr | 1,500.00 |
| Architectural Fund, for Scholarships | 1,069.87 |
| Estate of Thomas Gaffield | 1,000.00 |
| Mr. C. W. Hubbard, for Applied Chemistry | 1,000.00 |
| Edison Electric Illuminating Co., for Vehicle Research | 1,000.00 |
| Gould Storage Battery Co., for Vehicle Research | 250.00 |
| Prof. F. J. Moore, for salaries | 600.00 |
| Mr. A. A. Corey, for salaries | 500.00 |
| Mrs. W. Scott Fitz, for Seismological Research Fund | 500.00 |
| Mr. Henry A. Morss, for Seismological Research Fund | 500.00 |
| Estate of Frances E. Weston, for Scholarships | 400.00 |
| Saturday Club, for Library | 300.00 |

| | |
|---|---|
| General Electric, Co. for Library | 50.00 |
| Mr. H. M. Dawes, account of Summer Camp | 285.00 |
| Herbert E. Fales | 250.00 |
| Mr. James P. Munroe, for Newsboys' Scholarship | 150.00 |
| Contributions for services | 110.00 |
| Mr. H. W. Jordan | 100.00 |
| 1912 Technique Board, account of Walker Memorial | 50.00 |

The Walker Memorial Fund with accrued interest now amounts to $133,453.91.

WILLIAM B. THURBER,
*Treasurer.*

## Schedule A.

### FINANCIAL RESULT OF THE YEAR ENDED JUNE 30, 1912.

| | |
|---|---|
| Total income (not including gifts for general purposes), Schedule B–1 | $652,646.77 |
| Total outgo, Schedule C–1 | 622,089.68 |
| Excess of income | $30,557.09 |
| Gifts for general purposes | 1,350.00 |
| | $31,907.09 |
| Net charges against surplus, per Schedule S | 4,147.43 |
| Net increase of surplus | $27,759.66 |

## Schedule B–1.

## INCOME.

| | | | |
|---|---|---|---|
| INCOME FROM STUDENTS:— | | | |
| Tuition fees* | | $351,735.15 | |
| Entrance examination fees forfeited | | 505.00 | |
| Locker fees | | 505.25 | |
| Supplies, chemicals, laboratory materials, etc. | | 17,044.26 | |
| Sale of lecture notes, etc. | | 1,435.42 | |
| Registration fees | | 145.00 | $371,370.08 |
| INCOME FROM INVESTMENTS OF:— | | | |
| Endowments for general purposes, Schedule P | | $35,522.08 | |
| Endowments for designated purposes, Schedule Q recapitulation | | 57,162.57 | |
| Income not credited to funds | | 4,471.77 | |
| Total per Schedule H | | $97,156.42 | |
| Less:— | | | |
| Accrued interest on purchases | $3,471.77 | | |
| Annuity to Samuel Dorr | 1,000.00 | 4,471.77 | 92,684.65 |
| RENTS FROM INVESTMENTS OF REAL ESTATE (net) | | | 25,437.85 |
| GRANTS BY NATION AND STATE. | | | |
| Annual grant from State of Massachusetts | | $100,000.00 | |
| State of Massachusetts for scholarships | | 4,000.00 | |
| Federal Aid Income from land grant, Act 1862 | | 5,015.01 | |
| Act 1890 | | 16,666.67 | 125,681.68 |
| GIFTS FOR | | | |
| Minor Funds, Schedule R: | | | |
| Physico-Chemical Research Fund | | $3,000.00 | |
| Sanitary Research Fund | | 6,000.00 | |
| Seismological Research Fund | | 1,000.00 | |
| Weld Naval Architecture Fund | | 2,000.00 | |
| Egg Investigation Fund | | 5,000.00 | |
| Edison Vehicle Research Fund | | 1,448.67 | |
| Vehicle Research Fund | | 1,250.00 | 19,698.67 |
| Other Designated Purposes. | | | |
| Salaries | | $1,100.00 | |
| General Library | | 350.00 | |
| Architectural Department | | 60.00 | 1,510.00 |
| INCOME FROM OTHER SOURCES. | | | |
| Interest | | $3,335.45 | |
| Rents, Huntington Hall | | 3,500.00 | |
| Sales of electricity, fuel and water | | 1,773.07 | |
| Lunch Room (net) | | 1,303.20 | 9,911.72 |

*In addition to the above, $24,962.50 was transferred from the income of scholarship funds in payment of scholarships.

INCOME FROM OTHER SOURCES—*Continued.*

| | | |
|---|---|---|
| Minor Funds, Schedule R: | | |
| Jacques Fund | $30.38 | |
| Letter Box Fund | 22.50 | |
| Research Laboratory of Applied Chemistry | 5,151.83 | |
| Roëntgen Ray Experiment Fund | 18.93 | $5,223.64 |
| INCOME FROM SOCIETY OF ARTS. | | |
| DUES. | | 1,128.48 |
| Total Income (Schedule A) | | $652,646.77 |
| GIFTS. | | |
| For General Purposes: | | |
| Estate Thomas Gaffield | $1,000.00 | |
| H. W. Jordan | 100.00 | |
| Herbert E. Fales | 250.00 | $1,350.00 |

Schedule C–1.

## OUTGO.

| | | |
|---|---|---|
| SALARIES OF TEACHERS: | | |
| Professors | $138,342.48 | |
| Associate Professors | 37,120.09 | |
| Assistant Professors | 61,560.87 | |
| Instructors | 68,920.97 | |
| Lecturers | 10,738.33 | |
| Librarian | 1,750.00 | |
| Assistants | 44,573.34 | $363,006.08 |
| WAGES ACCESSORY TO TEACHING. | | |
| Clerks | $1,578.00 | |
| Stenographers | 7,009.94 | 8,587.94 |
| DEPARTMENT SUPPLIES AND REPAIRS (Schedule C–2) | | 49,610.21 |
| ADMINISTRATION AND GENERAL EXPENSES. | | |
| Salaries of officers | $23,008.38 | |
| Salaries of assistants, stenographers, etc. | 16,985.58 | |
| Advertising and printing | 11,254.74 | |
| Insurance | 4,025.88 | |
| Other general expenses | 23,873.21 | 79,147.79 |
| OPERATION AND MAINTENANCE OF PLANT. | | |
| Mechanicians' wages | $5,181.70 | |
| Laborers' wages | 50,541.40 | |
| Light, heat and power | 28,697.99 | |
| Repairs (Schedule C–3) | 6,413.61 | |
| viz., wages $3,046.05 | | |
| other 3,367.56 | | 90,834.70 |
| MISCELLANEOUS EXPENSES. | | |
| Premiums charged off | | |
| General Investments | $1,373.00 | |
| Rogers Memorial Investments | 576.00 | 1,949.00 |
| Whitney Fund | $50.83 | |
| Ednah Dow Cheney Fund | 104.29 | 155.12 |
| EXPENSES OF MINOR FUNDS (excluding salaries). | | |
| Letter Box Fund | $2.25 | |
| Physico-Chemical Research Fund | 910.28 | |
| President's Fund | 486.90 | |
| Research Laboratory of Applied Chemistry | 1,484.34 | |
| Sanitary Research Fund | 1,691.70 | |
| Seismological Research Fund | 1,098.18 | |
| Travelling Scholarship in Architecture | 1,000.00 | |
| Weld Naval Architecture Fund | 2,903.22 | |
| Egg Investigation Fund | 1,350.54 | |
| Edison Research Fund (Electric Vehicle tests) | 705.33 | 11,632.74 |

