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Massachusetts Institute of Technology

REPORTS

OF THE

PRESIDENT AND TREASURER

PRESENTED AT THE DECEMBER MEETING OF THE CORPORATION

JANUARY, 1917

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Report of the President

TO THE MEMBERS OF THE CORPORATION:

In accordance with the by-laws I beg to submit to your Corporation a report of the affairs of the Institute, appending, as usual, reports from other administrative officers with reference to the work of their special departments.

The year with which this report deals has been a memorable one in the Institute's history, but its main events are so well known to your Corporation that it would be unnecessary to refer to them at all except for the expediency of continuing the official record. The event that overshadows all others has been the realization of the hopes and dreams of many years through the occupancy of a great group of buildings on a site that is ample for present purposes and that gives room for large expansion in the future. The first practical step towards this desired end was the securing of aid from the Commonwealth of Massachusetts to carry the Institute through the straits of its physical expansion, and without the assistance that was granted by the Commonwealth we should have been in real danger of running upon the rock of educational impoverishment. As soon as this aid was assured, Mr. Coleman du Pont made his timely and generous gift of half a million dollars which made it practicable for us to begin negotiations for the purchase of a site. This generosity stimulated others and it was not long before sufficient funds had been obtained to secure our present magnificent property of nearly fifty acres on the banks of the Charles. Now that we are here it is more generally recognized than ever before how admirably suited that site is for all our purposes. After the purchase of the land the next great step was taken when Mr. "Smith" made his munificent contribution to our building fund. We were extremely fortunate in the time at which we conducted our various operations for, owing to the depression then prevailing, we obtained our land at a very reasonable cost and secured the

main materials for the construction of our buildings when the market was at the very lowest. In spite of this, however, owing to the necessarily great scale of our buildings the total cost has reached very considerable dimensions, the whole undertaking, including land, filling, drainage, buildings, and equipment, having cost over seven millions of dollars. Especially during the last six months labor costs have risen extraordinarily and various other expenses have been raised correspondingly so that the work that was done in that period has cost more than was estimated. Fortunately, however, this increase was compensated by the fact that during the earlier and much longer period of our operations the cost of construction was kept below the estimate and the final result has been that the total expenditure on buildings and equipment has been very close indeed to the original estimate. It is especially gratifying, too, that we have been enabled to carry through an undertaking of such dimensions without encroaching at all on the slender endowment of the Institute. Indeed, during the period of construction and before the dedication of our new buildings in June last, we had made substantial additions to that endowment.

The main event of the year since my last annual report was, of course, the dedication to which I have just referred. It awakened great interest in the community, attracted the alumni in very large numbers from all parts of the country and of the world and stirred in them an enthusiasm unparalleled in the history of the Institute. The program of the Reunion of the alumni covered three days and comprised a series of notable achievements from the stirring oration of our Secretary, Mr. Munroe, with which the celebrations began to the closing exercises of the great banquet in Symphony Hall with its unique demonstration of the power of the telephone and its moving expression of loyalty on the part of the alumni. The official participation of your Corporation was confined to a single day, Wednesday, June 14. On the morning of that day the official delegates from various institutions and other distinguished visitors were received, and in the afternoon the buildings were formally dedicated in the presence of a vast assemblage that practically filled the Great Court. All the arrangements for this dedication were made under the direction of the Chief Marshal, Mr.

Coleman du Pont, aided by an able and unselfish group of workers, —Mr. Jasper Whiting, Mr. Arthur T. Bradlee, Mr. Franklin W. Hobbs, Mr. Frank L. Locke and Professor William T. Sedgwick, and these in turn were assisted by a much larger number of equally willing workers and to all of them the thanks of your Corporation have already been extended and were assuredly well earned.

At the Banquet that closed the program of the Alumni Association I was happily in the position to announce a further splendid benefaction from Mr. "Smith." He had already contributed three and one-half millions for the erection of buildings and he now offered to give five dollars for every three dollars that others would contribute to the endowment fund of the Institute before the first of January, 1917. He stipulated that his contribution should be limited to two and one-half millions which should be treated as a fund for the extension of the present educational buildings when and as required, but he left your Corporation free to use for general purposes the income of the unexpended portion of this fund. As soon as this most generous offer was announced the alumni immediately responded by promising a million dollars which has since been paid, the contributors being as follows: Mr. Pierre S. du Pont $500,000, Mr. Irénée du Pont $100,000, Mr. Lammot du Pont $100,000, Mr. Coleman du Pont $100,000, Mr. Charles Hayden $100,000, Mr. Edwin F. Adams $50,000, Mr. Charles A. Stone $25,000, and Mr. Edwin S. Webster $25,000. This left half a million dollars to be raised before the end of the year if the Institute was to reap the full benefit of Mr. "Smith's" great offer. As you are aware, practically every member of the Corporation has been working recently to secure the necessary amount.

During the summer various officers of the Institute, under the direction of the Bursar and the Superintendent of Buildings and Power, were busily engaged in moving the old equipment to our new buildings and installing the new. Great credit is due these officers for having conducted this operation without mishap and with such apparent ease. Few realize how much care is necessary to move the varied and delicate equipment of a department such as that of Physics and to do so as Professor Cross has testified, "with practically no injury even to the most delicate article,"

and when this achievement is extended throughout all the departments it is really a notable one. Few, moreover, will appreciate how great was the task of installing the new machinery and equipment of all kinds. An infinite variety of details had to be attended to and it is not surprising that there were some delays, especially when we consider the abnormal condition of the labor market and the extra difficulty in these days of obtaining even approximately on time the delivery of goods that have been ordered. Although everything was not in place at the beginning of the school year, the Institute opened at the appointed time and has carried on its work satisfactorily and regularly ever since. The vast machine is now in fairly good running order, but of course there are still numerous details to be attended to. The greatest delay occurred in the case of the Department of Mining Engineering and Metallurgy, but that, too, is now settling down to working conditions.

The move to Cambridge presented various problems regarding the use of our old buildings. The Garrison Street property has been sold and negotiations are in progress for the sale of our Trinity Place property. Our land and buildings on Boylston Street present, as your corporation is aware, some unusual problems, but we have made an arrangement with regard to these buildings which, if not permanent, is satisfactory for the present. The Walker Building has been placed at the disposal of Boston University for the use of its School of Business Administration and the Rogers Building has been modified internally so as to suit the requirements of our Department of Architecture. That Department is the oldest school of architecture in the country and has a notable history and a great prestige. It is specially gratifying to the students of architecture, as indeed to all the friends of the Institute, that this Department has at last been housed in a building adequate to its needs and worthy of the great ends for which it exists. Students of architecture more than any others should be susceptible to the influences of their surroundings and the improved condition of those surroundings will give a stimulus to the work of the school. The Rogers Building, in view of its intrinsic character and the traditions that have surrounded it, is not unworthy to become a great center of artistic endeavor not necessarily confined to architecture.

One of the compelling reasons for moving from the old site to the new was the necessity of providing proper living conditions for our students. This Institute has long drawn men in large numbers from every state in the Union as well as from outlying parts of the Commonwealth of Massachusetts and the student body now numbers almost two thousand. It is really essential for the proper conduct of such an institution to have a well-planned dormitory system, and it is fortunate that at the very outset we have been enabled to make at least a beginning with such a provision. The dormitory unit that has now been occupied houses about two hundred men. It is built on the plan of separate sections or houses of which there are six in number, two fraternities occupying the terminal sections. The funds for this dormitory were taken in part from the Alumni Fund, but came mainly from the gifts of Mr. Coleman du Pont and an anonymous donor. Owing to labor troubles and other difficulties there were various delays in the construction of the dormitory so that it was not ready for occupancy at the opening of the academic year. A considerable number of the students to whom rooms had been assigned were housed temporarily in the Museum of the Department of Civil Engineering. The arrangements made for their convenience proved workable and satisfactory and the conduct of the students during their occupancy reflected great credit upon them. Now that we have taken possession of the dormitory unit all the details of the regulation of the life there have been entrusted to student government acting in concert with an advisory committee consisting of three officers of the Institute—the Dean, the Bursar, and Professor Cole. The governing body of students has laid down rules for the conduct of the occupants of the dormitories and is charged with the duty of seeing that those rules are enforced. No proctors have been appointed and there will be no interference from the Faculty or the advisory committee to which I have referred if student government continues as effective as it has so far proved to be in this institution. I may add that the undergraduates have not been segregated in the various sections of the dormitories with reference to their classes. On the contrary some care has been exercised in securing representatives of all four classes in each section in the hope that the upper classmen will take a special

interest in maintaining high standards and handing on the best traditions to those that follow them.

Even the most rapid survey of the achievements of the last year would be incomplete without a reference to the extremely important forward step that was made in the establishment of the School for Chemical Engineering Practice. The plan of this School was presented to your Corporation by the Visiting Committee of the Department of Chemistry through its Chairman, Mr. Little, and since public announcements regarding it have been made it has received a great deal of commendation from those who are interested in the development of the chemical industries of the country. Thus, *Metallurgical and Chemical Engineering*, commenting editorially on the new school, says, "At the Massachusetts Institute of Technology a splendid idea of the most direct coöperation between education and industry is being transformed into reality with a boldness of conception that is unique in the history of chemical education. It is a grand pioneer experiment in education."

It would, of course, have been impracticable to put this plan into effect had it not been for the generosity of the anonymous benefactor who has contributed $300,000 to enable the work to be carried on for a number of years and for the support of industrial corporations whose plants are to be made a part of the educational machinery of the Institute. After due consideration it was decided that it would be expedient to begin with five carefully selected stations and these have been established, each in a different state, as follows:

Station A, at Bangor, Maine, with the Eastern Manufacturing Company, where the fundamental operations that enter into the manufacture of paper can be well studied.

Station B, at Everett, Massachusetts, with the New England Gas & Coke Company, a company operating on a large scale and offering in its plant excellent opportunities for the study of various high temperature reactions of great importance in different branches of industry.

Station C, at Niagara Falls, with the Carborundum Company, where high temperature electrochemistry is represented in all its phases.

Station D, at Stamford, Connecticut, with the American Syn-

thetic Color Company, whose operations exhibit the most important phases of the chemical engineering of organic chemistry.

Station E, at Allentown, Pennsylvania, with the Atlas Portland Cement Company, where large scale operations involving crushing and grinding are carried on with machines of many types and the chemistry of combustion and furnace control may be studied under the most favorable conditions.

Dr. Walker, who has for years been in charge of our Course in Chemical Engineering, has been relieved of part of his duties in order to have greater freedom to devote himself to the direction of the new School for Chemical Engineering Practice. Directors of the various stations have been selected and the School begins its work with a very promising set of students, as many as it is deemed expedient to deal with at the initiation of such an experiment. The various directors are entering upon their duties with enthusiasm and are reporting the most generous and hearty cooperation on the part of the representatives of the industries concerned.

PROBLEMS OF THE FUTURE

So much for the past year. Looking ahead, what are our prospects, and what are the most important problems with which this Institute is confronted? It has for long been national in its scope and influence and maintained a great record of achievement. It now occupies a magnificent group of buildings, on a site ideally located for its purposes and is coöperating with Harvard University in a way that must increase its effectiveness and add to its prestige. It enters upon its work in its new surroundings at an epoch in the world's history singularly appropriate to a great effort in the field of industrial education. Much has happened in recent years to bring home to the world at large and to this country in particular a realization of the fundamentally important fact that industrial development and national well-being depend very largely indeed on the progress of science and of its applications to practical affairs. If we have regard to the industrial needs of this country we can have no doubt that those needs demand the very best schools of applied science that are to be found anywhere in the world. Through the coöperation of Harvard and Technology and with the assistance of the friends

of both institutions we must build up here a still greater *national* school. Happily, we set out in our new buildings far better equipped for the task than was ever the case during the earlier history of the Institute.

We have, as has been said, a splendid physical equipment. It will doubtless require to be strengthened in various directions as new developments arise, but such strengthening may be expected to come as a matter of course. We have made an excellent beginning in providing dormitories for our students, have given them an athletic field admirably adapted to their needs, and are looking forward during the present year to the occupation of the great social center now rising on the embankment in memory of President Walker. So much for physical things. On the still more important *human* side, we have students, most of them admirable in quality, drawn from all parts of the country and of the world in as large numbers as we care to admit. The numbers keep growing steadily and our problem is rather to limit than to increase them. The great thing needed is to maintain a sufficient supply of good teachers and investigators and the fundamental problem now and always must be to devise ways and means of maintaining this supply. Unfortunately, much has happened during the last generation to depress rather than to raise the teaching profession of America. It is not held in as high respect as it should be and particularly in the field of applied science the emoluments of the profession are dangerously low. Unquestionably our first and most urgent need is to increase the salaries of the regular staff so as to offset to some extent the increased cost of living and to make it possible for our teachers to carry on their work without constant anxiety as to how to pay their bills. The increase of salaries must be a first charge upon the endowment fund that we are now raising and the increase must be made as soon as we have cleared ourselves of temporary embarrassments and have learned from actual experience over a sufficient period of time, and not merely from estimates, what the cost of the maintenance of our plant actually is. When we have raised the salaries of our staff to a more satisfactory level we can consider the strengthening of that staff by the addition of more men of mark from without.

There are, however, other ways in which we can improve our

condition and make the profession of teaching here more attractive to able men. The most important of these is to provide more adequate facilities for research, a thing that should be done anyway owing to the great need of encouraging the spirit of investigation in *every* department of a great school of science. I have laid an emphasis on "every" in order to recall to your minds the importance of cultivating here the fundamental sciences at least as carefully as the so-called applied sciences. Personally, I deprecate the tendency to emphasize the distinctions between pure and applied science. It is a distinction that often has no real basis in fact, as pure science and applied science shade off into one another imperceptibly. Apart from this the methods that are used in solving the problems of applied science are in most cases the same as those employed in pure science and the fundamental principles are, of course, the same. The distinction usually turns on questions of purpose and motive—distinctions which are reduced to a minimum in our schools and which, outside the schools, have often less significance than is supposed. The motives that impel a man to solve a problem in the realm either of pure science or of its applications are as varied as the diversities of human personality. In an institution such as this the sciences that we pursue must be dealt with in all their phases. Here, at least, we can tolerate no rivalry between science pure and applied, and if we emphasize one more than the other it must be merely because for the time being it is most in need of encouragement. It is obvious that we can not have applied science without the sciences on which it is founded and it seems natural and proper that we should look first to our foundations. Here the departments affected are those of Mathematics, Physics, Chemistry, Geology, and Biology, and in every one of these departments we should have men of mark sufficiently free from other duties to carry on important researches themselves and stimulate to a like endeavor as many of their colleagues within the department as have aptitude for such work. (I may say in passing that many able and effective teachers have no powers of original work. In a teaching institution such men may be invaluable, if they are left to follow their natural bent and there could be no greater educational folly than to compel men to be investigators when nature fitted them for other spheres of usefulness.) To return

to my subject, however, we must do our best to encourage a spirit of investigation in the departments that deal with the fundamental sciences. It would be a splendid thing for the Institute if we had a special endowment for this purpose. The encouragement of research in the departments of pure science is of the first importance, not only because of the direct contributions to science that may be expected to come from such research. Apart from this it sets up a valuable reaction in the teacher by giving him another incentive to his work and adding greatly to his interests. A man who is a teacher and nothing more, unless he be one of those rare persons born for just such work, is in danger of finding himself in middle or later life somewhat deadened by the constant repetition of the same routine and he may pass on this deadness to his students. Nothing will keep him so alive to the interests of his own subject as the constant effort to extend the boundaries of his knowledge and to make contributions, whether they be notable or not, to the advancement of science. Here we must cultivate "pure" science, but in addition to this there is, of course, the vast field of applied science, a field that naturally attracts the greater attention from those who look at this Institute from without. In past years research work of great importance has been conducted in the Institute's laboratories of applied science just as it has been conducted within the departments dealing with the more fundamental subjects. Now, however, that we have vastly greater facilities in our engineering laboratories we should do everything possible to give our professors the opportunity to take full advantage of those facilities. Here, as elsewhere, progress depends very largely on endowment. The Department of Chemical Engineering did notable work in solving problems of great importance to industry when special funds were available that made it possible to carry on such researches. When those funds were diminished the work was correspondingly lessened, but it would rapidly rise again if money were available. The research work of the Department of Electrical Engineering has been enormously stimulated in recent years by the funds supplied for research purposes by the American Telephone & Telegraph Company, The Stone & Webster Company, and other progressive industrial organizations. That research work is directed most effectively by Dr. Kennelly,

whose stimulating presence in our laboratories is due to our agreement with Harvard University. Adjoining the Department of Electrical Engineering are the great series of laboratories under the general direction of Professor Miller, the head of the Department of Mechanical Engineering. These comprise a group of six laboratories each in charge of a different professor,—the steam and compressed air laboratory, the power measurement laboratory, the gas engine laboratory, the refrigeration laboratory, the laboratory for the testing of materials, and the hydraulic laboratory, unquestionably the most completely equipped of its kind in existence. In each of these laboratories important researches should be in progress and the professors in charge and their associates are anxious to do their utmost. The adjoining Department of Civil and Sanitary Engineering has a modest laboratory for dealing with the materials of road-making. This laboratory will doubtless have to be enlarged in the near future and we still lack adequate facilities for conducting research in certain branches of sanitary engineering. The Department of Public Health has a special importance at this time that I shall take the liberty of referring to later. The new laboratories of electrochemistry and applied physics afford excellent opportunities of research, and with sufficient endowment notable developments may be expected in this field of special promise. The Pratt School of Naval Architecture has not yet been erected but the funds for its construction and maintenance have come to the Institute most opportunely. It seems as if we were at the beginning of a new era in the history of ship-building in this country, and if the Institute is to contribute as it should to the national development in this field it must not only have competent designers, but make notable contributions to the advancement of the art. Several years ago it established a course in Aëronautical Engineering and simultaneously set up and equipped a modest laboratory for aërodynamical research. Excellent results have been obtained even with this equipment, but it must, of course, be extended before long if we are to keep pace with the rapid advance of aëronautics. The last addition to our buildings comprises a series of laboratories for mining, metallurgy and metallography. The metallographical laboratory will be directed by Professor Sauveur, whose contributions to the ad-

vancement of science have already earned him great distinction. The ore dressing laboratory, which is to be named in honor of Professor Richards, presents excellent facilities for research and negotiations are in progress for the carrying on of important investigations in our greatly enlarged metallurgical laboratory. However, no mere enumeration of a great series of laboratories such as I have referred to can give a real sense of their potential power if they are properly manned and properly maintained.

The training of men in the methods of scientific research is an essential part of our great task. Industry will call more and more loudly for such men as it appreciates their value more fully. In the coming competition industrial success will be more than ever dependent on the constant improvement of methods by scientific means. One of the greatest tasks of a school of applied science such as this is to turn out not a few but a large number of men who have not only a knowledge of science but experience and training in applying that knowledge to the solution of new problems. Our success here will depend far more on our Faculty than on our equipment although the Faculty can do little without adequate equipment.

No faculty is so strong in research that it can not be strengthened by the influx of new blood of the right quality. Doubtless, we should benefit by such an influx here, but we have excellent material already and the important problem is to make the most of it. This, of course, needs some money, but it needs far more than money. It calls for an earnest and careful consideration of problems of organization and a serious study of the means of encouraging every man within the Institute to do the very best that is in him. To study this problem I have recently set up a committee composed of representatives of this Corporation and of the Faculty and alumni, and I hope that in due time some practical and notable result will come from the deliberations of this committee. The end in view is to develop each department to the utmost of its capacity and to assemble all the departments together into an organized machine that will be thoroughly effective in advancing science and helping to solve the problems actually presented in our industries. Institutions like the Mellen Institute have been founded in this country and in other parts of the world for the solution of special industrial

problems. Here the range of our activities is so great that we need not be confined to a special field, for there are few problems that we might not profitably attack.

I must not presume too much upon your patience, but there are still some matters to which I should refer, however briefly, before closing. It goes without saying that progress and development are essential to a school of science. We can never be complete, there must always be something more to be done as new problems constantly arise or old problems are presented in a new light. I have already touched on what seems to be the greatest of the problems with which the Institute is confronted, that of organizing its forces so as to make itself an effective instrument of research constituting not merely a Massachusetts, but a *National Institute of Investigation* regarding the problems of industry. That is comprehensive enough to cover almost the whole field, but there are certain portions of that field that seem at the moment to call for special consideration. For the present I shall confine myself to three of these. For many years we have maintained a Course in Chemical Engineering, a Course that has grown with extraordinary rapidity within the last decade as the country's appreciation of the possibilities of the chemical industry has developed. For the improvement of that Course we have recently established the School of Chemical Engineering Practice to which reference has already been made. An important feature of that School is the opportunity that will be presented for assisting in the conduct of their research work those industrial concerns in connection with which stations are maintained. However, the idea of industrial research must be carried much further than that. The program of the School provides for a five-year course. During the first three years the student lays as thoroughly as possible the foundations of his scientific knowledge, of course with special reference to chemistry. His fourth year he spends in studying intensively the fundamental principles illustrated at the different stations. In the fifth year he returns to the Institute and devotes himself to the broadening and deepening of his knowledge of chemistry and its practical applications. It is an integral part of the plan that during this year he should have opportunities for carrying on investigations and it is of great importance that these opportunities should be of such a

character that he can continue his investigations for a longer time if his circumstances permit. If this is to be the case and the number of students in the School grows as is expected, we shall soon need larger and more completely equipped laboratories especially devoted to chemical industrial research. This will probably be the next addition to our laboratories after the erection of the Pratt School of Naval Architecture that has recently been provided for.

The second need that I would mention is the need of increasing our facilities for instruction and investigation in the field of highway engineering. New methods of locomotion and new means and materials of construction have entirely changed the problems of road-making and called for the application of scientific methods and the abandonment of "rule of thumb" procedure. A national association has recently estimated that during the next five years more than $2,000,000,000 will be expended in the construction and maintenance of state, county and town roads. It is not improbable that twenty-five per cent of this will be wasted through ignorance and lack of scientific method. Thirty-eight states in the Union have highway departments. The highway work of the counties and towns is in the hands of about one hundred thousand local officials and in each of the twelve thousand municipalities there are from one to twenty officers in charge of the department that deals with highways. In the states, counties and towns certainly not over five per cent and in the cities not over twenty-five per cent of the highway officials possess the training and experience that are necessary to perform, efficiently and economically, the duties imposed upon them. The only remedy for this is an adequate supply of properly trained men and the Institute should take its full share in maintaining that supply.

The third problem affects our Department of Public Health. This is a Department that, under the stimulating guidance of Professor Sedgwick, has made notable contributions to the public welfare through a long series of years. It has done excellent work with the facilities that have been available in training men as health officers in various parts of the country and the achievements of these men have reflected much credit on their training. In recent years the Institute has extended its efforts in this direction and, in alliance with Harvard University, established a School for Health Officers which is doing excellent work in an un-

pretentious way. I venture to suggest to you that the needs of the country call for a very considerable extension of the work of this School, but it goes without saying that such extension is impossible without adequate endowment. It must be unnecessary, in addressing your Corporation, to emphasize the fundamental importance of doing all that can practicably be done for the improvement of the public health. All will recognize that this lies at the very root of national well-being. Nor can it be necessary here to dispel the popular illusion that a health officer is merely a physician under another name, and that he should get his training in a medical school. Under modern conditions and through the modern development of science the profession of the health officer has become quite distinct from that of the physician, although needless to say the professions are allied. The opportunities of a medical school such as that of Harvard University and the engineering facilities of the Institute, particularly in the field of sanitary engineering, are needed properly to round out the training of a public health officer. If the school that is jointly maintained by these two institutions were adequately endowed Massachusetts and New England should continue to occupy their traditional position as leaders in the promotion of public health in the United States. Unless, however, they seriously bestir themselves, this leadership will pass elsewhere with results that will be deplorable for this section of the country. By bringing together the forces of Harvard University and the Massachusetts Institute of Technology and the State Department of Health of Massachusetts we could build up here a great Institute of Public Health that would have a profound influence on the future of the race. The necessary endowment is unfortunately lacking, but the need for an institution of this kind is great and the time most opportune. "Never before has so much interest been felt in personal and public health, never before has the scientific knowledge available been so abundant or so easily applied, and never before have communities and individuals been as ready as they are today to make fundamental reforms to improve the general health." Thus writes the Director of our Department of Public Health. I earnestly commend the subject to your attention and to that of the community.

RICHARD C. MACLAURIN.

Reports of Administrative Officers

REPORT OF THE SECRETARY OF THE FACULTY

Some changes have been made in the schedules of several of the courses. In the second term of the first year some additional time has been allotted to the work in English. In courses I, III, VI and XI German has been omitted above the first year, and additional time has been given to instruction in English, not only in the second year, but also in the third or fourth year. In Course IV the Mathematics above the first term of the second year has been omitted, and in this Course also additional time has been given to English. The schedule of Course VI has been completely revised; and one very desirable feature of the new schedule is that several related subjects calling for a relatively small number of hours have been grouped together under two or three titles, so that fewer subjects appear in the schedule, and the distribution of the work will be such that a student will not be studying as many different topics at one time as formerly.

Of special importance has been the approval of the new Course in Chemical Engineering, combining as it does the School of Engineering Practice of about eight months with four and one-half years of study at the Institute. The eight months of engineering practice, taken by the students at five important industrial plants, follows the first three and one-half years of study, and is followed by one year of graduate study. The Course leads to the degrees of Bachelor and Master of Science. Twenty-three third-year students are now registered in this Course, and it is pleasing to note that almost without exception they are men of excellent attainments.

For many years the regular schedules have called for seven hundred and twenty hours of work per term, including all of the hours of exercise and also all of those allotted to preparation, being an average of forty-eight hours per week. During the

past year the Faculty has voted to adopt these as the number of hours per term for undergraduate courses, with the further regulation that the time devoted to class-room exercises, not including design, drawing, field-work, laboratory or thesis work, shall not exceed eighteen hours per week, hoping thereby to guard against excessive requirements.

Since about 1878 the Institute has had its "Colors," but not until last May, when the question of suitable costume for the Faculty at the dedication of the new buildings arose, were these colors formally adopted. The "Red and Gray" were adopted as the Institute colors, and the President appointed a committee to have these colors standardized.

In February, 1916, eighteen new students entered the Institute from other colleges, and in September three hundred and eight, making a total of three hundred and twenty-six. Of these one hundred and eighty-five had graduated from their previous college.

In June, 1916, the Faculty recommended three students for the degree of Doctor of Philosophy, two for the degree of Doctor of Engineering, and thirty-eight for the degree of Master of Science. Three hundred and seventeen were recommended for the degree of Bachelor of Science, two of whom were recommended for the degree in two Departments. It is interesting to note that for the first time the number of candidates receiving the degree of Bachelor of Science has exceeded three hundred.

ALLYNE L. MERRILL,
Secretary.

REPORT OF THE DEAN

The most important new problem that has come under the oversight of the Dean during the last year is the one in connection with the new dormitories. As soon as it was understood that the dormitories would be ready for occupancy at the opening of the school year 1916–1917, the question of the allotment of rooms and the government of the dormitories was intrusted by the President to a committee, of which the Dean was Chairman, and Mr. Horace S. Ford, the Bursar, and Major Edwin T. Cole, members.

The dormitories had been planned to house two fraternities and one hundred and seventy of the students. The two fraternities were to have the end sections of an L-shaped building, and the remainder of the building was to be divided into four sections with separate staircases.

The committee issued a circular of information to the students in May, 1916. This circular, with accompanying floor plans of the dormitories, was distributed among the undergraduates, and it was stated that applications for rooms in the dormitories should be filed on forms obtained at the Bursar's Office before June 1. The method of allotment of rooms as stated in the circular was to be as follows: sixty men from the third-year class would have the first choice of rooms, members of the second- and first-year classes, to the number of eighty, the next choice, accommodations for thirty men being reserved for the next year's first-year class. It was planned to distribute the members of all classes fairly uniformly throughout the dormitory sections.

The committee stated in the circular that the government of the dormitories was to be carried on under the superintendence of the President of the Institute, through the Dormitory Committee, but that it was the general desire to place the whole question of discipline and maintenance of good order and right living in the hands of the students themselves, the Dormitory Committee looking after the sanitation and janitor service and general regulations as to the allotment of rooms. Arrangements were to be made for the student members in each section to meet and elect a Section Committee at the opening of the term, the Section Committee to be composed of a member from each class,

with a fourth-year student acting as house representative. The four House Representatives thus chosen were in turn to choose a fifth member from among the fourth-year men in the dormitory. These five fourth-year men were to constitute the General House Committee.

The Dean's Report is for the year ending August 1, 1916. It might be well, however, to state that the occupancy of the dormitories began the first week in November, and that the arrangements for student government were carried out practically as suggested by the committee. The House Representatives were elected and they chose a chairman to represent them on the Student Institute Committee, thus linking the government of the dormitories with the general undergraduate government of student affairs. The House Representatives drew up a simple set of rules for the conduct of students and up to the time of writing this report the student management has been satisfactory.

The Student Adviser system instituted by the Technology Christian Association was carried on with marked success. The advisers got into communication with first-year students before the opening of the term and were on hand to help them in registration. Although the conditions for registration were perhaps more difficult this year than usual the Registrar informs me that the work never went on so smoothly. The Technology Christian Association, under the direction of its Secretary, investigated a large list of rooms in Cambridge suitable for students, and added a Registry of Rooms to their Handbook, which they distributed among the students. This Association is becoming of greater practical benefit to students every year.

There are two undergraduate clubs that are of general assistance to the whole student body, and it seems proper to recognize them as important factors of the student social life. The Walker Club, numbering twenty-five selected men from the fourth- and third-year classes, has for ten or more years conducted a reception to all the students coming to the Institute from other colleges, and it has been a very important factor in the perpetuating of Founder's Day, the general gathering of students on the seventh of December, to celebrate the birth of President Rogers.

The Cosmopolitan Club, now in its seventh year, has made a great difference in the life of the foreign students at the Institute.

It has not only been helpful to the foreign students but has been a signal element in broadening the minds of American undergraduates. It has always been an active, energetic club, and has generously thrown open its entertainments for the benefit of all students, and deserves a special room in the Walker Memorial.

The Dean is ex-officio chairman of five Faculty Committees, and the reports of these committees have all been submitted to the Secretary. It may be interesting, however, to note that the Committee on Recommendations of Graduates for Appointment reports that the number of applications for men received at the Institute during the year was three hundred and eighty-three, two hundred and sixty more than the year previous, and the number of men filing appointment blanks with the committee, one hundred and seventy-seven, which was eleven more than the previous year. The larger number of applications were for Mechanical Engineers and Chemists. This number included only applications sent to the committee. Many others were received by the heads of departments.

Following is an abstract from the report of the committee on Physical Training:

The classes in Physical Training were held under the direction of Mr. Frank M. Kanaly, assisted by Mr. Carleton J. Spear, of the Class of 1916. The required twenty weeks of compulsory exercise began November 8, 1915, and ended April 6, 1916. During the first term 356 men took the required work. In the second term 322. The number excused on account of physical disability was 27. The number of students who substituted athletic sports for gymnasium was 135, divided as follows: track athletics, 50; wrestling, 45; swimming, 11; rowing, 11; heavy gymnastics, 8; hockey, 7; boxing, 3. Forty-six students failed to pass in Physical Training and will be required to repeat the course.

Physical examinations for all first-year male students under twenty-one years of age were made in October, 1915, and again in April, 1916. On the basis of these examinations charts were plotted showing the improvement in measurements and strength. Five Cabot Medals were awarded to those students showing the greatest improvement and greatest efficiency in class work. The order of these awards is as follows: Everett Alexander Soars, '19,

Chi Yen Yuang, '19, Laurence Darius St. John, '19, Frank Percival Reynolds, '19, and Alfred George Hoffman, '19. Five men were given Honorable Mention: Walter Jeremiah Creedon, '19, Leighton Bruerton Smith, '19, Franklin Stanley Adams, '19, John Stanley Carter, '19, and Kuang-Piao Hu, '19.

One hundred and thirty-two in the first-year class were temporarily excused from work on account of illness; 115 in the second year; 68 in the third year; and 32 in the fourth year. This represents a very much lower per cent. of excuses in the later years. The absences in the first year are undoubtedly increased by the desire to be excused from compulsory gymnasium and drill. There were two deaths during the year; Mr. R. M. Snyder of the class of 1916, who died on February 20 of spinal meningitis, and Mr. F. B. Bill, of the class of 1917, who died in August from the effects of an electric shock.