| | | |
|---|---|---|
| AWARDS. | | |
| Edward Austin Fund awards | $4,200.00 | |
| Teachers' Fund awards | 1,500.00 | |
| Funds incomes (Schedule R) | 5,700.00 | |
| Bursar's Fund | 341.80 | |
| Newsboys' Scholarship Fund | 250.00 | |
| Fellowship Awards | 1,550.00 | |
| Architectural Prizes | 400.00 | $8,241.80 |
| INTEREST | | 7,161.14 |
| SOCIETY OF ARTS. Expenses | | 1,763.16 |
| Total Outgo (Schedule A) | | $622,089.68 |

**Schedule C–2.**

*Departments.*

| | | |
|---|---|---|
| Applied Mechanics | $1,614.59 | |
| Architecture | 1,950.00 | |
| Biology | 1,400.00 | |
| Chemistry | 17,121.55 | |
| Civil and Sanitary Engineering | 1,718.51 | |
| Drawing | 132.88 | |
| Economics | 428.73 | |
| Electrical Engineering | 3,763.61 | |
| English | 148.31 | |
| General Library | 2,572.05 | |
| Geology | 1,515.34 | |
| History | 706.31 | |
| Mathematics | 334.87 | |
| Mechanic Arts | 1,890.81 | |
| Mechanical Engineering | 2,930.13 | |
| Military Science | 987.83 | |
| Mining | 2,371.80 | |
| Modern Language | 269.91 | |
| Naval Architecture | 719.73 | |
| Physical Culture | 1,849.47 | |
| Physics | 5,073.78 | $49,500.21 |
| Additional disbursements from Gifts: | | |
| Architecture | | 60.00 |
| General Library | | 50.00 |
| | | $49,610.21 |

**Schedule C–3.**

**DETAIL OF PLANT REPAIRS.**

| | | |
|---|---|---|
| Rogers Building | $764.08 | |
| Walker Building | 625.52 | |
| Lowell Building | 493.59 | |
| Engineering A and B | 777.80 | |
| Engineering C | 135.84 | |
| Pierce Building | 444.91 | |
| Mechanical Laboratory | 212.98 | |
| Gymnasium | 106.49 | |
| Tech Union Building | 97.28 | |
| Boiler Room | 508.57 | |
| Power Plant | 1,719.13 | |
| Sundries | 527.42 | |
| | | $6,413.61 |

## Schedule D.

## TREASURER'S BALANCE SHEET

1.

### INVESTMENT ASSETS.

| | |
|---|---|
| Notes Receivable, Schedule F | $400,700.00 |
| Securities, Schedule H | 2,812,516.50 |
| Real Estate, Schedule I | 557,517.32 |
| Total Investments | $3,770,733.82 |
| Cash: In bank for investment | 442,501.52 |
| Total Investment Assets | $4,213,235.34 |

2.

### CURRENT ASSETS.

| | |
|---|---|
| Cash on hand and in banks, available for general purposes, Schedule E | $16,448.65 |
| Accounts Receivable, Schedule F–2 | 6,029.10 |
| Rents Receivable, less reserve, Schedule F–3 | 3,000.00 |
| Unexpired Insurance | 8,839.65 |
| Advances against Alumni Site Fund | 2,468.81 |
| Total | $36,786.21 |
| Excess of investment assets (brought down, contra) | 241,659.75 |
| | $278,445.96 |

3.

### EDUCATIONAL PLANT ASSETS.

**Lands, Buildings and Equipment. Nominal Values.**

| | |
|---|---|
| Total book value at beginning of year | $1,703,036.33 |
| Additions during year | 792,406.25 |
| Total book value at end of year, Schedule J | $2,495,442.58 |
| Unexpended balance in Investments as above | 956,616.26 |
| | $3,452,058.84 |

### WALKER MEMORIAL. ASSETS.

| | |
|---|---|
| Securities (page 17) | $133,088.30 |
| Cash in bank (reserved for investment) Schedule E | 365.61 |
| Total assets | $133,453.91 |

### IMPROVEMENT FUND. ASSETS.

| | |
|---|---|
| Securities (page 17) | $17,484.68 |
| Cash in bank (reserved for investment) Schedule E | 2,081.37 |
| Total assets | $19,566.05 |

## Schedule D.

JUNE 30, 1912.

1.

### ENDOWMENT AND OTHER FUNDS.

| | | |
|---|---|---|
| Funds for general purposes, Schedule P | | $1,266,959.67 |
| Funds for designated purposes, Schedule Q recapitulation, | | 1,702,689.06 |
| Minor Funds, Schedule R | | 12,464.38 |
| Funds' income balances, Schedule R | | 32,846.22 |
| Total Funds | | $3,014,959.33 |
| Excess of investment assets (carried down, contra) | $241,659.75 | |
| New Site cash and investments (carried down, contra) | 956,616.26 | 1,198,276.01 |
| | | $4,213,235.34 |

2.

### CURRENT LIABILITIES.

| | |
|---|---|
| Accounts Payable, Schedule N | $4,522.25 |
| Tuition fees in advance for year 1912–13 | 8,655.00 |
| Summer Camp fees in advance | 580.00 |
| Entrance examination fees | 2,800.00 |
| Students' deposits in advance, breakage and supplies | 1,250.00 |
| Students' deposits unclaimed | 2,278.75 |
| Locker deposits outstanding | 155.00 |
| Alumni Site Fund | 5,000.00 |
| Total | $25,241.00 |
| Surplus available for current expense | 253,204.96 |
| | $278,445.96 |

3.