At the request of Professor C. R. Mann, representing the Carnegie Foundation for the Advancement of Teaching, a special examination of forty-one first-year students was held for two days in the middle of April by Mr. C. L. Thorndike. The purpose of this examination was to obtain the relative ratings of these students by examinations testing their mental capacity in different directions. These ratings were to be used by the Carnegie Foundation for the study of students at the Institute and for the comparison of these men with those from other colleges. Full results of these examinations have not yet been given out but I have no doubt they will be of considerable interest and importance.

ALFRED E. BURTON,
Dean.

REPORT OF THE LIBRARIAN

There have been two prominent events in the history of the Library since the publication of the previous report,—first, the Reunion Exhibit, held in connection with the dedication of the new buildings, and second and most important, the moving to Cambridge.

The Librarian was invited to serve as a member of the Committee on the Reunion Exhibit, and especially, he was requested to take charge of a section of the exhibit which consisted of the published writings of officers and alumni of the Institute. This collection was known as the "Tech Men's Library." Room 1–202 was set apart for the display of these books, and was furnished with book-cases and tables. Here was gathered together a very interesting exhibit of about 2,000 volumes, most of which were given by their authors, some were lent, and some were taken from various departmental libraries, and to these were added a small collection which had been established for some time in the General Library. The contributions were mostly bound volumes, but there were included a number of interesting pamphlets, maps, and photographs. Several of the contributors had their works bound especially for this exhibit, and these collected works made a very handsome appearance. The room was kept open during the reunion week, and some member of the Library Staff was always in attendance to receive visitors and explain the collections. The collection is to be kept intact, so far as possible, and to be made a permanent feature of the new Central Library.

When the plans of the new Library were definitely established, preparations were begun for the moving to Cambridge. It was hoped that we should be able to move the books into the new library without having any of them inaccessible to the readers any longer than the time required to transport the books from Boston to Cambridge. Circumstances, however, prevented the attainment of this ideal. The books in the libraries of the Institute in Boston were separated into fourteen departmental libraries, counting the General Library as one, that library being practically only a departmental library of the English Department.

The problem before the Librarian was to combine nine of these libraries into one classification in the new Central Library. The libraries of the Department of Architecture, the Margaret Cheney Room, the Department of Mathematics, the Department of Mining, and the Department of Naval Architecture did not come into the main problem, as these libraries are for the present practically to be kept intact in the new arrangement. The problem was complicated by the fact that in some cases books had to be selected to be sent to the special departmental reading rooms.

Careful plans were made for the transfer of the books in the various libraries. These proved to be eminently successful, so that at the time when this report is submitted, practically every box of books has been placed upon its shelf in the new Library without undue delay, and without confusion.

The success of the moving could scarcely have been possible without the devotion and team-play of the Library Staff, who worked early and late to carry out the plans as carefully and thoroughly as possible. Mention should also be made of the excellent work of the students in the "Moving Gang," who applied both mind and muscle to the packing and moving of the books, and greatly lightened the labors of the Librarian and the Staff. The students in this work were R. Hamilton, '19, S. M. Boyd, '18, R. S. Bolan, '19, and E. F. Perkins, '19.

The Librarian is also under great obligation for assistance to Mrs. R. P. Bigelow, who spent many evenings in making the tabular entries from dictation and in helping to check the calculations, for upon the accuracy of these depended entirely the success of the moving operations.

The following statistics cover the fiscal year ending June 30, 1916, the last year of the Library under the old conditions. During this period the ordinary receipts of the libraries, exclusive of periodicals, was 4,915 pieces. These may be classified as to their sources as shown in Table I.

TABLE I. TOTAL RECEIPTS, 1915–1916.

By purchase		1,118
By binding		1,291
By gift, volumes	1,330	
pamphlets and maps	1,176	2,506
Total		4,915

This table includes the accessions to the Vail Library, of which four were by purchase, two by gift, and 387 volumes by the binding of pamphlets.

After deducting books worn out or lost, and pamphlets bound into volumes, etc., the net accessions to the Libraries for the year were 3,644 volumes, 630 pamphlets, and 138 maps, as shown in Table II.

TABLE II. NET INCREASE, WITH THE COST OF THE SAME DURING THE YEAR 1915–1916, AND THE TOTAL CONTENTS OF THE LIBRARIES OF THE INSTITUTE JUNE 30, 1916.

LIBRARIES.	NET INCREASE.				TOTAL CONTENTS.	
	Volumes.	Pamphlets.	Maps.	Cost.	Volumes.	Pamphlets and Maps.
General Library:						
General	226	185	..	$270.82	9,199	6,052
English	24	....	..	35.87	3,575	40
Military Science . . .	....	....	..	....	367	9
Walker Memorial . . .	39	....	..	33.40	526	....
Other Departments . .	9	....	..	37.05	186	1
Total, General Library .	298	185	..	$377.14	13,853	6,102
Architecture	121	1	..	422.11	5,174	311
Biology	128	13	..	211.93	4,642	1,501
Chemistry	300	108	..	483.97	14,184	3,947
Electrical Engineering .	202	27	..	352.63	2,828	215
Engineering	696	314	..	1,036.88	19,623	6,859
Geology	253	59	138	208.93	5,889	4,284
History and Economics	763	214	..	326.32	18,056	5,144
Margaret Cheney Room	3	....	..	31.40	899	15
Mathematics	79	14	..	116.91	2,693	397
Mining	148	51	..	242.92	6,505	1,270
Modern Languages . .	10	....	..	9.23	2,081	61
Naval Architecture . .	76	3	..	212.88	2,164	569
Physics	174	28	..	264.14	10,166	1,764
Total Libraries	3,251	1,017	138	$4,297.39	108,757	32,439
Special Collections:						
Vail	393	−387	..	232.40	13,793	17,696*
Baldwin	....	....	..	....	2,000	93
Wyeth	....	....	..	....	805	20
Grand Totals . . .	3,644	630	138	$4,529.79	125,355	50,248

* See estimate in previous Report.

The cost of maintaining the libraries, exclusive of salaries, was $6,310.75, including $232.40 contributed by the A. T. & T. Library Fund for the purchase and binding of books for the Vail collection. The distribution of these expenditures is shown on Table III.

TABLE III. BILLS APPROVED, 1915–1916.

For accessions by purchase and binding	$4,529.79
For subscriptions to periodicals	1,377.01
For office supplies, etc.	417.13
	$6,323.93
Received from the sale of duplicates, etc.	13.18
Total net Expenditures	$6,310.75

The Library has received during the year 1915–1916, 892 current periodicals, of these, 389 are charged to the Periodical Account; for which there was expended $1,377.01.

The work in the office of the Library included the writing of 5,013 cards which were added to the General Catalogue, making a total of 139,826 cards in the General Catalogue. The new cards were duplicated for the Departmental Catalogues.

Orders issued for new books numbered 1,251, and for binding, there were issued 1,339 orders, covering 2,029 volumes.

The practice of granting inter-library loans was continued, and we lent 83 volumes, and 7 were borrowed from other libraries. The circulation of books so far as our records have been kept, totals 18,443 volumes and pamphlets. The Architectural Department also lent 6,844 photographs, a large increase over the record of the previous year. The numbers of books lent from the various libraries are shown in the following table.

TABLE IV. CIRCULATION OF BOOKS, 1915–1916.

Architectural Library	5,682
Biological Library	624
Chemical Library	2,064
Electrical Engineering Library	2,076
General Library	2,718
Geological Library	695
Mining Library	608
Physical Library	1,345
Total	18,493

The General Library was open for business during the year, and was open in the evening for 265 days, the total attendance from 5 to 7 p. m. was 1,549, and from 7 to 10 was 856, the average for the whole year being 9 people to an evening.

The work on the Vail Library, referred to in the previous Report as the "American Telephone and Telegraph Collection," was continued actively during the year 1915–1916, by Mr. E. W. Chapin and his assistants. From his office there were issued 3,167 orders for binding books, of which 387 were pamphlets. The number of books catalogued during the year was 9,612; of these 429 were pamphlets. This makes a total of 12,010 books catalogued at the end of June, 1916, and has involved the writing of 41,032 cards. Adding these to the cards in the General Catalogue, June 30, 1916, makes the total catalogue of the Institute consist of 180,858 cards.

The extension of work incidental to the establishment of a real Central Library containing a large number of books on various subjects, has necessitated an increase in the Library Staff. Accordingly, the Librarian was authorized to engage an additional Cataloguer, and we are very fortunate in being able to obtain Miss Anne E. Harwood, a graduate of Simmons College, who comes to us well recommended after three years of experience in the Library of the University of Maine.

The Institute has been fortunate in the receipt of a large number of gifts, some of the more important of which are mentioned in the following list.

Donor.	Gift.
Frederic Amory, Esq.	50th Annual Report of Pennsylvania R. R. Co.
J. B. Babcock	22 Annual Reports of Various City Departments.
Hon. J. M. Beck	Beck, J. M. The Evidence in the Case.
General Wm. H. Bixby	Military Policy Pamphlets.
E. S. Balch	Balch, E. S. Mount McKinley Mountain Climbers' Proofs.
Chemical Rubber Co.	Handbook of Chemistry and Physics.
Class of 1873	2 Copies of George Ward Blodgett, A Memoir by H. A. Phillips.
C. Cobb	Pocket Dictionary of Common Rocks and Rock Minerals.

Major E. T. Cole	Carpenter, F. A. Climate and Weather of San Diego, Cal. 1913.
C. R. Cross	Agassiz, E. C. and A. Seaside Studies in Natural History.
" " "	Vestiges of Creation. 8th ed.
" " "	Ferrero, F. The Valley of Aosta.
" " "	Prof. and Mrs. Agassiz. A journey in Brazil.
" " "	Agassiz, L. The Structure of Animal Life.
R. A. Cram	Cram, R. A. Heart of Europe. 1915.
" " "	" " " Church Building.
L. Derr	Derr, L. Photography.
A. Dow	The Development of Scientific Rates for Electric Supply.
L. C. Eddy	Eddy, L. C. Laboratory Manual of Alternating Currents. 1915.
F. H. Fay, C. M. Spofford, and S. H. Thorndike	Report of the Watuppa Ponds and Quequechan River.
T. A. Fernley	Fernley, T. A. Price Maintenance.
S. K. Gunn	American Association of Infant Mortality.
W. T. Hall and R. S. Williams	Translation of Bauer & Deiss, Sampling and Chemical Analysis of Iron and Steel.
F. M. Hueffer	Hueffer, F. M. Between St. Dennis and St. George.
E. F. Langley	Poetry of G. da Lentino.
M. I. T. Alumni Association	Technology Review, Vol. 17.
E. Maxweiler	Maxweiler, E. Belgium Neutral and Loyal.
Metcalf & Eddy	Metcalf & Eddy. American Sewerage Practice.
National Assoc. of Manufacturers	Schwedtman, F. C. and Emery, J. A. Accident Prevention and Relief.
M. G. Overlook	Keyes and Brownlee. The Thermodynamic Properties of Ammonia.
Right Hon. Sir Gilbert Parker, Bart,	Parker, Sir G. The World in Crucible, and numerous documents relating to the War.
S. N. Pearmain	8 Books for the Economic Library.
J. D. Rockefeller, Jr.	Colorado Industrial Plan.
A. T. Robinson	Aydelotte, F. Materials for the Study of English Literature and Composition.
M. Rollins	Four Books on Banks.

S. Sato	Sato, S. Some Historical Phases of Modern Japan.
F. Schneider, Jr.	Schneider, F., Jr. Russell Sage Foundation.
" " "	A Survey of the Activities of Municipal Health Depts. in the U. S.
Stiles, P. G.	Styles, P. G. Nutritional Physiology.
H. P. Talbot	18 Books on the Study of Chemistry.
Technique Board	"Technique 1916."
Wiley & Sons, Inc.	Keyes and Brownlee. The Thermodynamic Properties of Ammonia.
A. G. Woodman	Woodman, A. G. Food Analysis 1915.

ROBERT P. BIGELOW,
Librarian.

REPORT OF THE REGISTRAR

The present registration of students is 1,957, the largest in the history of the Institute. The fourth-year class is practically identical in size with that of last year, in the third-year class there is a gain of twenty-two; the second year is practically the same size this year, while in the first year there is a gain of fifty-eight students, an increase of 13.5 per cent. The total gain in the registration is, however, 3 per cent. During the past ten years there has been an average gain in registration of 3.4 per cent. each year, ranging from 1 per cent. to a maximum of 8 per cent. in 1914.

The noticeable drop in the number of students who have returned for advanced work is due, I believe, to the unusually great demand for our students by industrial concerns. In times of financial depression, it has been noticed, that the number of students returning to the Institute for advanced work is greater than usual. The registration in the first-year class would not be affected by these conditions, because the students of this class are not trained to take these industrial positions.

Among the professional Courses the registration has increased in Mining Engineering, Chemistry, Biology, Chemical Engineering, Naval Architecture, and in Engineering Administration. In the other Courses the registration is either identical with last year, or there is a slight drop; the greatest drop is that in the Course of Sanitary Engineering. This drop is offset by the marked increase in the number of students studying Biology. Part of the increase in the number of students in the Course of Engineering Administration is due to the fact that this is the first year that all of the classes of this Course have been opened to students. The number entering this Course each year has, however, been uniformly large.

The number of new students who have entered the Institute from other colleges is greater than ever before, having risen in a year from 266 to 308, a gain of 16 per cent. Among our students there are now 327 graduates of other colleges, and in addition 261 who have been a year or more at another college, making a total of 588 students; 30 per cent. of the student body. Last year this per cent. was 29. Of those from other colleges, 55 per cent.

are graduates. One out of every six of our students is, therefore, a college graduate. About 40 per cent. of the students are new; of these new students 39 per cent., an increase of 4 per cent. over last year, are students who have come from other colleges.

For the first time, last June, more than three hundred Bachelor of Science degrees were awarded. The class of 1914 has now 301 such degrees. The number of advanced degrees now amounts to 329; 300 being Masters of Science, 23 Doctors of Philosophy and 6 Doctors of Engineering.

The number of women students remains small, a total of sixteen. More are in the Department of Biology and Public Health than elsewhere. The other courses having women students are Architecture, Chemistry, General Science, and Geology.

Considering the geographical distribution of students there is a marked increase in the number who come to us from the North Atlantic States; yet, the number of students who come to us from Massachusetts and Rhode Island is less than last year. There is another gain from the South Atlantic States; in particular from the District of Columbia, Florida and West Virginia. In the North Central District the loss of students from Illinois is more than balanced by the large gain from Wisconsin, and also more than offset by the gain from Missouri. There is a slight drop in the number of students from the Western States. This year we have students from all the United States except Nevada and New Mexico.

We have 122 students from foreign countries, which is more than 6 per cent. of the student body. The delegation of 40 Chinese students continues to be the largest from any foreign country. The countries sending six students or more are, Chili 8; China 40; Japan 8; Mexico 9.

The Faculty is larger, by eleven, than last year, the gain being in the associate, the assistant professors and the research professors. The number of Instructors is larger by eleven, and the whole staff by twenty-three. Not counting the 31 specially appointed lecturers, the ratio of teachers to students is: 1 to 6.5. The rate of gain in teachers during the past year has been greater than that of the gain in students.

Eighteen years and ten months is the average age of the entering class, one month less than last year. The average age

of graduation, last June, twenty-three years and five months, is found to be greater than that of the class of the year before. For more than ten years the variation in the age of the entering students has been very slight. There has been a slight tendency toward an increase in the age of graduation during the same period, due undoubtedly to the increased number of students admitted from other colleges.

The amount of undergraduate scholarship assistance given during the school year of 1915–1916 from Institute Funds was $25,775.00, and the number of students aided from this was 233. The amount was somewhat larger than before, and the number of students aided was slightly greater. There were 119 students aided by the state of whom 41 received whole scholarships, and 78 one-half scholarships: of these 108 students were aided only by the state. Hence, the number of students receiving scholarship aid, either by the Institute, or by the state or both, was 341, *i. e.* more than one in every six of the students. As usual, the largest group of students aided was in the second-year class.

In addition to this usual statistical report I am very pleased to refer to aid rendered my office by students of the Institute. One purpose in asking the officers and members of the freshman regiment to act as ushers and aids at the dedicatory exercises was to have a group of students somewhat familiar with the lay-out of the new buildings. This was a help at the opening of the buildings this fall, but as 40 per cent. of our students are new and the military organization is considerable less than 25 per cent. of the students, there remained a large proportion unfamiliar with the geography of our new plant. A few days before the Institute opened, with the confidence I have in the student activities, I presented to a group of seniors the problem of registration in the new buildings. They took hold of the problem with enthusiasm and arranged the details successfully and handled the new students with tact and sympathy.

Students from our new Department of Engineering Administration have come to the Registrar's Office from their study of statistics for subjects for investigation. Two, Messrs. C. E. Lowe and N. M. Marsilius made an interesting report on the mortality of Technology graduates. The work received the special commendation of state officials and professional statis-

ticians. The study included the following mortality comparison:

Technology with the Standard American Insurance rate; Technology with Yale University; Technology's major Courses with the Institute as a whole; Past graduates with recent ones.

The result of these investigations shows that Technology's death rate is 38.2 per cent. of the American Experience Mortality rate, and 67.3 per cent. of that of Yale. These facts conclusively disprove a high death rate at Technology.

At Technology, using one hundred as an index number to represent the composite death rate of all Institute Courses, the rates for other Courses are: Civil Engineers, 116; Mechanical Engineers, 93; Mining Engineers, 115; Chemists, 78; Electrical Engineers, 92.

Certain curves are published which have been made from the statistics gathered by these students.

THE CORPS OF INSTRUCTORS

	1909–10.	1910–11.	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Professors	44	45	41	56	56	69	73	72
Associate Professors	14	20	17	16	23	23	24	31
Assistant Professors	32	31	33	35	34	36	32	37
	— 90	—96	— 91	—112	—113	—128	—129	—140
Research Professors	—	—	4	16	18	10	7	6
			— 95	—128	—131	—138	—136	—146
Number counted twice	—	—	—	11	17	10	7	6
Faculty	90	96	95	112	114	128	129	140
Instructors	69	66	64	67	74	70	79	90
Assistants	51	55	50	49	54	52	58	54
					—128	—122	—137	—144
Faculty, Instructors and Assistants	210	217	200	228	242	250	266	284
Research Associates	12	8	5	4	3	5	5	5
Research Assistants	1	5	6	7	10	16	12	14
					— 13	— 21	— 17	— 19
Lecturers	18	21	25	16	19	23	30	31
Total Members of Staff*	241	251	245	254	272	291	308	331

* Omitting those counted twice.

YEARLY REGISTRATION SINCE THE FOUNDATION OF THE INSTITUTE

Year.	Number of Students.	Year.	Number of Students.	Year.	Number of Students.
1865–66	72	1882–83	368	1899–00	1,178
1866–67	137	1883–84	443	1900–01	1,277
1867–68	167	1884–85	579	1901–02	1,415
1868–69	172	1885–86	609	1902–03	1,608
1869–70	206	1886–87	637	1903–04	1,528
1870–71	224	1887–88	720	1904–05	1,561
1871–72	261	1888–89	827	1905–06	1,466
1872–73	348	1889–90	909	1906–07	1,397
1873–74	276	1890–91	937	1907–08	1,415
1874–75	248	1891–92	1,011	1908–09	1,462
1875–76	255	1892–93	1,060	1909–10	1,481
1876–77	215	1893–94	1,157	1910–11	1,509
1877–78	194	1894–95	1,183	1911–12	1,566
1878–79	188	1895–96	1,187	1912–13	1,611
1879–80	203	1896–97	1,198	1913–14	1,685
1880–81	253	1897–98	1,198	1914–15	1,816
1881–82	302	1898–99	1,171	1915–16	1,900
				1916–17	~~1,957~~ 1964

THE STUDENTS

Registration by Classes.	Classified.	Unclassified.	Total.
Fellows	7	—	7
Candidates for advanced degrees	38	—	38
Fourth Year	326	52	378
Third Year	309	168	477
Second Year	286	191	477
First Year	383	104	487
Special	—	—	100
Total	1,442	515	1,957

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.	Chemical Engineering X*.	Sanitary Engineering.	Geology.	Naval Architecture.	Naval Construction A.	Naval Construction B.	Electrochemistry.	Engineering Administration.	Total.
Graduates	—	5	1	—	4	11	6	—	1	—	1	1	1	1	4	—	—	2	—	38
4th C†	—	46	60	12	22	10	48	10	1	4	20	23	15	—	6	5	4	10	31	326§
4th U	1	6	8	1	5	3	12	2	—	—	3	1	1	1	—	—	—	1	9	52§
Total 3rd	1	52	68	13	27	13	60	12	1	4	23	24	16	1	6	5	4	11	40	378§
3rd C	—	41	67	7	29	8	47	4	4	—	40	—	7	1	7	15	—	11	23	309§
3rd U	—	19	32	7	19	9	32	3	3	—	13	—	2	2	2	—	—	4	21	168
Total 2nd	—	60	99	14	48	17	79	7	7	—	53	—	9	3	9	15	—	15	44	477§
2nd C	—	33	59	12	17	5	54	11	1	—	41	—	5	1	11	—	1	9	26	286
2nd U	1	17	37	9	20	7	27	4	1	—	29	—	—	—	6	—	1	5	27	191
Total	1	50	96	21	37	12	81	15	2	—	70	—	5	1	17	—	2	14	53	477
Specials	7	5	6	7	26	7	7	27	—	—	1	—	—	3	2	—	—	—	2	100
Total C	—	125	187	31	72	34	155	25	7	4	102	24	28	3	28	20	5	32	80	959§
Total U	2	42	77	17	44	19	71	9	4	—	45	1	3	3	8	—	1	10	57	411§
Total Sp.	7	5	6	7	26	7	7	27	—	—	1	—	—	3	2	—	—	—	2	100
Total	9	172	270	55	142	60	233	61	11	4	148	25	31	9	38	20	6	42	139	1,470
First year*																				487
																				1,957§

* First year students do not elect their courses until after this report is presented.
† C means classified; U means unclassified.
§ Deducting names counted in two courses.

TOTALS OF THE SAME CLASSIFICATION* FOR TEN YEARS

Year.	Engineering Courses.										Total of Engineering Courses.	Architecture.	Science Courses.				Total of Science Courses.	General Science.
	Civil Engineering.	Mechanical Engineering.	Mining Engineering.	Electrical Engineering.	Chemical Engineering.	Sanitary Engineering.	Naval Architecture.	Naval Construction.	Electrochemistry.	Engineering † Administration.			Chemistry.	Biology.	Physics.	Geology.		
1906–07	210	214	100	193	55	32	43	18	—	—	865	102	51	10	18	2	81	0
1907–08	210	227	118	202	59	39	37	16	—	—	908	84	53	17	21	0	91	2
1908–09	197	197	104	209	71	52	41	13	—	—	884	91	60	20	19	2	101	4
1909–10	207	204	99	203	84	60	41	14	14	—	926	109	44	22	4	1	71	4
1910–11	220	198	90	210	128	46	26	9	26	—	953	113	44	19	7	0	70	2
1911–12	217	214	79	203	129	57	19	8	35	—	961	112	56	20	4	2	82	3
1912–13	212	243	50	201	149	55	29	6	42	—	987	127	60	33	5	2	100	4
1913–14	209	279	37	196	141	65	31	7	38	—	1,003	130	78	36	12	3	129	3
1914–15	197	271	34	205	146	61	25	16	46	57	1,057	157	66	44	10	3	123	5
1915–16	188	279	46	235	157	60	28	23	50	99	1,165	163	59	48	14	4	125	4
1916–17	172	270	55	233	173	31	38	26	42	139	1,179	142	60	61	11	9	144	4

* First-year students do not elect their courses until after this report is presented.
† Only second- and third-year students in 1915–16.

STUDENTS AT THE END OF THE SCHOOL YEAR FOR THE PAST SIX YEARS

This table includes first-year students

	1911.	1912.	1913.	1914.	1915.	1916.
Engineering Courses						
Civil	267	276	264	263	251	234
Mechanical	264	273	331	365	329	337
Mining	108	91	61	58	49	56
Electrical	264	255	244	250	271	282
Chemical	161	183	181	205	192	200
Sanitary	70	72	80	90	78	69
Naval Architecture	41	38	42	52	49	62
Electrochemistry	41	44	57	53	65	63
Engineering Administration					102	146
Total Eng.	1,216	1,232	1,260	1,336	1,386	1,449
Architecture	132	145	148	160	183	173
Science Courses						
Chemistry	57	71	73	82	82	72
Biology	20	25	31	41	51	51
Physics	9	9	9	8	16	15
Geology	7	4	2	3	6	5
Total Science Courses	93	109	110	134	155	143
General Science	4	5	3	5	5	4
Special and No Course Classification.	9	11	18	10	18	17
Grand Total	1,454	1,502	1,544	1,645	1,747	1,786

RESIDENCE OF STUDENTS

NUMBER OF STUDENTS IN EACH YEAR, FROM 1906, COMING FROM EACH STATE OR TERRITORY

States and Territories.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
North Atlantic:	1,025	1,049	1,116	1,126	1,118	1,152	1,212	1,279	1,394	1,434	1,502
Connecticut	36	29	31	32	33	45	44	45	55	61	69
Maine	18	23	22	20	24	25	24	25	32	23	32
Massachusetts	764	781	839	852	840	860	890	954	1,032	1,060	1,110
New Hampshire	26	27	24	27	27	29	28	34	34	27	30
New Jersey	15	17	14	14	18	33	34	38	48	54	53
New York	84	82	99	99	106	90	108	102	113	121	122
Pennsylvania	55	57	53	46	37	39	43	42	42	46	57
Rhode Island	23	28	28	30	27	25	33	34	31	35	17
Vermont	4	5	6	6	6	6	8	5	7	7	12
South Atlantic:	52	48	51	44	41	49	45	66	66	72	81
Delaware	2	1	—	1	1	1	2	2	3	5	4
Dist. of Columbia	12	10	10	8	5	13	12	21	18	19	27
Florida	3	3	6	5	1	2	3	5	2	5	7
Georgia	4	2	3	4	5	3	3	4	3	5	5
Maryland	17	18	17	12	14	8	8	16	18	13	9
North Carolina	1	—	1	—	—	1	2	4	2	4	5
South Carolina	3	2	—	2	1	3	—	5	6	9	9
Virginia	8	9	11	10	12	15	13	8	11	8	8
West Virginia	2	3	3	2	3	3	2	1	3	4	7
South Central:	32	36	38	37	37	48	46	43	50	54	49
Alabama	2	4	3	5	4	6	3	5	5	5	5
Arkansas	—	2	1	2	2	2	2	1	2	1	1
Kentucky	5	5	4	4	2	8	7	10	10	8	9
Louisiana	2	—	3	2	5	4	4	5	5	7	7
Mississippi	5	3	3	3	6	8	7	5	6	5	2
Tennessee	3	6	8	8	5	3	2	2	5	5	8
Texas	15	16	16	13	13	17	21	15	17	23	17
North Central:	153	142	121	123	140	141	137	115	115	152	146
Illinois	37	31	23	24	33	30	25	15	27	37	31
Indiana	15	12	9	11	10	9	10	9	7	12	5
Iowa	14	16	14	5	4	9	8	11	10	12	6
Kansas	6	5	4	6	9	7	8	3	4	2	3
Michigan	7	8	7	10	9	9	7	12	14	15	16
Minnesota	14	8	8	10	8	7	14	15	6	5	6
Missouri	17	14	6	7	13	12	13	3	5	10	18
Nebraska	2	3	2	4	6	8	8	8	5	5	5
North Dakota	3	4	3	3	3	3	3	2	3	3	1
Ohio	30	26	30	27	33	37	32	25	28	44	43
South Dakota	1	3	3	5	3	2	2	2	1	3	1
Wisconsin	7	12	12	11	9	8	7	10	5	4	11
Western:	52	49	54	59	53	57	65	63	72	59	52
Alaska	—	—	—	—	—	—	1	1	—	—	—
Arizona	—	—	—	—	1	1	1	—	—	—	1
California	21	14	20	25	21	23	22	23	30	25	22
Colorado	12	10	5	6	9	11	14	13	14	11	8
Idaho	—	—	1	—	—	—	—	1	2	1	2
Montana	3	3	2	3	2	2	4	4	3	2	1
Nevada	1	1	1	—	—	—	—	—	—	—	—
New Mexico	—	1	1	1	—	—	1	1	1	1	—
Oklahoma	—	1	1	—	—	—	1	2	—	—	1
Oregon	2	3	4	7	8	11	14	11	10	5	6
Utah	3	3	5	5	3	3	2	2	2	5	5
Washington	5	12	13	11	9	6	6	5	10	7	4
Wyoming	5	1	1	1	—	—	—	—	—	2	2

	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Districts.	7	6	9	11	15	11	6	6	5	4	5
Canal Zone	—	1	1	1	1	—	—	—	—	—	—
Hawaii	2	2	1	2	2	3	2	1	2	1	—
Philippine Islands	3	1	1	1	4	3	1	2	1	1	2
Porto Rico	2	3	6	7	8	5	3	3	2	2	3
Total for the United States	1,321	1,331	1,389	1,400	1,404	1,458	1,511	1,572	1,702	1,775	1,835

Number of Students in Each Year, from 1906, Coming from Each Foreign Country

	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913	1914.	1915.	1916.
Foreign Countries.	76	79	72	79	102	101	100	113	114	125	122
Argentine Republic	1	2	2	4	5	2	1	—	—	1	1
Armenia	2	2	2	—	—	—	—	—	—	—	—
Australia	—	—	—	—	—	1	—	—	—	—	—
Austria-Hungary	3	3	—	—	2	1	2	1	2	1	1
Belgium	1	1	—	—	—	—	—	—	—	—	—
Bermuda	1	—	—	—	—	—	—	—	—	—	—
Brazil	—	2	3	1	2	3	5	7	4	1	1
Bulgaria	—	—	—	1	—	—	—	—	—	1	—
Canada	15	9	15	20	18	19	13	14	15	14	16
Cape Colony	1	1	1	—	—	1	—	—	1	—	—
Central America	—	—	1	—	—	—	2	—	2	—	—
Chile	1	1	1	1	3	1	—	1	—	—	8
China	7	9	10	11	27	36	37	42	46	49	40
Colombia	—	—	—	—	—	—	—	1	3	4	3
Costa Rica	—	2	3	2	1	1	—	1	—	—	1
Cuba	4	4	2	7	5	3	6	7	3	2	8
Cyprus, Island of	—	—	—	—	—	—	—	—	—	1	—
Denmark	1	1	—	—	1	1	—	2	1	1	1
Ecuador	2	2	2	1	1	1	1	1	—	—	1
Egypt	2	2	2	1	1	2	1	1	1	1	1
England	6	4	3	—	1	1	—	—	1	1	1
Finland	—	—	—	—	1	—	—	—	—	—	—
France	—	—	—	—	2	2	3	4	2	—	—
Germany	—	—	—	1	1	2	3	2	2	3	1
Greece	—	—	—	—	—	1	1	1	1	—	—
Guatemala	—	—	—	—	1	—	—	1	1	1	—
Honduras	1	—	1	3	3	2	—	1	1	2	3
India	1	1	2	1	—	—	2	1	2	2	1
Ireland	2	3	1	—	—	—	—	—	—	—	—
Italy	—	2	1	1	1	—	—	—	—	1	2
Jamaica	1	—	1	1	1	1	—	—	—	—	—
Japan	5	3	4	4	4	3	—	1	1	6	8
Korea	—	—	—	—	—	—	2	—	—	—	—
Mexico	12	12	6	10	9	5	4	7	7	10	9
Newfoundland	—	—	—	—	—	1	1	1	—	—	—
New Zealand	—	—	—	1	1	2	1	—	—	—	—
Nicaragua	—	—	—	—	—	—	—	—	—	2	—
Norway	—	—	—	—	1	—	—	—	—	2	3
Paraguay	—	1	1	1	1	1	1	1	1	—	—
Peru	1	2	2	1	2	1	—	2	3	3	—
Poland	—	1	—	—	—	—	—	—	—	—	—
Portugal	—	—	—	—	1	—	—	1	—	1	—
Russia	—	2	2	2	2	3	4	4	5	2	2
Salvador	—	—	—	—	1	—	—	1	—	3	1
Scotland	1	1	—	—	—	—	—	1	1	—	—
Siam	—	—	—	—	—	—	—	—	—	1	1
South African Republic	—	—	—	—	—	—	1	1	—	1	—
Switzerland	—	—	—	1	1	1	—	—	—	—	—
Syria	—	—	—	—	1	2	3	2	2	—	1
Transvaal	3	3	2	1	2	—	—	—	—	—	—
Turkey	1	2	1	2	2	1	5	3	6	8	6
Uruguay	1	1	1	—	—	—	—	—	—	—	—
Total in school	1,397	1,410	1,461	1,471	1,506	1,559	1,611	1,685	1,816	1,900	1,957