### EDUCATIONAL PLANT ENDOWMENTS AND CAPITAL ACCOUNTS.

| | |
|---|---|
| Endowment for Electrical Engineering Building | $68,000.00 |
| New Site and Buildings Fund | 1,736,793.05 |
| Other endowment funds and capital (not analyzed into specific items) | 1,647,265.79 |
| | $3,452,058.84 |

### WALKER MEMORIAL FUND.

| | |
|---|---|
| Balance at beginning of year | $127,998.91 |
| Net income for year added to fund | 5,455.00 |
| | $133,453.91 |

### IMPROVEMENT FUND.

| | |
|---|---|
| Balance at beginning of year | $18,647.46 |
| Net income for year added to fund | 918.59 |
| | $19,566.05 |

## Schedule E.

## CASH RECEIPTS AND DISBURSEMENTS.

FOR THE PERIOD.

| | |
|---|---|
| Total Cash Receipts | $3,018,530.02 |
| Total Cash Disbursements | 2,577,536.52 |
| Excess of Receipts | 440,993.50 |
| Cash balance at beginning of year | 20,403.65 |
| Cash Balance at end of year | $461,397.15 |

Viz.:—

## CASH BALANCE.

Cash on deposit at banks:

| | SPECIAL. | GENERAL. | TOTAL. |
|---|---|---|---|
| Old Colony Trust Co. | | | $447,488.70 |
| Viz.: For Walker Memorial | $365.61 | | |
| " Improvement Fund | 2,081.37 | | |
| " Investment | 442,501.52 | | |
| " General Purposes. | | $2,540.20 | |
| National Shawmut Bank, For general purposes | | 11,766.45 | 11,766.45 |
| Total on deposit | | | $459,255.15 |
| Cash at office, For general purposes | | 2,142.00 | 2,142.00 |
| Cash balance as above | $444,948.50 | $16,448.65 | $461,397.15 |

## Schedule F–1.

## NOTES RECEIVABLE.

| | *Amount.* | *Rate of Interest.* |
|---|---|---|
| T. C. du Pont | $400,000.00 | 4% |
| Estate Frances M. Perkins. Burke Loan | 700.00 | 6% |
| Total | $400,700.00 | |

## Schedule F–2.

## ACCOUNTS RECEIVABLE.

| | |
|---|---|
| For Tuition: | |
| 9 Students | $4,050.00 |
| Miscellaneous: | |
| Chemical Breakage | 1,979.10 |
| | $6,029.10 |

## Schedule F–3.

## RENTS RECEIVABLE.

| | | |
|---|---|---|
| Arrears of Rents at beginning of year | | $11,500.00 |
| Rents due during year: | | |
| Huntington Hall | $3,500.00 | |
| Clarendon Street (Grundmann Studios) | 6,716.11 | |
| Edge Hill Road | 1,000.00 | |
| Massachusetts Avenue | 803.75 | |
| Mrs. Emma Rogers Estate | 17,676.99 | |
| | | 29,696.85 |
| Total | | $41,196.85 |
| Collection of Rents during year | | 32,696.85 |
| Arrears of Rents at end of year | | $8,500.00 |
| Less: Reserve for doubtful accounts | | 5,500.00 |
| | | $3,000.00 |

## Schedule G.

## INTEREST AND DIVIDENDS ACCRUED ON SECURITIES.

(Not computed.)

## Schedule H.

## SECURITIES: BONDS, STOCKS AND

| *Bonds.* | *Description of Securities.* | | | *Balance at beginning of year.* |
|---|---|---|---|---|
| $26,000.00 | Am. Dock & Improvement Co. 5%. | due | 1921 | $26,740.00 |
| 115,000.00 | Am. Tel. & Tel. Co. 4% . . . . | " | 1929 | 104,700.00 |
| 25,000.00 | Atchison, Top. & St. Fe R.R. 4% . | " | 1995 | 25,000.00 |
| 34,000.00 | Baltimore & Ohio R.R. 3 1-2% . . | " | 1925 | 30,090.00 |
| 10,000.00 | Boston & Northern St. Ry. Co. 4% | " | 1954 | — |
| 3,000.00 | Burlington & Mo. River R.R. (Neb.) 6% | | 1918 | 3,000.00 |
| 43,000.00 | Chesapeake & Ohio R.R. 5% . . | " | 1939 | 48,249.25 |
| 38,000.00 | Chi., Burl. & Quincy R.R. 4% . . | " | 1958 | 38,092.50 |
| 70,000.00 | Chi. Junc. & Union Stock Yards 5% | " | 1915 | 50,721.50 |
| 50,000.00 | Chi. Junc. & Union Stock Yards 4% | " | 1940 | 49,250.00 |
| 100,000.00 | Chi. & W. Michigan R.R. 5% . . | " | 1921 | 100,925.00 |
| 25,000.00 | Cumberland Tel. & Tel. Co. 5% . | " | 1937 | — |
| 17,000.00 | Delaware & Hudson R.R. 4% . . | " | 1943 | 17,312.50 |
| 7,000.00 | Electrical Securities Corp. 5% . . | " | 1940 | 6,965.00 |
| 3,000.00 | Illinois Central R.R. 4%. . . . | " | 1951 | 3,000.00 |
| 120,000.00 | Illinois Steel Co. 5% non conv. . . | " | 1913 | 119,586.25 |
| 7,000.00 | K. C., Clinton & Spgffd. R.R. 5% . | " | 1925 | 6,289.21 |
| 50,000.00 | K. C., Ft. Scott & Mem. R.R. 6% . | " | 1928 | 55,801.25 |
| 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% . . | " | 1987 | 17,910.00 |
| 3,000.00 | Lake Shore & Mich. Southern R.R. 4% | " | 1928 | 3,000.00 |
| 85,000.00 | Lake Shore & Mich. Sou'n R.R. 4% . | " | 1931 | 75,000.00 |
| 100,000.00 | Long Island R.R. 4% . . . . . | " | 1949 | 96,137.50 |
| 110,000.00 | Maine Central R.R. 4% . . . . | " | 1913 | — |
| 50,000.00 | Mass. Gas Co. 4 1-2% . . . . . | " | 1931 | — |
| 25,000.00 | Mass. Electric Co. Notes 4 1-2% . | " | 1913 | 24,468.75 |
| 50,000.00 | New Eng. Tel. & Tel. Co. 4 % . . | " | 1930 | 50,383.25 |
| 52,000.00 | N. Y. C. & H. R.R. (L. S.) 3 1-2% . | " | 1998 | 46,046.65 |
| 36,000.00 | N. Y. C. Equipment 5% . . . . | " | 1919 | 34,740.00 |
| 31,000.00 | N. Y., N. H. & H. R.R. 6% . . . | " | 1948 | 35,277.50 |
| 50,000.00 | Nor'n Pac. Gt. Nor'n R.R. 4% . . | " | 1921 | 48,500.00 |
| 10,000.00 | Old Colony St. Ry. 4% . . . . . | " | 1954 | — |
| 50,000.00 | Oregon R.R. & Navigation Co. 4%. | " | 1946 | 51,027.50 |
| 50,000.00 | Oregon Short Line R.R. 4% . . . | " | 1929 | 48,500.00 |
| 25,000.00 | Pacific Tel. & Tel. 5% . . . . . | " | 1937 | — |
| 25,000.00 | Portland General Electric Co. 5% . | " | 1935 | — |
| 50,000.00 | Rio Grande & Western R.R. 4% . | " | 1939 | 49,180.00 |
| 19,000.00 | Seattle Electric Co. 5% . . . . | " | 1929 | 18,430.00 |
| 6,000.00 | Seattle Electric Co. 5% . . . . . | " | 1930 | — |
| 25,000.00 | Southern Ry., St. Louis Div. 4% . | " | 1951 | 24,875.00 |
| 5,000.00 | Terminal R.R. Asso. St. Louis 4% . | " | 1953 | 5,000.00 |
| 50,000.00 | Union Pacific R.R. 4% . . . . . | " | 1947 | 51,480.50 |
| 28,000.00 | U. S. Steel Corporation 5% . . . | " | 1963 | 29,306.25 |
| 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 |
| 25,000.00 | Western Electric Co. 5%. . . . | " | 1922 | 24,875.00 |
| 100,000.00 | West End St. Ry. 4% . . . . . | " | 1917 | 101,102.50 |
| | | | | $1,606,094.36 |

## Schedule H.

## REAL ESTATE MORTGAGES.

| *Purchases and charges during the year.* | *Sales and credits during the year.* | *Balance at end of the year.* | *Interest received.* |
|---|---|---|---|
| — | $80.00 | $26,660.00 | $1,300.00 |
| $9,325.00 | — | 114,025.00 | 4,200.00 |
| — | — | 25,000.00 | 1,000.00 |
| — | — | 30,090.00 | 1,190.00 |
| 9,250.00 | — | 9,250.00 | — |
| — | — | 3,000.00 | 180.00 |
| — | 194.25 | 48,055.00 | 2,150.00 |
| — | 2.50 | 38,090.00 | 1,520.00 |
| 20,200.00 | 307.50 | 70,614.00 | 2,500.00 |
| — | — | 49,250.00 | 2,000.00 |
| — | 100.00 | 100,825.00 | 5,000.00 |
| 25,137.50 | 5.50 | 25,132.00 | — |
| — | 12.50 | 17,300.00 | 680.00 |
| — | 6,965.00 | — | 350.00 |
| — | — | 3,000.00 | 120.00 |
| 437.50 | 70,437.50 | 49,586.25 | 5,591.67 |
| — | — | 6,289.21 | 350.00 |
| — | 362.25 | 55,439.00 | 3,000.00 |
| — | — | 8,287.50 | 340.00 |
| — | — | 34,225.00 | 1,850.00 |
| — | — | 17,910.00 | 720.00 |
| — | — | 3,000.00 | 120.00 |
| 9,087.50 | — | 84,087.50 | 3,200.00 |
| — | — | 96,137.50 | 4,000.00 |
| 110,000.00 | — | 110,000.00 | — |
| 49,312.50 | — | 49,312.50 | 1,125.00 |
| — | — | 24,468.75 | 1,125.00 |
| — | 21.25 | 50,362.00 | 2,000.00 |
| — | — | 46,046.65 | 1,820.00 |
| — | — | 34,740.00 | 1,800.00 |
| — | 118.50 | 35,159.00 | 1,860.00 |
| — | — | 48,500.00 | 2,000.00 |
| 9,100.00 | — | 9,100.00 | — |
| — | 30.50 | 50,997.00 | 2,000.00 |
| — | — | 48,500.00 | 2,000.00 |
| 25,020.00 | — | 25,020.00 | — |
| 25,625.00 | 27.00 | 25,598.00 | — |
| — | — | 49,180.00 | 2,000.00 |
| — | — | 18,430.00 | 950.00 |
| 6,330.00 | 18.00 | 6,312.00 | — |
| — | — | 24,875.00 | 1,000.00 |
| — | — | 5,000.00 | 200.00 |
| — | 42.50 | 51,438.00 | 2,000.00 |
| — | 25.25 | 29,281.00 | 1,400.00 |
| — | — | 24,360.00 } | 1,980.00 |
| — | — | 18,259.00 } | |
| — | — | 24,875.00 | 1,250.00 |
| — | 22.50 | 101,080.00 | 4,000.00 |
| $298,825.00 | $78,772.50 | $1,826,146.86 | $71,871.67 |