Women Students

Year and Classification.		Course.					Total.
		Architecture.	Chemistry.	Biology & P. H.	Gen. Science.	Geology.	
First Year	Classified	1	—	—	—	—	—	2
	Unclassified	1	—	—	—	—	—	
Second Year	Classified	2	—	—	1	—	1	6
	U'classifi'd	2	1	1	—	—	—	
	Special	2	—	1	—	—	1	
Third Year	Classified	1	1	—	—	—	—	3
	U'classified	2	1	—	1	—	—	
	Special	—	—	—	—	—	—	
Fourth Year	Classified	1	—	—	—	1	—	5
	U'classifi'd	—	—	—	—	—	—	
	Special	4	—	1	3	—	—	
Total		16	3	3	5	1	2	16

Statistics of Admission

	Classified.	Unclassified.	Special.	Total.
Admitted clear	190	—	—	190
" with one condition	92	29	—	121
" with more than one condition	38	42	—	80
" on examination	320	71	—	391
Total First-year Class	383	104	—	487

Admitted but did not enter	30
Candidates at June Entrance Examinations	729
Candidates in September for Entrance and Advanced Standing Examinations	399
Certificates of the College Entrance Examination Board submitted	183

TOTAL REGISTRATION AND NUMBER OF NEW STUDENTS

Year.	(1) Total No. of Students.	(2) No. of Students in the Catalogue of the previous year who remain in the Institute.	(3) No. of New Students entering before issue of Catalogue.	(4) Of those in column (3) the following number are classified First-year Students.	(5) No. of New Students not of the regular First-year Class.
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
1913–1914	1,685	1,049	636	295	341
1914–1915	1,816	1,084	727	348	379
1915–1916	1,900	1,146	754	321	433
1916–1917	1,957	1,165	792	369	423

GRADUATE STUDENTS

American Colleges and Universities Represented

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Alabama	1	2	2	2	1	2
Alabama Polytechnic Institute	..	..	1	..	1	2
Albany Medical	..	..	..	..	1	..
Allegheny	..	1	1	1	..	..
Amherst	2	3	7	8	6	10
Armour Institute of Technology	..	..	..	..	..	2
Baldwin	..	..	1	..	..	..
Baltimore Medical	..	..	..	1	..	..
Bates	1	3	3	3	..	4
Baylor	1	1	1	2	1	1
Bellevue	..	..	..	1	..	1
Bellevue Hospital, Medical	..	..	..	..	1	..
Beloit	..	2	3	2	1	2
Boston College	2	4	2	2	..	3
Boston University	3	3	2	..	1	4
Bowdoin	2	2	4	2	..	4
Brooklyn Polytechnic Institute	..	..	..	..	..	2
Brown	3	3	4	2	1	2
Bryn Mawr	1	1	..	..	..	..
Bucknell	..	..	1	..	..	..
California	2	..	1	2	3	7
Canisius	..	2	..	..	..	1
Carnegie Institute of Technology	..	..	..	1	..	1
Case School of Applied Science	..	1	..	1	..	6
Catholic University of America	..	..	..	1	..	5
Central	1	..	..	..	..	..
Charleston	..	..	1	1	2	1
Chicago	..	1	1	1	..	1
Cincinnati	..	..	..	1	1	1
City of New York	3	4	1	2	2	3
Clark	..	1	4	3	2	1
Clemson Agricultural	..	..	1	1	..	..
Colby	1	1	2	1	1	3
Colgate	..	..	1	1	2	2
Colorado Agricultural	..	..	..	..	1	1
Colorado College	2	1	..	1	1	1
Colorado School of Mines	..	1	..	2	..	1
Colorado University	..	..	..	1	..	1
Columbia	..	1	2	3	4	6
Cooper Union	..	..	..	..	..	1
Cornell	2	1	..	1	2	9
Cornell (Iowa)	..	..	..	..	1	..
Cotner	..	..	..	..	..	1
Creighton	..	..	1	1	1	..
Dakota Wesleyan	..	..	..	..	1	..
Dartmouth	6	9	7	7	4	22
Davis & Elkins	..	..	..	..	..	1
Denison	2	2	2	2	4	2
Denver	..	..	..	..	..	2
De Pauw	1	..	..	..	..	..
Doane	..	..	..	1	..	..
Drake	1	2	1	..	..	1
Drury	..	..	..	..	..	2
Earlham	..	..	..	1	..	..
Fargo	..	..	..	..	..	1
Franklin and Marshall	..	1	1	..	..	1
Furman	..	..	1	1	1	..
Geneva	..	..	..	..	..	1
Georgetown	2	1	2	1	1	2
George Washington	1	..	..	..	..	..
Georgia	1	..	1	..	1	1
Georgia School of Technology	..	..	2	1	1	4
Gonzaga (Spokane)	..	1	1	2	2	1
Grinnell	2	..	..	..	2	2
Grove City	1	1	..	..	..	..
Hamilton	2	3	3	3	3	4
Hamline	..	1	1	..	..	..
Harvard	8	8	11	23	44	46
Haverford	1	..	..	..	..	3
Highland Park	..	..	1	..	..	..
Hobart	..	..	1	..	1	1
Holy Cross	1	1	3	1	1	1
Hospital College of Medicine	..	..	..	1	..	..
Illinois	1	2	2	2	3	5
Iowa State	1	..	1	..	1	2
Jefferson Medical	..	..	..	1	..	..
John B. Stetson (De Land, Fla.)	..	..	..	..	..	2
Johns Hopkins	2	2	3	1	2	1
Juniata	..	..	..	1	..	..
Kalamazoo	..	..	..	..	..	2
Kansas	1	2	..	..	1	2
Kentucky	..	..	..	1	1	1
Kenyon	..	..	..	1	..	..
Lafayette	1	2	1	2	..	1
Lake Forest	..	..	..	..	1	1
Lawrence	..	..	..	..	..	1
Lehigh	1	..	..	..	..	4
Leland Stanford Junior	3	1	..	1	1	2
Lincoln	..	..	..	..	..	1
Lombard	..	..	..	..	1	1
Louisana State	..	..	..	..	..	1
Louisville	..	..	..	..	..	1
Loyola	..	..	..	1	1	1
Maine	1	..	1	..	3	7
Marietta	2	..	..	1	1	..
Maryland Agricultural	1	..	..	..	..	..
Maryville	..	..	..	..	1	1
Massachusetts Agricultural	..	..	..	1	1	6
Mass. Institute of Technology	6	17	22	32	3	16
Miami	..	..	..	1	2	2
Michigan	2	3	6	3	4	4
Michigan Agricultural	..	1	..	1	1	..
Michigan College of Mines	..	..	..	..	1	1
Middlebury	1	1	3	2	1	2
Minnesota	..	2	1	1	2	3
Mississippi	1	1	..	..	..	..
Mississippi Agricultural and Mech.	1	..	2	3	3	2
Missouri	1	..	..	..	1	3
Missouri Sch. Min. & Met.	1	..	..	..	..	..
Monmouth	..	..	..	..	1	1
Montana	1	1	1	..	..	..
Moore's Hill	..	..	..	..	1	1
Mount Holyoke	..	..	..	2	..	1
National Univ. Law School	..	..	..	..	1	..
Nebraska	1	2	1	..	..	1
Newberry	..	..	..	..	..	1
N. H. Agr. & Mech.	..	..	..	..	..	1
New Mexico	..	1	1	1	..	..
New York University	..	3	3	1	..	2

GRADUATE STUDENTS—*Continued*

American Colleges and Universities Represented

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
North Carolina	2	1	2	..	2	6
North Dakota Agricultural	2	2	1	..	..	..
North Western	..	..	1	1	..	3
Norwich	..	..	..	..	..	4
Notre Dame	..	..	..	..	..	2
Oberlin	4	3	3	1	2	5
Occidental	2	2	2	..	1	1
Ogden	..	..	1	1	2	1
Ohio Northern	..	..	..	1	..	..
Ohio State	..	1	..	..	2	2
Ohio University	..	..	..	..	2	1
Ohio Wesleyan	..	..	..	1	1	1
Oklahoma Agr. & Mech.	..	..	1	..	..	1
Oregon	2	1	1	1	1	..
Oregon Agricultural	1	1	..	1	1	1
Otterbein	1	1	..	..	..	..
Park	..	1	1	1	..	..
Pennsylvania (Gettysburg)	..	..	..	..	1	2
Pennsylvania Military	2	2	1	1	..	..
Pennsylvania (Pittsburgh)	..	..	..	..	1	..
Pennsylvania State	2	1	1	1	1	3
Pennsylvania University	..	..	..	3	2	10
Pittsburgh	..	1	..	1	..	..
Pomona	1	..	..	..	..	..
Princeton	7	3	6	6	6	9
Purdue	..	..	3	3	3	3
Radcliffe	..	..	1	..	2	4
Randolph-Macon	..	..	..	1	..	..
Reed	..	..	..	..	1	1
Rensselaer Polytechnic Institute	..	..	..	..	..	3
Rhode Island State	..	..	..	..	1	1
Rice Institute	..	..	..	..	..	1
Richmond	1	..	..	..	..	..
Rochester	2	..	..	1	3	7
Rutgers	1	..	..	..	..	1
Saint Anne	..	..	..	..	..	1
St. Anselm	..	..	..	..	..	1
St. Elizabeth (N. J.)	..	..	..	..	..	1
Saint John's	..	2	2	2	3	2
Saint Louis	6	3	..	..	..	..
Saint Mary's	1	1	1	1	..	..
Saint Olaf	..	1	1	1	..	1
Saint Xavier	3	1	..	..	..	1
Sacred Heart	1	..	..	..	..	..
Simpson	..	2	2	2	..	..
Smith	..	1	2	1	2	..
South Carolina	..	..	..	..	..	2
South Carolina Military	1	..	2	1	3	3
South Dakota State	..	1	..	..	..	..
Southern California	..	..	1	1	..	..
Southwestern	..	..	1	1	..	..
Spring Hill	4	4	4	2	3	1
Stevens Institute of Technology	..	..	..	1	..	..
Syracuse	..	1	1	3	1	2
Tarkio	..	1	..	..	..	..
Tennessee	..	1	1	2	2	1
Texas	2	4	3	4	2	3
Texas, Agr. & Mech. Coll. of	..	1	1	..	4	4
Throop	..	..	..	..	..	2
Trinity	..	..	..	3	2	..
Trinity (Washington, D. C.)	..	..	..	..	2	2
Trinity (N. C.)	..	..	..	..	1	..
Tufts	..	..	..	3	1	14
Tulane	1	..	..	..	1	1
Union	..	..	1	1	1	2
U. S. Military Academy	2	1	1	..	..	3
U. S. Naval Academy	9	6	8	10	15	22
Univ. of the South	..	..	..	..	..	1
Ursinus	..	..	1	1	1	1
Utah	..	..	..	..	..	2
Utah Agricultural C	..	..	..	..	..	1
Vermont	..	..	1	..	..	2
Valparaiso	1	..	..	1	..	1
Vanderbilt	..	..	..	..	..	1
Virginia	2	2	1	5	4	3
Virginia Military	1	1	..	3	7	5
Virginia Polytechnic Institute	..	..	1	..	1	..
Wabash	1	1	..	..	..	..
Washburn	1	2	..	1	1	3
Washington	..	1	..	1	..	6
Washington & Jefferson	3	2	1	1	..	2
Washington & Lee	1	2	1	1	2	4
Washington State	..	..	..	..	..	1
Wellesley	..	2	..	..	1	..
Wesleyan	..	..	..	1	1	7
Western Reserve	..	..	..	1	..	1
West Virginia	..	..	..	..	1	..
Whitman	2	1	1	1	1	..
Whitworth	1	..	..	..	..	..
William Jewell	..	..	..	1	1	..
William and Mary	1	1	1	2	1	1
Williams	5	11	11	10	12	10
Wisconsin	1	..	2	1	2	4
Wittenberg	..	..	..	..	1	..
Wofford	..	..	..	..	..	1
Wooster	..	1	2	2	3	3
Worcester Polytechnic	1	..	1	..	..	9
Wyoming	..	..	..	..	1	2
Yale	7	7	8	19	25	21
Yankton	1	1	..	..	..	..

GRADUATE STUDENTS—*Continued*

Foreign Colleges and Universities Represented

	1911–12.	1912–13.	1913–14.	1914–15.	1915–16.	1916–17.
Acadia University	..	..	..	..	..	2
Anhui Provincial (China)	2	2	2	..	..	..
Belgian Institute (Liege)	..	..	..	..	..	2
Cambridge (England)	1	..	..	..	..	1
Central Technical	..	..	..	..	1	..
Central Turkey	..	..	1	1	1	3
Central University of Quito	..	..	..	..	..	1
Chile	..	..	1	..	..	2
Chi-li Provincial (China)	1	1	1	1	1	..
Chinese Naval	4	4	4	4	4	4
Colegio Mayor de Unestra del Rosario	..	..	..	..	1	1
Dalhousie	1	..	1	1	..	1
Durham	..	..	..	..	3	..
Ecole Polytechnique (Montreal)	1	..	..	..	1	..
Escuela Industrial (Buenos Ayres)	2	1	..	..	..	..
Euphrates (Turkey)	..	1	..	..	..	1
France	1	1	1	..	..	..
Greece (Athens)	1	..	..	..	..	..
Gymnasium of Salonica	..	..	..	1	..	..
Havana	1	3	2	..	..	2
Heidelberg	1	..	..	..	..	..
Imperial German Naval College	..	..	..	..	..	1
Imperial Polytechnic (Shanghai)	8	8	8	7	2	..
Inst. National of Honduras	..	..	..	..	..	2
Institute National Central (Salvador)	..	..	..	..	2	1
Japanese Naval Engineering (Tokio)	1	1	1	..	..	1
Kiang Nan Provincial	..	..	1	1	1	..
Köng. Techn. Hochschule	..	..	..	..	1	..
Kyoto Imperial	..	..	..	..	1	2
London University	..	..	..	..	1	1
Maimi (China)	1	..	..	..	..	..
McGill (Montreal)	1	2	1	..	..	4
McGill University (Vancouver)	..	..	..	..	..	1
Manitoba	..	..	..	2	1	2
Meizi College of Technology	..	..	..	..	..	1
Melbourne (Australia)	1	1	..	..	..	..
Nanking (China)	3	3	..	..	..	..
Nanyang College	..	..	..	..	..	4
National (Paraguay)	..	..	1	1	..	..
Naval Academy (Chile)	..	..	..	..	..	6
Naval College (Canton)	..	..	..	..	3	1
Naval College (Cheetoo)	..	..	..	..	1	..
New Brunswick	2	..	..	..	..	..
Oxford	1	1	..	..	..	..
Paris University	..	..	..	..	..	2
Pekin	..	..	..	..	1	1
Philippines	..	..	..	1	..	1
Presidency (Calcutta)	..	..	1	1	1	..
Queens (Canada)	1	..	..	..	..	..
Robert College (Turkey)	..	..	..	..	..	1
Royal Military (Canada)	1	1	..	..	..	..
Royal Tech. (Copenhagen)	..	..	1	..	..	..
Santa Clara (Cuba)	..	..	..	1	1	2
Scientific & Lit. Inst.	..	1	..	..	..	..
Shantien (China)	1	..	..	..	..	..
Syrian Protestant	3	4	3	3	4	3
Technical Hochschule (zu Darmstadt)	..	..	..	..	..	2
Technical Hochschule (Karlsruhe)	..	..	..	..	..	1
Technical Hochschule (zu Sachen)	..	..	..	..	..	1
Tokio Imperial	..	..	..	..	4	2
Tomsk Institute of Technology	..	..	..	1	..	..
Tong-Shan Eng. College	..	..	..	..	..	1
Toronto	..	..	1	2	..	1
Tsing Hua	..	..	..	2	2	11
Turin University (Italy)	..	..	..	..	..	1
Union Medical (Pekin)	..	..	..	..	1	..
Universidad National	..	..	..	..	1	..
Wuchang (China)	1	1	1	1	..	..