## Schedule H. (*Continued.*)

| *Stocks.* | *Description of Securities.* | | | *Balance at beginning of year.* |
|---|---|---|---|---|
| 30 shares | Atlantic Cotton Mills | par | 100 | — |
| 272 " | Boston & Albany R.R. | " | 100 | $34,456.50 |
| 10 " | Boston Ground Rent Trust | " | 100 | 900.00 |
| 64 " | Boston Real Estate Trust | " | 1000 | 68,605.64 |
| 80 " | Chi., Mil. & St. Paul R.R. Pfd. | " | 100 | 5,738.00 |
| 2 " | Coöperative Publishing Co. | " | 1 | — |
| 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 | — |
| 50 " | Nashua Mfg. Co. | " | 100 | — |
| 3 " | New Boston Music Hall | " | | — |
| 50 " | Pray Building Trust | " | 50 | — |
| 17 " | Pepperell Mfg. Co. | " | 100 | 2,789.50 |
| 25 " | South Terminal Trust | " | 100 | — |
| | | | | $126,731.64 |
| MORTGAGE NOTES. | | | | |
| E. V. & C. T. Bigelow. | | | | — |
| W. H. Partridge | | | | — |
| INVESTMENTS W. B. ROGERS MEMORIAL FUND. | | | | |
| $25,000.00 | Atchison, Top. & St. Fé R.R. 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 | 7,854.75 |
| 1,000.00 | Chi., Burl. & Quincy R.R. 4% | " | 1958 | 1,000.00 |
| 40,000.00 | Chi. Junc. & Union Stock Yds, 5% | " | 1915 | 40,840.50 |
| 4,000.00 | Cin., Ind., St. Louis & Chi. R.R. 6% | " | 1920 | 4,000.00 |
| 37,500.00 | Detroit, Gr. Rapids & Western R.R. 4% | " | 1946 | 37,500.00 |
| 35,000.00 | Fort St. Union Depot 4 1-2% | " | 1941 | 34,825.00 |
| 27,000.00 | Kansas City Belt R.R. 6% | " | 1916 | 27,531.25 |
| 31,000.00 | N. Y. C. & H. R. R.R. 4% | " | 1934 | 30,225.00 |
| 1,000.00 | N. Y. Central Equipment 5% | " | 1919 | 965.00 |
| 3,200.00 | Republican Valley R.R. 6% | " | 1919 | 3,200.00 |
| 24,000.00 | Rome, Watert'n & Ogdensb'g R.R. 5% | " | 1922 | 25,332.50 |
| 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 |
| | | | | $248,055.00 |
| INVESTMENTS JOY SCHOLARSHIP FUND. | | | | |
| Mass. Hospital Life Insurance Co. | | | | $5,000.00 |
| Deposits in Savings Banks | | | | 6,817.63 |
| | | | | $11,817.63 |
| 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 SCHOLARSHIP FUND. | | | | |
| 4,477 shares | Clinton St. Real Estate Trust | | | — |
| $21,000.00 | United Electric Securities Co., due 1940 | | | — |
| | | | | — |
| Grand Total | | | | $2,004,698.63 |

**Schedule H.** (*Continued.*)

| *Purchases and charges during year.* | *Sales and credits during year.* | *Balance at end of year.* | *Interest received.* |
|---|---|---|---|
| $1,200.00 | — | $1,200.00 | — |
| 22,200.00 | — | 56,656.50 | $1,755.00 |
| — | — | 900.00 | 45.00 |
| — | $144.00 | 68,461.64 | 2,880.00 |
| — | 20.00 | 5,718.00 | 560.00 |
| 2.00 | — | 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 | — | 5,519.00 | — |
| 32,500.00 | — | 32,500.00 | 1,250.00 |
| 18.00 | 18.00 | — | — |
| 2,500.00 | — | 2,500.00 | — |
| — | — | 2,789.50 | 204.00 |
| 2,000.00 | — | 2,000.00 | 21.87 |
| $65,939.00 | $182.00 | $192,488.64 | $7,759.87 |
| $7,500.00 | — | $7,500.00 | — |
| 7,000.00 | — | 7,000.00 | — |
| $14,500.00 | — | $14,500.00 | |
| — | — | $24,470.00 | $1,000.00 |
| — | — | 5,310.00 | 210.00 |
| — | $31.75 | 7,823.00 | 350.00 |
| — | — | 1,000.00 | 40.00 |
| — | 280.50 | 40,560.00 | 2,000.00 |
| — | — | 4,000.00 | 240.00 |
| — | — | 37,500.00 | 1,500.00 |
| — | — | 34,825.00 | 1,575.00 |
| — | 131.25 | 27,400.00 | 1,620.00 |
| — | — | 30,225.00 | 1,240.00 |
| — | — | 965.00 | 50.00 |
| 130.00 | 3,330.00 | — | 104.67 |
| — | 132.50 | 25,200.00 | 1,200.00 |
| — | — | 961.00 | 45.00 |
| — | — | 4,040.00 | 200.00 |
| $130.00 | $3,906.00 | $244,279.00 | $11,374.67 |
| — | — | $5,000.00 | $206.25 |
| $119.28 | $6,936.91 | — | 119.28 |
| $119.28 | $6,936.91 | $5,000.00 | $325.53 |
| — | — | $10,000.00 | $412.50 |
| — | — | $2,000.00 | $90.00 |
| $497,000.00 | — | $497,000.00 | $5,322.18 |
| 21,105.00 | $3.00 | 21,102.00 | — |
| $518,105.00 | $3.00 | $518,102.00 | $5,322.18 |
| $897,618.28 | $89,800.41 | $2,812,516.50 | $97,156.42 |

**Schedule H.** (*Continued.*)

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 | 9,950.00 |
| 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 |
| | Total | | | $126,123.30 |

INVESTMENTS IMPROVEMENT FUND.

| | | | | |
|---|---|---|---|---|
| $8,000.00 | Electrical Securities Corporation 5%, | due | 1940 | $7,960.00 |
| 9,000.00 | U. S. Corporation 5% | " | 1963 | 9,524.68 |
| | Total | | | $17,484.68 |

**Schedule H.** (*Continued.*)

| | | | |
|---|---|---|---|
| — | — | $30,300.00 | $1,200.00 |
| — | — | 10,000.00 | 400.00 |
| $6,965.00 | — | 16,915.00 | 500.00 |
| — | — | 47,986.35 | 1,890.00 |
| — | — | 16,310.00 | 700.00 |
| — | — | 4,812.50 | 200.00 |
| — | — | 6,764.45 | 315.00 |
| $6,965.00 | — | $133,088.30 | $5,205.00 |
| — | — | $7,960.00 | $400.00 |
| — | — | 9,524.68 | 450.00 |
| — | — | $17,484.68 | $850.00 |

## Schedule I.

## INVESTMENTS IN REAL ESTATE OTHER THAN EDUCATIONAL PLANT.

| *Description of Properties.* | *Balance at beginning of year.* | *Balance at end of year.* |
|---|---|---|
| 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 |
| 117 Marlboro St. Land and Buildings | — | 27,000.00 |
| 200 State St. Land and Buildings | — | 38,000.00 |
| 11–13 Temple Place Land and Buildings | — | 291,000.00 |
| Norfolk St., Dorchester | — | 2,000.00 |
| | $176,917.32 | $557,517.32 |