Graduates who are candidates for Advanced Degrees	38
Graduates who are pursuing undergraduate work	289
Colleges and Universities represented	192

New Students from Other Colleges by Years

Class Joined at Institute.	Years Spent at College.				Total.
	One.	Two.	Three.	Four, or more.	
First Year . . .	29	9	3	12	53
Second Year . . .	25	36	7	26	94
Third Year . . .	—	6	22	62	90
Fourth Year . . .	—	3	8	41	52
Graduate Year .	—	—	2	17	19
Total	54	54	42	158	308

College Students Among the Courses

Graduates and Students from Colleges. 29% of the Total Student Body.	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 A.	Naval Construction B.	Electrochemistry.	Engineering Administration.	No Course Classification.	Total in the Courses.
Graduates	11	34	34	14	25	25	60	28	1	1	23	4	3	8	21	6	4	16	9	327
Non-graduates . .	29	35	45	15	34	10	28	5	..	1	25	1	2	5	..	..	5	18	3	261
Total	40	69	79	29	59	35	88	33	1	2	48	5	5	13	21	6	9	34	12	588

AGES OF STUDENTS

CLASSIFIED FIRST-YEAR STUDENTS, OCTOBER, 1916

Period of Life.	1915–1916.		1916–1917.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
Under 17	6	6	8	8
17 to 17½	18	—	28	—
17½ to 18	44	62	44	72
18 to 18½	61	—	85	—
18½ to 19	58	119	46	131
19 to 19½	48	—	57	—
19½ to 20	30	78	24	81
20 to 20½	22	—	35	—
20½ to 21	17	39	15	50
21 to 22	12	12	14	14
22 to 23	—	—	6	6
	316	316	362	362

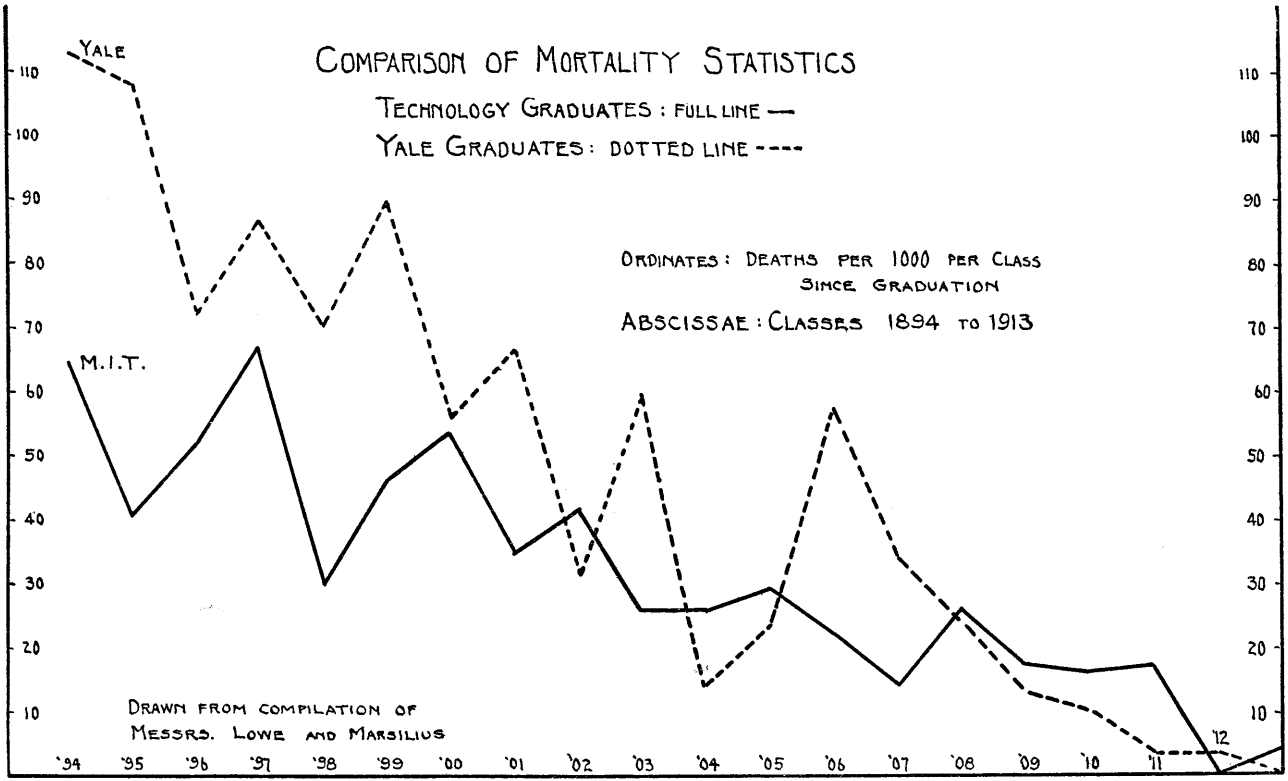
Repeating the first year 14
Students of unusual age 7
Average age, omitting these 21 . . . . . 18 years, 10 months

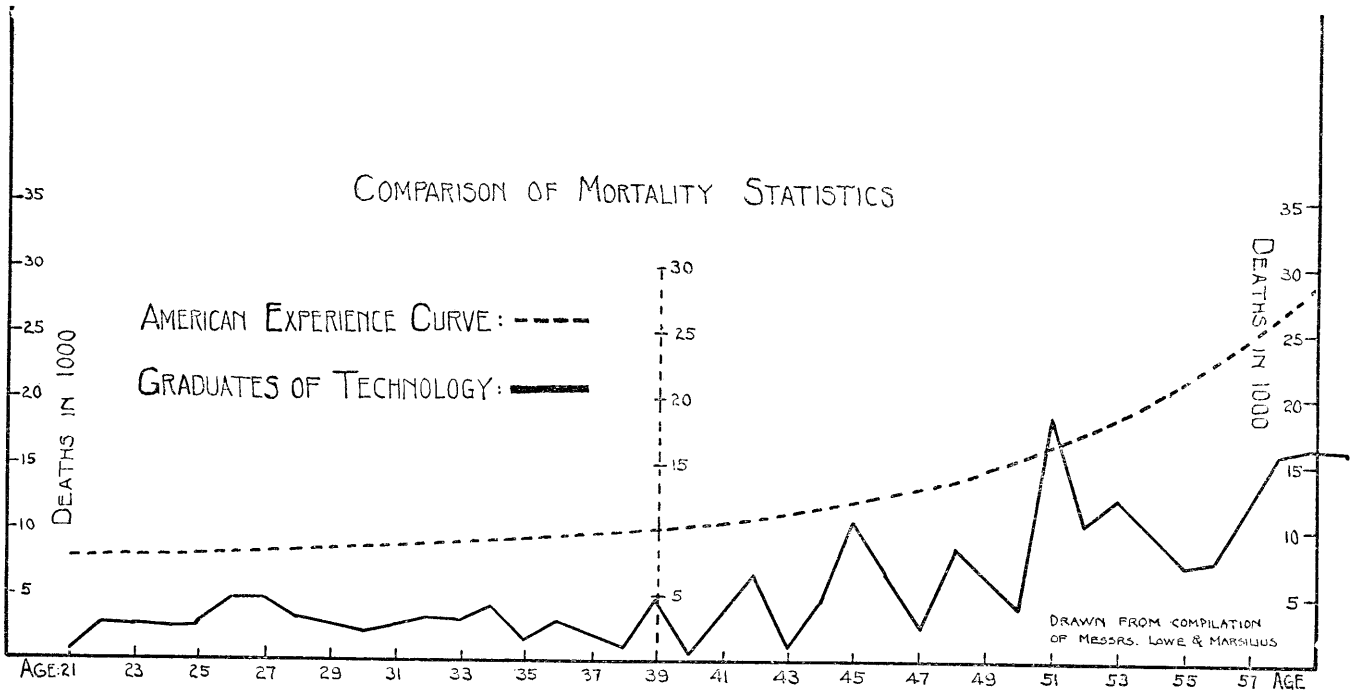
THE GRADUATING CLASS, JUNE, 1916

Those receiving the S.B. degree in one course

Below 20 years	2
Between 20 and 21	14
" 21 " 22	58
" 22 " 23	74
" 23 " 24	58
" 24 " 25	51
" 25 " 26	27
" 26 " 27	13
" 27 " 28	9
" 28 " 29	2
" 29 " 30	2
" 30 " over	5
Total	315

The average age was 23 years and five months.


COMPARISON OF MORTALITY STATISTICS
TECHNOLOGY GRADUATES : FULL LINE —
YALE GRADUATES : DOTTED LINE ----
ORDINATES : DEATHS PER 1000 PER CLASS SINCE GRADUATION
ABSCISSAE : CLASSES 1894 TO 1913
YALE
M.I.T.
DRAWN FROM COMPILATION OF MESSRS. LOWE AND MARSILIUS
110
100
90
80
70
60
50
40
30
20
10
'94
'95
'96
'97
'98
'99
'00
'01
'02
'03
'04
'05
'06
'07
'08
'09
'10
'11
'12


COMPARISON OF MORTALITY STATISTICS
AMERICAN EXPERIENCE CURVE:
GRADUATES OF TECHNOLOGY:
DEATHS IN 1000
DEATHS IN 1000
35
30
25
20
15
10
5
AGE: 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 AGE
DRAWN FROM COMPILATION OF MESSRS. LOWE & MARSILIUS

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.	Electrochemistry.	Total.	Total by Decades.
1868	6	1	6	—	—	—	—	—	1	—	—	—	—	—	14	
1869	2	2	—	—	1	—	—	—	—	—	—	—	—	—	5	
1870	4	2	2	—	1	—	—	—	1	—	—	—	—	—	10	29
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	225
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	507
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	1,573
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	2,256
1911	46	49	17	10	12	49	1	1	2	19	15	—	6	5	231*	
1912	55	47	21	21	7	52	4	2	1	31	14	—	3	3	260*	
1913	58	50	20	26	12	43	2	1	—	30	15	—	4	8	269	
1914	60	65	17	19	9	51	6	1	4	37	19	—	8	8	301*	
1915	48	69	5	30	23	41	3	3	2	33	12	—	7	10	284*	
1916	45	81	3	35	11	53	5	3	2	31	18	—	9	14	308*	
Totals	1,152	1,389	521	520	488	1,041	87	65	109	395	176	14	213	76	6,225*	

Names counted twice, students graduating in two different years	22
Bachelors of Science	6,203*
Masters of Science, not including 146 counted above	154
Doctors of Philosophy and of Engineering, not including 12 counted above	17
Total	6,374*

* Deducting names counted twice (students graduating in two courses).
† Prior to 1909 this Course was designated as Option 3 (Electrochemistry) of Course VIII.

Statistics of Graduation, Class of 1916

Number receiving degree after one year at the Institute	6
" " " " two years at the Institute	59
" " " " three years at the Institute	40
" " " " four years at the Institute	173
" " " " more than four years at the Institute	39
Total number of degrees of S. B. awarded	317
Number entering from other colleges	121
" of graduates among these	76
" of non-graduates among these	45

Further Statistics of the Students from Other Colleges of the Graduating Class, June, 1916

Years at the Institute.	Graduate.	Non-graduate.	Total.
1	5	1	6
2	46	11	57
3	20	14	34
4	5	15	20
More than 4	—	4	4
	76	45	121

SUMMER SCHOOL

	1915.	1916.
Number from other colleges and schools attending	82	113
Number not referring to any other school or college	6	1
Number from Massachusetts Institute of Technology	460	436
	548	550
Registrations for failures or deficiencies	254	275
Registrations to anticipate work	632	684
Number who attended Summer School but did not return for Registration	71	164

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

	1915.	1916.
Algebra B.	12	13
Alternating Current Machinery	0	7
Applied Mechanics	21	32
Bacteriology Gen.	0	7
Carpentry	2	0
Chemistry, Inorganic and Analytical	147	137
Descriptive Geometry	70	34
Design	28	20
Elect. Eng. Lab.	16	22
Electrical Engineering, Prin. of	7	6
English	19	14
Forging	10	3
French	19	16
German	36	46
Hydraulics, Theoretical	10	9
Hygiene and Sanitation	0	1
Industrial Chemical Laboratory	18	14
Machine Tool Work	19	17
Mathematics (1)	26	44
Mathematics (2)	29	67
Mathematics (3)	9	10
Mechanic Arts 297	19	16
Mechanical Applications of Electric Power	0	4
Mechanical Drawing	13	10
Mechanical Engineering Drawing	23	23
Mechanism	20	17
Metal Turning	2	0
Microscopy Gen. Biology	0	2
Organic Chemical Laboratory	7	0
Pattern Work	2	0
Physical Laboratory	16	15
Physics	24	42
Precision of Measurements	18	12
Reinforced Concrete	1	0
Shades and Shadows	9	5
Solid Geometry	12	17
Structures	20	16
Surveying	17	6
Theory of Warship Design	0	2
Vise and Bench Work	7	16
Warship Design	0	4
Wood Turning	2	0
Woodwork and Pat. Making	8	12
Surveying Camp.		
Railroad Field Work 120	93	64
Plane Surveying 107	93	64
Hydrographic Surveying 160	93	64
Geodetic and Topographic Surveying 108	93	64
Surveying 103	0	11
Survey Underground 104	0	11

MASSACHUSETTS CITIES WHICH SEND FIVE OR MORE STUDENTS

Boston	260	Winchester	10
Cambridge	85	Chelsea	9
Brookline	54	Everett	9
Newton	51	Framingham	9
Somerville	34	Haverhill	9
Lawrence	30	Marlboro	9
Lynn	29	Medford	9
Malden	28	Milton	9
Brockton	23	Gloucester	8
Melrose	21	Swampscott	7
Lowell	20	Weymouth	7
Newburyport	19	Wollaston	7
Taunton	19	Canton	6
Arlington	16	Concord	6
Fall River	14	Woburn	6
Andover	13	Worcester	6
Quincy	13	Beverly	5
Winthrop	13	Holyoke	5
Lexington	12	Needham	5
Waltham	12	New Bedford	5
Springfield	11	Salem	5
Watertown	10	Wakefield	5

WALTER HUMPHREYS,

Registrar and Recorder.

Reports of Departments

DEPARTMENT OF CIVIL AND SANITARY ENGINEERING

MAINTAINED BY HARVARD UNIVERSITY AND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

After twenty-nine years of continuous teaching at the Institute, Professor C. Frank Allen was, at his own request, relieved from active teaching in February last and in June was retired on a Carnegie Pension. Professor Allen was graduated from the Civil Engineering Course in 1872 and for the next fifteen years was actively engaged in practice; for six years in municipal engineering in the East, and for nine years in railroad engineering in the Southwest. During this latter period he also studied and practiced law, being admitted to the New Mexico bar in 1885, and later to the bar of Massachusetts. He joined the Institute instructing staff in 1887 as assistant professor of railroad engineering, became an associate professor after two years, and in 1896 was promoted to the grade of full professor. During this period he systematized and developed to a high degree the courses in railroad engineering at the Institute, and published in 1899 a book on railroad curves and earthwork which is extensively used as a text-book in American colleges and as a field-book by practicing engineers. He also took an active part in the broader engineering activities of the country, holding at various times the presidency of each of the following organizations: Boston Society of Civil Engineers, Massachusetts Highway Association, New England Railroad Club, and the Society for the Promotion of Engineering Education.

Professor Allen's clear mind and logical presentation of any subject which he taught made him an excellent teacher. He was, moreover, greatly interested in all matters pertaining to the broader fields of teaching, was an active participant in Faculty matters, and contributed in every way possible to the welfare of

the Department and of the Institute. The appreciation of his services was shown at the time of his retirement by a dinner given in his honor at which addresses were made by President Maclaurin and other representatives both of the Corporation and Faculty. Since his retirement he has devoted himself to the preparation of a book on contracts and specifications for use in engineering schools, a subject which he is especially well fitted to write upon, owing to his combined legal and engineering training and his experience in teaching the subject at Technology.

Professor Charles B. Breed, who has been associated with Professor Allen as instructor and professor in the Civil Engineering Department since 1899, succeeds him in charge of the instruction in railroad engineering. Professor Breed's ability as a teacher and his practical experience in railroad engineering make him eminently qualified to conduct and develop still further the courses in Railroad Engineering at the Institute, and the Department is fortunate in having one of its staff so well fitted to take charge of instruction in this important branch of the profession.

Professor Swain, after thirty-five years of continuous teaching, is taking a sabbatical leave of absence during the present year. The course in Valuation of Public Service and Other Corporations, which he has given in the past is offered this year by Messrs. Edward L. Walker, B.S., 308 Boylston Street, Boston, and Frank C. Shepherd, S.B., Boston & Maine Railroad Company, Boston. The course in Specifications and Contracts will be given by Mr. C. M. Saville, A.B., Chief Engineer, Board of Water Commissioners, Hartford, Connecticut. The more strictly technical work ordinarily given by Professor Swain is being given by Professor Spofford.

Mr. James M. Barker, who has served as instructor in civil engineering for the last two years, has been promoted to the grade of assistant professor of structural engineering. Mr. Barker's experience both in teaching and in practice make him well fitted to take charge of the instruction in structural engineering to third-year students and in bridge design to fourth-year students, and it is appropriate that his success in these fields should be recognized by his promotion.

At the time of Professor Allen's resignation, Mr. John B. Babcock, 3d, a graduate in Civil Engineering of the class of 1910, was

appointed as instructor in Railroad Engineering. Prior to his appointment, Mr. Babcock spent three years in railroad engineering and two years in hydraulic construction work. His professional training, ability as a student, and vigorous and pleasing personality fit him well for this position.

The following men, graduates of the class of 1916, were appointed to fill the positions left vacant by resignations of assistants of the previous year: Messrs. Edward H. Clarkson, Jr., S.B., Charles L. Crosier, S.B., Howard L. Foster, S.B., Chester F. Lewis, S.B., William A. Liddell, S.B., Charles J. McCarthy, S.B. and James H. Murdough, S.B.

The quarters assigned to the Department in the new building have proven admirably fitted for its needs, ample space being provided for present conditions and for reasonable future growth. The new hydraulic laboratory bids fair to prove exceptionally well adapted for undergraduate instruction, and it is expected that the research work done in it under the direction of Professor Russell will prove of marked value to the profession.

The fifth session of the Surveying Camp extended from July 25 to September 15 inclusive, with a total attendance of seventy-three students, all but three of whom were from courses in which attendance is required. The instructing staff was the same as that of the previous year with the exception of the following graduates of the class of 1916 who replaced assistants who resigned at the end of the academic year: Messrs. Edward H. Clarkson, Jr., S.B., Charles L. Crosier, S.B., Howard L. Foster, S.B., William A. Liddell, S.B. and Charles J. McCarthy, S.B. The resident physician was Dr. F. W. Hodgdon, Jr.

This year for the first time, students in Course III, Options 1 and 3, attended the Summer Camp for a course of five weeks only, after which they went with Professor Howard to Corinth, Vermont, where they were given an opportunity to do surveying work in an actual mine.

The reduced attendance at the camp and the increased cost of food and other supplies increased the cost to the students, the total charge per student for meals and miscellaneous expenses necessary for the operation of the camp, including a small charge for depreciation but exclusive of transportation between Boston and East Machias and personal laundry was $56.72, an increase

of about $8.00 per student over that of the previous year. The health of those in attendance was excellent.

One of the interesting incidents of the year was the establishment by the Barber Asphalt Paving Company of the Clifford Richardson Fellowship in Highway Engineering, with a grant of $1,000 per year for research work, particularly in connection with bituminous pavements. The holder of this scholarship this year is Mr. William H. Sandlas, B.S., a graduate of Pennsylvania College and a student at Technology for the past year.

Gifts to the Department during the year include the following:

An 18-inch high speed turbine by the S. Morgan Smith Company of York, Pennsylvania, through the efforts of Mr. Herbert C. Daggett, M. I. T. '95. This turbine was tested free of charge by the Holyoke Water Power Company, through the courtesy of Mr. A. F. Sickman, Chief Engineer of the Company. It forms an extremely important addition to our equipment and will make possible the securing of much useful information upon turbine efficiency.—A precise level instrument by C. L. Berger & Sons, Boston. This is a valuable instrument and the gift is greatly appreciated by the Department.—A clinometer by Dr. R. S. Williams of the Chemical Department.—A clock for the Summer Camp by A. Farwell Bemis, Esq., '93, of the Corporation.—A sun dial for the Summer Camp by the students attending the camp in 1915

The thanks of the Department are due to the Holyoke Water Power Company which permitted the graduate class in Water Power Engineering to conduct an informal test of a water turbine at its plant, and to the Proprietors of Locks and Canals at Lowell for permission to occupy their stream gaging station. The Department is also indebted to Mr. Henry E. Warren of the Lombard Governor Company for lectures given to our students free of charge.

Through the courtesy of Mr. J. H. Allen, '81, permission was given to use the mine at Corinth, Vermont, for the course in Underground Surveying this year, and every courtesy was extended to the students by Mr. H. G. Hunter, manager of the mine, and by Mr. P. G. Whitman, '12.

The Department is also indebted to The Warren Brothers Company, Boston and The Barber Asphalt Paving Company,

Philadelphia, for extending to students the opportunity to inspect laboratories and work under construction.

During the year the invar tape belonging to the Department was compared free of charge by the United States Bureau of Standards.

Mr. Waddill Catchings has again offered $200 in prizes for the best paper on the practice or theory of plumbing, these prizes to be known as the Nelson Prizes in Plumbing.

CHARLES M. SPOFFORD.

DEPARTMENT OF MECHANICAL ENGINEERING

MAINTAINED BY HARVARD UNIVERSITY AND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The Mechanical Engineering Department, on account of the large amount of heavy machinery and the various kinds of delicate apparatus in its laboratories, was the most difficult to move to and to erect on the new site.

As classes were held in the Mechanical Laboratories at Garrison Street until August 6, nothing could be done toward dismantling this branch of the Department until after that date. Through the efficient management of the Superintendent of Buildings and Power, Mr. A. S. Smith and his staff, all of this machinery was moved before September 1. On September 25 the Department was ready to receive all classes, with the exception of those in foundry work and forge work, which are to be held during the second term, the time necessary for these classes having been obtained by transferring drawing of the second term to the first term, thus setting free time in the second term. These two branches are to be housed in a separate building now in process of construction.

A number of prominent engineers and educators who are familiar with the laboratories both in this country and abroad, have expressed their belief that the Engineering Laboratories of the Institute are superior to any in the world.

The design and arrangement of the laboratories has made possible the separation of the equipment into six groups, namely,—Steam and Compressed Air; Hydraulics; Refrigeration; Power Measurement; Material Testing; Gas Engines.

Members of the Department have felt that in order to develop these laboratories as a whole, to carry on research work of value to the engineering profession, and to secure the most efficient instruction of undergraduate students, there should be in charge of each group, or division of the laboratory, a man who is distinctly an expert in that branch of the work. With this in mind, a scheme of organization of the laboratory staff has been submitted to and approved by the President.

The Engineering laboratories of the new Technology are now under the general charge of a Director and six men,

each of whom is in direct charge of one division of the laboratories.

A list of apparatus donated for use in the new laboratories was given in the President's report for 1916. Since then the following gifts have been received: A 100 H.P. Terry turbine, from the Terry Turbine Co.; a triplex plunger pump, and a double hydraulic ram, from Goulds Manufacturing Co.; a 60 H.P. suction gas producer, together with a 60 H.P. gas producer engine, complete, from the Westford Water Co.; an efficiency indicator from the American Pulley Co.; new dash pots for the 16 H.P. Corliss engine from the Harris Corliss Engine Co.; a 50 H.P. Diesel engine from the General Electric Co.; a 175 H.P. hydraulic turbine from the S. Morgan Smith Co.; a number of safety valves, Clark type, from the Crosby Steam Gage & Valve Co.; a cotton gin from the International Cotton Gin Co., Birmingham, Ala.; a 40-inch cotton card from the Saco-Lowell Co.; a one-delivery evener drawing frame from the Saco-Lowell Co.; a two-delivery drawing frame with electric stop motion from Howard & Bullough, Pawtucket, R. I.; a two-head cotton comber from the Whitin Machine Works; a 72-inch spindle slubber from the Woonsocket Machine & Press Co.; an 80-inch spindle, coarse intermediate from Woonsocket Machine & Press Co.; a 72-inch spindle, fine intermediate roving frame from the Woonsocket Machine & Press Co.; a 72-inch spindle ring spinning frame from Fales & Jenckes Machine Co.; a new loom from the Draper Co.; an automatic moisture control with turbo heads, from the G. M. Parks Co.

There has been promised, but not yet received, a five-ton ammonia absorption machine from the Carbondale Machine Co., and a Webber subterranean pump from the Rand Ingersoll Sargeant Co. Many manufacturers have furnished apparatus for use in the laboratories at shop cost.

The Warren Steam Pump Co. which some time ago presented an outside packed plunger pump for use in the boiler room has recently exchanged an old duplex Blake pump for a new Warren pump of 1,000 gallon capacity and has just furnished, at a special price, a 1500-gallon duplex pot valve pump, designed for 250 lbs. delivery pressure. The Becker Brainerd Milling Machine Co. have made a very satisfactory price on an exchange on a milling machine of an old type which came to us from Harvard,

for a new machine. The exchange amounting to a gift of about $800. Messrs. Fay and Egan made a very low price on the motor-driven wood turning lathes to be used in our Pattern Shop. The Hendey Machine Co. have exchanged an old lathe for a new Hendey Lathe. The Sheppard Crane Co. also have made a very low price on two 10-ton cranes, one of which was furnished for use in the Engineering Laboratories.

A new study dealing with Heat Transmission has been offered by Professor Berry. Apparatus for use in experimental work in this line has been secured and is to be erected in the Refrigerating Laboratory.

There have been a number of changes in the instructing staff during the summer. An exchange of instructors has been made with Worcester Polytechnic, Mr. Dean Peabody, Jr., having gone to Worcester and Mr. Francis W. Roys having come here. Mr. DeWitt M. Taylor, an instructor, resigned to accept an assistant professorship at the University of Maine. Mr. George H. Clark, an instructor, resigned to accept a position with the Crosby Steam Gage & Valve Co. Assistants Charles P. Putnam and Arthur F. Petts have also resigned. The Department has been fortunate in securing Mr. Alpheus A. Packard, S.B., class of '98 in place of Mr. Taylor; and Mr. Stephen R. Bartlett, A.B., Yale, S. B., M. I. T., '03 in place of Mr. Clark. Mr. Dean A. Fales, '15 and Mr. Archibald S. Morrison, '15 in place of Messrs. Putnam and Petts. Messrs. Caruthers A. Coleman and William J. Barrett have been appointed as assistants in the Material Testing laboratory and the Drawing Room respectively.

There has been a constantly increasing demand for our graduates. Nearly every man in the Senior class in Mechanical Engineering had accepted a position at least two weeks before graduation. The salaries offered have been about 25 per cent. higher than those received five years ago.

In its new quarters the Department is equipped to handle a greater number of students and to give better and, in the laboratories, more varied instruction than has been possible heretofore.

The students, as well as the instructing staff, are much pleased with their new quarters and are taking up the year's work with renewed earnestness and enthusiasm.

EDWARD F. MILLER.

DEPARTMENT OF MINING ENGINEERING AND METALLURGY

MAINTAINED BY HARVARD UNIVERSITY AND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The Department expects to be fully installed on the new site by the close of the first term. The removal to the new site will take some time, as the various apparatus for instruction are in use and can be transferred only when the term's work with them has been finished. Some new apparatus are already in their final places; the others will follow in quick succession.

The transition from old to new necessitated some temporary arrangements in the class-room and laboratory exercises. All lectures and recitations are given in class rooms of the new main building assigned to the Department. Laboratory work in assaying, ore-dressing, and wet metallurgy is carried on in the Rogers building; metallography in the Rotch and the Rogers buildings; pyrometallurgy has been postponed until the end of the term, when the new laboratory will be ready for occupancy. The regular order in which metallurgical subjects are usually taught has been changed to meet the present requirements.

The new quarters of the Department are an immense improvement over the old in the basement of the Rogers building. There are provided special laboratories for the divisions of mining, ore-dressing, dry and wet assay; dry and wet metallurgy, electrometallurgy, heat treatment and metallography; rooms for drawing, for a museum and library, recitations and offices. Most of the laboratories are fully equipped for immediate needs, and space is provided for apparatus which will be acquired, it is hoped, in the near future.

During the year the large amount of experimental material which had accumulated for years has been brought to light. Among it have been found apparatus which dated back to the beginning of the departmental laboratories. Useless devices have been scrapped; more recent machines, which had been put aside on account of lack of room, have been renovated, and will occupy their proper places in the new laboratories. All laboratories contain some new apparatus which are to supplement or replace the old in use at present. Though most machines and

other experimental apparatus can be transferred from the old laboratories to the new, furnaces as a rule, have had to be pulled down and rebuilt; and this offered occasions for improved constructions. An enumeration of the apparatus purchased would form a list too long to be given here. The Department has, however, received a number of gifts for the laboratories: The Sullivan Machinery Co. presented two rock drill models and a Sullivan air-driven coal-pick machine; the Mine and Smelter Supply Co., two Wilfley head mechanisms, and one set of special riffles for a Wilfley table; Mr. W. A. Butchart, one set of Butchart riffles for a Wilfley table; the Dwight-Lloyd Sintering Co., one Dwight-Lloyd straight-line sintering machine for experimental purposes; Mr. J. Blatchford, one electric muffle furnace; the Merrill Metallurgical Co., a filter-press, for experimental work with zinc dust precipitation from cyanide solutions. Messrs. F. A. Eustis and U. Wedge made a contribution to permit the purchase of a Wedge multiple-hearth roasting furnace for experimental purposes; Professor R. H. Richards has continued to turn over to the library his current numbers of the Mining and Scientific Press.

In the present year the new schedules of the three options are followed by the second and third-year students, while the studies of the fourth-year students are still governed by the old course scheme. Options 1 and 3 have had their instruction in general surveying with Courses I and XI at the Surveying Camp near East Machias, Maine, and a special course in mine surveying at the Pike Hill Copper Mines near East Corinth, Vermont. At the beginning they received the general instruction which has been given hitherto at the Institute during the school year, later they carried on general field-work, and devoted the last two weeks to mine surveying. Students in Option 2, for whom surveying is not obligatory, have had the seven-weeks course of qualitative analysis in the Summer School of Chemistry. The continuity of this work, which is favorable for concentration of mind and effort, has given excellent results.

Courses 333, Metallography, and 341, Metallurgy of Iron and Steel, which were scheduled for 1917–1918, are being given this year, as there has been a special demand for them by eight students for the former, and five for the latter. The Bureau of Ordnance

of the Navy Department has assigned two naval officers to the Department for the two courses noted above.

Last June the Department graduated the smallest number for many years. At the time the class of 1916 entered the Institute the number of mining students all over the country suddenly fell off to such an extent that several mining departments had no students. Since then matters have improved. There are at present in each of the second-, third-, and fourth-year classes from fifteen to twenty students. With the facilities offered in the new laboratories this number ought to increase. The Department has a number of special students with advanced standing, who wish to give their time to professional work entirely and are not candidates for a degree; and some from foreign countries, such as Chile, Japan, and China, who expect to become regular students.

The demand for men, especially for recent graduates, has been greater than the available supply. It seems probable that this condition will continue for some time with the continued activity in the mining industry. With the coöperation of alumni and of friends of the Institute, places have been secured for all undergraduates who desired to have practical work during the summer vacation. Work of this character gives a student valuable experience, and is strongly recommended by the Department.

A Summer School of Mining was held last June with seven students under the direction of Professor Locke. The places visited and the operations studied were the following: mining and magnetic concentration of iron ore at Mt. Hope, N. J.; hydro-electric plant and manufacture of graphite in electric furnaces at Niagara Falls, N. Y.; ore handling, iron blast furnace, open hearth steel plant, rolling mill, and calcium carbide plant at Duluth, Minn.; soft iron ore mining, drying, and washing in the Mesabi district, Minn.; hard iron ore mining at Ironwood, Michigan; diamond drilling, mining, concentration, leaching, and smelting of native copper ore around Houghton, Michigan. The thanks of the party are due to former M. I. T. men and others for the many courtesies extended.