## 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 Eng. 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 | |
| | $1,570,155.29 | |
| Summer Camp, E. Machias, Me. | 12,229.46 | |
| New Site and Preliminary Expense | 780,176.79 | |
| | | $2,362,561.54 |

*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 | | $2,495,442.58 |

## Schedule K.

## ADDITIONS TO LANDS, BUILDINGS AND EQUIPMENTS.

| | |
|---|---|
| Summer Camp, East Machias, Me. | $12,229.46 |
| New Site and preliminary expense thereon | 780,176.79 |
| | $792,406.25 |

## Schedule L.

## DEPRECIATION ON LANDS, BUILDINGS AND EQUIPMENT.

| | | |
|---|---|---|
| Depreciation written off to beginning of year, viz.: | | |
| On Buildings | $ | |
| On Equipment | | |
| Appreciation of lands (if any) | | |
| Total (net) at beginning of year | | $ |
| Depreciation written off during year, viz.: | | |
| On Buildings | $ | |
| On Equipment | | |
| Total | $ | |
| Appreciation of Lands | | |
| Net Depreciation written off | | |
| Depreciation written off to end of year | | $ |

## Schedule M.

## NOTES PAYABLE.

| Notes Payable: | *Amount.* | | |
|---|---|---|---|
| Temporary loans issued | $775,500.00 | | |
| Temporary loans paid | 775,500.00 | | |
| Total Notes Payable outstanding | | $ | 0.00 |
| Interest accrued | | | 0.00 |
| Total Notes Payable and Interest accrued thereon, | | | 0.00 |

## Schedule N.

## ACCOUNTS PAYABLE.

| | |
|---|---|
| Total per balance sheet | $4,522.25 |

## Schedule P.

## ENDOWMENT FUNDS FOR GENERAL PURPOSES.

### Increases and Decreases of Funds for General Purposes.

| *Invested Funds.* | *Funds June 30, 1911.* | *Income and other increases of funds.* | *Expenditures and other decreases of funds.* | *Funds June 30, 1912.* |
|---|---|---|---|---|
| *Restricted.* | | | | |
| George Robert Armstrong | $5,000.00 | $235.00 | $235.00 | $5,000.00 |
| Charles Choate | 32,149.54 | 1,511.03 | 1,511.03 | 32,149.54 |
| Martha Ann Edwards | 30,000.00 | 1,410.00 | 1,410.00 | 30,000.00 |
| James Fund | 163,654.21 | 7,691.74 | 7,691.74 | 163,654.21 |
| Katharine B. Lowell | 5,000.00 | 235.00 | 235.00 | 5,000.00 |
| Richard Perkins | 50,000.00 | 2,350.00 | 2,350.00 | 50,000.00 |
| John W. and Belinda L. Randall | 83,452.36 | 3,922.26 | 3,922.26 | 83,452.36 |
| William B. Rogers | 250,225.00 | 11,374.67 | 11,374.67 | 250,225.00 |
| Samuel E. Sawyer | 4,764.40 | 223.93 | 223.93 | 4,764.40 |
| Albion K. P. Welch | 5,000.00 | 235.00 | 235.00 | 5,000.00 |
| *Unrestricted.* | | | | |
| Sidney Bartlett | $10,000.00 | $470.00 | $470.00 | $10,000.00 |
| Stanton Blake | 5,000.00 | 235.00 | 235.00 | 5,000.00 |
| George B. Dorr | 49,573.47 | 2,329.95 | 2,329.95 | 49,573.47 |
| Arthur T. Lyman | 5,000.00 | 235.00 | 235.00 | 5,000.00 |
| James McGregor | 2,500.00 | 117.50 | 117.50 | 2,500.00 |
| Nathaniel C. Nash | 10,000.00 | 470.00 | 470.00 | 10,000.00 |
| Frances M. Perkins | — | *16,500.00 | — | 16,500.00 |
| Emma Rogers | — | *486,459.92 | — | 486,459.92 |
| Robert E. Rogers | 7,680.77 | 361.00 | 361.00 | 7,680.77 |
| Nathaniel Thayer | 25,000.00 | 1,175.00 | 1,175.00 | 25,000.00 |
| Charles G. Weld | 15,000.00 | 705.00 | 705.00 | 15,000.00 |
| Alexander S. Wheeler | 5,000.00 | 235.00 | 235.00 | 5,000.00 |
| Totals | $763,999.75 | $538,482.00 | $35,522.08 | $1,266,959.67 |
| *Less Gifts, Transfers, etc. | | 502,959.92 | 35,522.08 | |
| | | $35,522.08 | — | |

## Schedule Q.

## ENDOWMENT FUNDS FOR DESIGNATED PURPOSES.

### Increases and Decreases of Funds for Designated Purposes.

| *Invested Funds.* | *Funds June 30, 1911.* | *Income and other increas s of funds.* | *Expenditures and other decreases of funds.* | *Funds June 30, 1912.* |
|---|---|---|---|---|
| FUNDS FOR SALARIES. | | | | |
| Sarah H. Forbes | | | | |
| For General Salaries | $500.00 | $23.50 | $23.50 | $500.00 |
| George A. Gardner | | | | |
| For General Salaries | 20,000.00 | 940.00 | 940.00 | 20,000.00 |
| James Hayward | | | | |
| Professorship of Engineering | 18,800.00 | 883.60 | 883.60 | 18,800.00 |
| William P. Mason | | | | |
| Professorship of Geology | 18,800.00 | 883.60 | 883.60 | 18,800.00 |
| Henry B. Rogers | | | | |
| For General Salaries | 25,000.00 | 1,175.00 | 1,175.00 | 25,000.00 |
| Nathaniel Thayer | | | | |
| Professorship of Physics | 25,000.00 | 1,175.00 | 1,175.00 | 25,000.00 |
| Totals | $108,100.00 | $5,080.70 | $5,080.70 | $108,100.00 |
| Less Transfers | | | 5,080.70 | |
| | | | 0.00 | |
| FUNDS FOR FELLOWSHIPS. | | | | |
| Dalton Graduate Chemical | $5,298.37 | $235.00 | $200.00 | $5,333.37 |
| Williard B. Perkins | 7,405.43 | 282.00 | *1,000.00 | 6,687.43 |
| Richard Lee Russel | 2,091.57 | 90.00 | — | 2,181.57 |
| Henry Saltonstall | 10,458.00 | 470.00 | *400.00 | 10,528.00 |
| James Savage | 14,275.61 | 470.00 | 550.00 | 14,195.61 |
| Susan H. Swett | 10,645.45 | 412.50 | 400.00 | 10,657.95 |
| Totals | $50,174.43 | $1,959.50 | $2,550.00 | $49,583.93 |
| *Less Transfers | | | 1,000.00 | |
| | | | $1,550.00 | |
| FUNDS FOR SCHOLARSHIPS. | | | | |
| Elisha Atkins | $5,229.00 | $235.00 | *$200.00 | $5,264.00 |
| Billings Student Fund | 50,290.00 | 2,350.00 | *1,950.00 | 50,690.00 |
| Lucius Clapp | 5,640.83 | 235.00 | *400.00 | 5,475.83 |
| Isaac W. Danforth | 5,295.26 | 235.00 | *200.00 | 5,330.26 |
| Ann White Dickinson | 41,148.42 | 1,907.93 | *1,600.00 | 41,456.35 |
| Farnsworth Fund | 5,229.00 | 235.00 | *200.00 | 5,264.00 |
| Charles Lewis Flint | 5,276.51 | 235.00 | *200.00 | 5,311.51 |
| T. Sterry Hunt | 3,259.40 | 141.00 | *150.00 | 3,250.40 |
| Wm. F. Huntington | 5,214.10 | 235.00 | *200.00 | 5,249.10 |
| Joy Scholarship | 11,817.63 | 119.28 | *1,936.91 | 10,000.00 |
| Income Joy Scholarship | 631.25 | *2,252.99 | *437.50 | 2,446.74 |
| Elisha T. Loring | 5,279.79 | 235.00 | *200.00 | 5,314.79 |
| James H. Mirrlees | 2,929.90 | 117.50 | *100.00 | 2,947.40 |
| Nichols Fund | 5,229.00 | 235.00 | *200.00 | 5,264.00 |
| Charles C. Nichols | 5,270.29 | 235.00 | *200.00 | 5,305.29 |
| John Felt Osgood | 5,420.00 | 235.00 | *300.00 | 5,355.00 |

**Schedule Q.** (*Continued.*)

| | | | | |
|---|---|---|---|---|
| Richard Perkins | $54,058.43 | $2,432.94 | *$2,000.00 | $54,491.37 |
| Thomas Sherwin | 5,279.00 | 235.00 | *200.00 | 5,314.00 |
| Susan Upham | 1,188.48 | 47.00 | *150.00 | 1,085.48 |
| Ann White Vose | 62,572.02 | 2,834.73 | *2,000.00 | 63,406.75 |
| Newsboys Fund | 100.00 | *150.00 | 250.00 | 0.00 |
| Wm. Litchfield | 5,170.00 | 235.00 | *100.00 | 5,305.00 |
| Jonathan Whitney | 0.00 | *524,819.01 | *6,819.01 | 518,000.00 |
| Frances Erving Weston | 0.00 | *200.00 | 0.00 | 200.00 |
| Samuel Martin Weston | 0.00 | *200.00 | 0.00 | 200.00 |
| Totals | $291,528.31 | $540,392.38 | $19,993.42 | $811,927.27 |
| *Less Gifts, Transfers, etc. | | 521,736.99 | 19,743.42 | |
| | | $18,655.39 | $250.00 | |
| FUNDS FOR LIBRARIES AND READING ROOM. | | | | |
| Charles Lewis Flint Library | $5,000.00 | $235.00 | *$235.00 | $5,000.00 |
| William Hall Kerr Library | 2,000.00 | 94.00 | *94.00 | 2,000.00 |
| Arthur Rotch Architectural Library | 5,000.00 | 235.00 | *235.00 | 5,000.00 |
| Ednah Dow Cheney for Margaret Cheney Reading Room | 14,163.64 | 658.00 | 392.29 | 14,429.35 |
| Totals | $26,163.64 | $1,222.00 | $956.29 | $26,429.35 |
| *Less Transfers | | | 564.00 | |
| | | | $392.29 | |
| FUNDS FOR PRIZES. | | | | |
| Arthur Rotch Prize Fund in Architecture | $5,229.00 | $235.00 | $300.00 | $5,164.00 |
| Arthur Rotch "Special" Prize Fund in Architecture | 5,429.00 | 235.00 | 100.00 | 5,564.00 |
| Totals | $10,658.00 | $470.00 | $400.00 | $10,728.00 |
| OTHER FUNDS. | | | | |
| Edward Austin Fund | $360.000.00 | $16,920.00 | *$16,920.00 | $360,000.00 |
| Edward Austin (income reserve) | 17,408.80 | *1,692.00 | 0.00 | 19,100.80 |
| Bursar's Fund | 6,572.09 | 322.46 | *566.80 | 6,327.75 |
| Susan E. Dorr | 22,788.48 | *2,571.06 | *1,071.06 | 24,288.48 |
| Students' Loan Fund | 100.00 | 0.00 | 0.00 | 100.00 |
| Charlotte B. Richardson (Industrial Chemistry) | 37,378.78 | 1,756.80 | *1,756.80 | 37,378.78 |
| Arthur Rotch Architectural Fund | 25,000.00 | 1,175.00 | *1,175.00 | 25,000.0 |
| Saltonsall Fund | 44,467.24 | 2,089.96 | *1,567.47 | 44,989.7 |
| Teachers' Fund | 100,000.00 | 4,700.00 | *4,700.00 | 100,00 |
| Architectural Society Fund | 0.00 | *1,105.82 | *50.00 | 1,05 |
| Samuel Cabot Fund (Industrial Chemistry) | 0.00 | *45,528.75 | 0.00 | 45,52 /5 |
| Whitney Fund | 25,050.83 | 1,175.00 | 50.83 | 26,175.00 |
| Eaton Fund | 10,000.00 | *8,204.86 | *12,229.46 | 5,975.40 |
| Totals | $648,766.22 | $87,241.71 | $40,087.42 | $695,920.51 |
| *Less Gifts, Transfers, etc. | | 57,466.73 | 39,694.79 | |
| | | $29,774.98 | $392.63 | |

## Schedule Q. (*Continued.*)

### Recapitulation of Funds.

| | *At beginning.* | *Investment. Income.* | *Expense Outgo.* | *At end, including transfers, etc.* |
|---|---|---|---|---|
| SPECIAL FUNDS. | | | | |
| Funds for Salaries | $108,100.00 | $5,080.70 | $0.00 | $108,100.00 |
| Funds for Fellowships | 50,174.43 | 1,959.50 | 1,550.00 | 49,583.93 |
| Funds for Scholarships | 291,528.31 | 18,655.39 | 250.00 | 811,927.27 |
| Funds for Libraries and Reading Room | 26,163.64 | 1,222.00 | 392.29 | 26,429.35 |
| Funds for Prizes | 10,658.00 | 470.00 | 400.00 | 10,728.00 |
| Other funds | 648,766.22 | 29,774.98 | 392.63 | 695,920.51 |
| Total Special Funds. | $1,135,390.60 | $57,162.57 | $2,984.92 | $1,702,689.06 |
| GENERAL FUNDS. | | | | |
| Funds for General Purposes | $763,999.75 | $35,522.08 | $ 0.00 | $1,266,959.67 |
| TOTAL INCOME per Schedule B–1 | | $92,684.65 | $2,984.92 | |
| Gifts, transfers, refunds, etc. | | 1,082,163.64 | 101,604.99 | |
| GRAND TOTALS | $1,899,390.35 | $1,174,848.29 | $104,589.91 | $2,969,648.73 |

## Schedule R.

## INCREASES AND DECREASES OF MINOR FUNDS.

| MINOR FUNDS. | *Funds June 30, 1911.* | *Income and other increases of funds.* | *Expenditure and other decreases of funds.* | *Funds June 30, 1912.* |
|---|---|---|---|---|
| Research Laboratory of Applied Chemistry | $1,268.06 | *$6,358.09 | *$6,628.60 | $997.55 |
| Research Laboratory of Organic Chemistry | 1,550.00 | 0.00 | 0.00 | 1,550.00 |
| Roëntgen Ray Experiment Fund | 946.94 | 18.93 | 0.00 | 965.87 |
| Sanitary Research Fund | 1,783.13 | 6,000.00 | 5,441.64 | 2,341.49 |
| Seismological Research Fund | 98.18 | *1,003.60 | *1,101.78 | 0.00 |
| Traveling Scholarship in Architecture | 500.00 | *1,000.00 | *1,500.00 | 0.00 |
| Weld Naval Architecture Fund | 1,335.00 | *2,020.74 | *3,070.71 | 285.03 |
| Egg Investigation Fund | 160.82 | 5,000.00 | 5,019.37 | 141.45 |
| Vehicle Research Fund | 0.00 | 1,250.00 | 0.00 | 1,250.00 |
| Samuel Cabot Medal Fund | 37.90 | 0.00 | 0.00 | 37.90 |
| Dormitory Fund | 1,868.96 | 0.00 | 0.00 | 1,868.96 |
| Jacques Fund | 1,519.16 | 30.38 | 0.00 | 1,549.54 |
| Letter Box Fund | 30.50 | 22.50 | 2.25 | 50.75 |
| President's Fund | 1,452.58 | 500.00 | 486.90 | 1,465.68 |
| | | | | $12,504.22 |
| Edison Research Fund | 657.05 | 1,448.67 | 2,129.29 | **23.57 |
| Physico-Chemical Research Fund | 16.88 | *8,009.71 | *8,042.86 | **16.27 |
| | $13,225.16 | $32,662.62 | $33,423.40 | $12,464.38 |
| *Transfers, etc. | | 7,740.31 | 1,807.19 | |
| ** Overdrafts. | | $24,922.31 | $31,616.21 | |

| FUNDS' INCOMES. (Cash Accumulations.) | | | | |
|---|---|---|---|---|
| Edward Austin Fund Income | $4,604.17 | $16,920.00 | *$15,367.00 | $6,157.17 |
| Teachers' Fund Income | 21,960.04 | 4,700.00 | *6,790.00 | 19,870.04 |
| Jonathan Whitney Fund Income | 0.00 | 7,473.71 | *654.70 | 6,819.01 |
| | $26,564.21 | $29,093.71 | $22,811.70 | $32,846.22 |
| *Less transfers, etc | | 29,093.71 | 17,111.70 | |
| | | 0.00 | $5,700.00 | |

## Schedule S.

## SURPLUS ACCOUNT.

### CURRENT SURPLUS.

| | | |
|---|---|---|
| **LOSSES AND CHARGES.** | | |
| Appropriation for Alumni Site Fund | $5000.00 | |
| " " President's " | 500.00 | |
| Notes receivable charged off | 231.59 | |
| Refund of Students' Fees, 1910–11 | 100.00 | |
| | $5,831.59 | |
| Income transferred to Funds (net) | 9,282.49 | |
| | | $15,114.08 |
| **GAINS AND CREDITS.** | | |
| Outstanding Insurance paid in previous years | 5,361.38 | |
| Decrease in Rents Receivable Reserve | 4,500.00 | |
| Gain on Bond Sales | 567.50 | |
| Refund of Salaries, 1910–11 | 278.00 | |
| Students' Fees, 1910–11 | 150.00 | |
| Dept. overcharge previous year | 93.50 | |
| Phys. Chem. Research Fund | 16.27 | |
| | | 10,966.65 |
| Net charge to surplus Schedule A | | $4,147.43 |
| Balance July 1, 1911 | | $225,445.30 |
| Net increase for the year Schedule A | | 27,759.66 |
| Balance June 30, 1912 Schedule D | | $253,204.96 |

## REPORT OF AUDITING COMMITTEE.

BOSTON, November 11, 1912.

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

Your auditing committee report that Messrs. Harvey S. Chase & Company, certified public accountants employed by this committee, have examined the accounts of the Treasurer of the Massachusetts Institute of Technology for the year ended June 30, 1912, and have verified the cash at office and in banks and that their certificate is hereto annexed.

We have verified the list of securities held by the Institute.

JAMES P. TOLMAN,
WILLIAM L. PUTNAM,
EDWIN S. WEBSTER,
} *Auditing Committee.*

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*To the Auditing Committee*
*of the Massachusetts Institute of Technology:*

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, 1912. We have established the assets and liabilities of the Institute as set forth on the balance sheet in the printed report of the Treasurer. We have verified 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 of the books on June 30, 1912, were actually available and that these balances are correct. We have verified the details of the bookkeeping during the year and have checked and approved the report, which has been prepared by the Technology office force.

Very respectfully,

HARVEY S. CHASE & COMPANY.

*Certified Public Accountants.*