In connection with the exhibition at the dedication of the new buildings in June, an interesting display of apparatus,

photographs, and charts was made, under the direction of Professors Richards and Locke, to show the growth of the mining and metallurgical laboratories of the Institute during the past forty-five years, and the general progress in mining and metallurgy during the same period.

There have been a few changes in the staff. Mr. F. O. Stillman, assistant in Ore-dressing, has resigned and taken up research work; Mr. L. W. Currier, assistant in Metallurgy, has had a call to Northwestern University to give instruction in geology, mining, and metallurgy. His place has been filled by Mr. Elmer E. Harrington, S.B., M. I. T., 1906, who will serve as assistant in ore-dressing as well as in metallurgy. Other men will be engaged as assistants when work begins in the new laboratories.

During the summer Professor Hofman visited the principal lead and lead-silver works of the United States and Canada to gather the latest data for his forthcoming treatise on the Metallurgy of Lead. Professor Smyth has a leave of absence for the first term of the year 1916–1917. Professor Locke, on his way back from the summer school in Michigan, visited the new zinc mines in Northern New York. Later in the summer he examined deposits in Florida and Virginia; he visited in September the Sherbrook Copper district, Quebec, Canada, and the copper mines near South Strafford and East Corinth, Vermont. Professor Bugbee examined some copper mines in Arizona, visited assay and testing laboratories in Los Angeles, Cal., Reno, Nev., and Denver and Golden, Colo., and the mills at Goldfield and Tonopah, Nev. In September he returned to the Southwest and visited, with the American Institute of Mining Engineers, mines, mills, and smelteries in Texas, New Mexico, and Arizona. Professor Richards maintains his interest in the Department and likes to be present whenever the senior class is at work on ore-dressing.

Throughout the year the research upon the recovery of nickel from brown iron ores has been continued and brought to a successful end. In Ore-dressing a number of problems engaged the services of several men. Lack of facilities made it necessary to refuse to undertake investigations of considerable interest. With the new laboratories affirmative answers will be given to such inquiries.

H. O. HOFMAN.

DEPARTMENT OF ARCHITECTURE

The beginning of the school year found the Department of Architecture located once more in the Rogers Building where it was first established in 1867. At that time it occupied but a part of the upper floor, while at present it is making use of the entire building with the exception of the basement, and plans for the occupancy of the latter have been studied and are to be carried out as soon as the Department of Mining, which now occupies the basement of Rogers, shall be moved to its new quarters in Cambridge.

Rogers has been made to adapt itself admirably to the purposes of the Department. Outwardly the building is a noble example of the earliest influence exerted in this country by the Ecole des Beaux-Arts. The alterations which have been made in the interior have transformed it into a most acceptable home for a school of Architecture, and we find ourselves housed under very favorable conditions with a certain dignity in our surroundings that has been impossible to realize before, and which cannot fail to exert a stimulating and beneficial effect upon our future work and standing.

The drafting rooms and studios are located on the two upper floors. The library is situated on the floor next below the drafting rooms, on the Boylston Street front, with facilities for study and research that hitherto could not be obtained. The old lecture halls and class-rooms, with slight changes, adapt themselves admirably to their new purpose, and the executive offices and quarters for the Department Faculty are spacious and conveniently arranged. The old library on the main floor affords a large exhibition gallery. The Department has always lacked adequate provision for holding exhibitions which should be easily accessible to the public. Such exhibitions furnish a stimulating and very necessary contact between the school and those interested in its work, and the opportunities that will now be afforded in this direction are most significant. An example of these opportunities may be seen in the joint exhibition which the Boston Society of Architects, the Boston Architectural Club, the Society of Landscape Architects, and the Society of Arts and Crafts held during the early part of November in the gallery and

adjoining rooms and hallway, and which created much interest and drew a large attendance. On the last evening of the exhibition the Department organized a students' festival, to which were invited students from the various art schools in Boston including those of music and the drama. Short addresses were delivered by Professor Ralph Adams Cram and Mr. J. Randolph Coolidge. Musical numbers were furnished by students from the Faelton Pianoforte School and from the New England Conservatory of Music; a dramatic selection by students from the Emerson College of Oratory, and folk-dances by students from the School of English Folk-Dancing. The opportunity thus furnished by our new quarters for making the Department of Architecture a center for the large body of persons pursuing the study of the fine arts in Boston cannot but react with great benefit to the Institute. We are most fortunate in being located in the heart of a city where such occasions are possible.

The removal of the social center of the Institute from Boston to Cambridge, however, leaves the Architectural Department, so far as the students are concerned, somewhat isolated, and we believe it necessary that the Rogers Building should provide as soon and as generously as possible a center of social life for our students. As already stated, our present situation in many ways gives us unusual opportunities from which we are hoping much, but in the opinion of the Department one of the most important things that can be done is the fitting up in Rogers of a large and attractive "Common Room," which shall be furnished and administered more as a social club than as a Department of specialized training. The rooms on the westerly side of Rogers, in the basement, are admirably adapted to this end, and we particularly desire that these rooms shall be reserved for this use. It is our hope to obtain from outside subscriptions a sufficient sum to enable us to equip these rooms with comfortable chairs, reading and writing tables, an open fireplace, and all the elements of an attractive club room. There should be a certain number of books not specifically connected with architecture but rather with general culture, a few newspapers and periodicals, the latter dealing with the various aspects of art in its broadest sense, while the walls should be covered with pictures of fine examples of ancient architecture together with a changing collection of the best current work, both local and foreign.

While the room should be open at all times it would be our idea that on regular evenings it should be understood that a general and informal gathering should take place, when all the students of the Department, members of the Faculty, and alumni should be welcome, the object being none the less educational because it is to be attained through informal conversation and personal association. From time to time special guests would be entertained at these meetings who would speak informally on matters of interest to the Department. In a word, our desire is to create a center of social life that will bring the students into close and personal touch not only with members of the Faculty and with the alumni of the Department, but with representatives of general culture, both at home and abroad, in order that the young men may acquire something of that "savoir faire" that is so imperative in the profession of architecture.

It is of interest to call attention to the formation last February of the Society of Technology Architects. Its object is to further the well-being of the Department of Architecture by fostering the interest of its members in the Department and in each other. It has at the present time a membership of one hundred and seventy-five. Its President is Mr. William H. Brainerd, and its Secretary, Mr. Alexander S. Jenney, both of Boston.

The instructing staff has undergone some change during the year. Professor Edgar I. Williams, whose temperament and training fit him unusually well for the purpose, has resigned to take up active practice in New York. He has had charge of the advanced classes in Design since the death of Professor Despradelle, and has made a pronounced success in his teaching. It was with great regret that we lost him from our staff. We have been exceedingly fortunate, however, in obtaining the services of Mr. Stephen Codman, who has accepted an associate professorship and who succeeds Professor Williams in taking charge of the advanced classes in Design. Professor Codman is a graduate of Harvard University with the class of '90; studied at the Ecole des Beaux-Arts under M. Blondel from 1889–1893. Between 1894 and 1905 he was in independent practice, and since 1905 has been a member of the firm of Codman & Despradelle. He is a member of the American Institute of Architects and of the Executive Committee of the Boston Society of Architects.

Mr. Charles Everett has been promoted from instructor to assistant professor in recognition of his interest, enthusiasm, and success in connection with his work in the courses in Design.

Mr. Clarence E. Morrow, instructor in Architectural Engineering, has given up the greater part of his work in the Department in order to devote his time to engineering practice. Mr. Edwin C. Holbrook has been appointed to take charge of the work relinquished by Mr. Morrow. Mr. Holbrook is a graduate of the class of 1912 of the Department of Civil Engineering of the Institute; was assistant in that Department for one year, and has since been engaged in active practice.

Important changes in the curriculum have been under consideration by the Department for over a year, and a new Course scheme for each option was adopted by the Faculty of the Institute last spring, the first and second years of which are in operation at the present time. We believe the new schedule represents a more logical training for the architectural student than the Department has before been able to offer.

The registration is somewhat smaller than it was last year, being one hundred and forty-two this year as against one hundred and sixty last. During last year and the year previous the enrollment was abnormally high, being over 22 per cent. greater than in any preceding year. A slight falling off in number was perhaps to be expected. The present registration exceeds that of 1914 and 1915 by eleven students.

In the graduate year there are four candidates for the Master's degree and one special student. In the senior year fifteen students are registered for the degree in Option I, twelve in Option II, and five specials. In the sophomore year nineteen are registered for the degree in Option I, twelve in Option II, and four specials.

Twenty-nine students in the Department already hold degrees from other institutions, and thirty-six have had from one to three years of college training before coming here.

During the past year a gift of two hundred and twenty-five photographs and etchings—to be known as the Charles Follen Atkinson Collection—has been received from Miss S. P. Atkinson, and from Mr. W. W. Bosworth a framed drawing, rendered by Mr. D. A. Gregg, of the new Technology Court. Dr. F. H.

Williams presented to the Department library a number of photographs and plates. From Mr. Charles N. Cogswell we have received copies of the first three volumes of the Technology Architectural Review and a portrait of M. Eugene Létang.

My two previous reports have referred to the interest that was being taken by the American Institute of Architects in architectural education. A most instructive meeting was held in New York on the 5th of November, at which were present the members of the Committee on Education of the American Institute of Architects and representatives from nine of the eleven schools having membership in the Association of Collegiate Schools of Architecture. The Institute was represented by Professors Codman, Cram and Lawrence. Questions in connection with architectural education were discussed. The meeting was an informal one, preliminary to the report which will be presented by the Committee on Education to the American Institute of Architects at the next convention, and although no very definite conclusions were reached, the general discussion by such a representative body, the mingling of the Faculty members of the different schools and the mutual interchange of ideas must prove of much value.

The 1916 Traveling Fellowship in Architecture was awarded to R. W. Baldrey. The American Institute of Architects' medal was won by A. T. Wyman. The Boston Society of Architects' prizes went to O. R. Freeman (regular student) and V. W. Jorgensen (special student). The following students received the Chandler prizes: J. F. Staub (graduate-year), Miss E. G. Pattee and H. Sterner (senior year), J. T. Whitmore (junior year). The Rotch prizes were presented to A. T. Wyman (regular student) and C. Robinson (special student); and the "Class of 1904" prizes to F. S. Carson (regular student) and J. C. Flaherty (special student).

WM. H. LAWRENCE.

DEPARTMENT OF CHEMISTRY AND CHEMICAL ENGINEERING

With the occupancy of the new laboratories has come the realization of the Departmental hopes and wishes of many years, which, in itself, renders the past year notable. The instructional laboratories were substantially ready for use on the opening day of the year, and the work of the students began promptly, and is now in full operation. The much-needed additional space, especially for Industrial Chemistry, Chemical Engineering, Organic Chemistry, and the laboratories of Water and Air Analysis, will greatly facilitate the instruction in these lines. The accommodations for members of the instructing staff, and for research, are adequate for the first time in many years, and this fact, of itself, will, when the staff have had time to adjust themselves to the new conditions, lead to increased productivity in research, and a corresponding increase in inspiration and efficiency of instruction.

The past year has also been rendered notable by the inauguration of what promises to be a unique and remarkable extension of the Course in Chemical Engineering, to include a five-year Course leading to the degree of Master of Science, comprising a School of Chemical Engineering Practice, followed by a full year of graduate study and research. The fundamental plan for such a Course was conceived by Mr. Arthur D. Little, Chairman of the Visiting Committee of the Department, and to his efforts is due, in large measure, the securing of funds for the immediate support of the School of Chemical Engineering Practice. The supervision of this School, as well as the work of the graduate year, is in the hands of Professor William H. Walker, who will, for two years at least, devote his time to the development of this Course. In brief outline, the Course is as follows: At the close of the third year of the Course in Chemical Engineering the students are given opportunity to elect between the four-year Course, leading to the degree of Bachelor of Science, and the five-year Course, leading to the Master's Degree. The records and personal traits of the students electing the latter Course are then carefully scrutinized by the senior members of the Department, and only those students who give promise of

attainment corresponding to the requirements for the Master's Degree are admitted to this Course. These students follow a somewhat modified schedule during the first term of the fourth year, and at the middle of that year they leave the buildings in Cambridge to spend thirty weeks in the School of Chemical Engineering Practice. The work of this School is carried on at five stations, each associated with a manufacturing plant, at which there are instructional facilities, generously provided by the corporations themselves, in the form of laboratories, drawing and conference rooms, and libraries. The work is in charge of a Station Director, a member of the Faculty of the Institute, with the rank of assistant professor, and an Assistant Director, with the rank of instructor. Five such stations are in preparation, as follows:

Station A. Eastern Manufacturing Company, Bangor, Me., makers of electrolytic caustic soda and calcium hypochlorite, cellulose from wood, bond and ledger papers.

Station B. New England Gas and Coke Company, Everett, Mass., makers of gas, coke, ammonia, and tar by-products.

Station C. Carborundum Company, Niagara Falls, N. Y., makers of carborundum, silicon, and other electric furnace products.

Station D. American Synthetic Color Company, Stamford, Conn., makers of phenol, picric acid, dye-stuffs, and coal tar intermediates.

Station E. Atlas Portland Cement Company, Northampton, Pa., makers of Portland cement.

The Department is under great obligations to these corporations for their generous attitude toward the new Course, which promises so much for the future of our students.

The students admitted to this Course are divided into five groups, each of which is assigned to one of the Stations, rotating at the end of six weeks, thus spending that period successively at each Station, during the thirty weeks.

The manufacturing operations at each plant are sub-divided into "unit operations" and facilities will be provided for the study of these unit operations with respect to efficiency and the effect of variations in the various factors involved upon that efficiency. The students will participate in the carrying on of

the technical processes involved, and in the methods employed to control the output and quality of product. They will be held strictly to account for an intelligent understanding of what they have seen and done. So far as practicable, problems of construction and design of plant will be assigned and worked out in the drawing room. At each Station those unit operations which are of special significance at that plant (such as grinding and mixing at the cement plant, or evaporation at the paper mills), will be particularly emphasized and broadly discussed in conferences, with the liberal aid of lantern slides, manufacturers' catalogues, and the like. The distribution of these topics among the Station Directors has been carefully systematized. The plan of instruction also includes, during migration from one Station to another, visits to other plants, which will greatly broaden the scope of the School.

On the completion of this practice, in the first week in September, and after a vacation interval of three or four weeks, the students will return to the Institute buildings at Cambridge, and enter upon a year of graduate work in science, engineering and research, with a considerable range of option as to the selection of subjects by the individual student. Upon the successful completion of this work the candidates will receive the degrees of Bachelor and Master of Science.

The unique features of this Course are, first, the opportunities afforded for a systematic and carefully planned experience in manufacturing plants of varied and suitable character, under the guidance of competent instructors, which affords an opportunity not only for the acquisition of a knowledge of operating conditions, but also contact with the human element in the industrial field, the lack of which is so often the object of criticism of the graduates of colleges and technical schools. Secondly, but possibly more important, is the graduate year of study with this experience as a background. It is universally noted that students who, by force of circumstances, have been obliged to spend a year or more in industrial fields, return to their student life with a marked increase in earnestness of purpose and desire to obtain all that courses of instruction offer. With the unusually varied and favorable experience which the students participating in the School of Chemical Engineering Practice will have had,

the graduate year cannot fail to be one of extraordinary value, and it is regarded as the crowning feature of an educational scheme which, in other respects as well, offers unusual advantages.

Another, and equally important, feature of the School of Engineering Practice is that which offers a return to the corporations which have coöperated with the Institute in the establishment of these Stations. The Institute will install and maintain at each Station a research organization which will be devoted to a study of problems relating to the plant in question. The Station Director will, with assistants, give his whole time to this organization during the interval between September and February, and, after the instructional procedure has been worked out, also, though to a more limited extent, during student residence. From the development of this research work, it is expected that much of advantage will accrue to the industrial plants which have coöperated in this plan, and, with its development, there should be increasing opportunities for advanced work, which should attract and hold our best men. Such men can hardly fail to command excellent positions. It is also expected that some type of extension courses for foremen, or selected employees, from these plants will be developed.

It is obvious that the success of an undertaking such as is outlined above must depend to a large extent upon the tact, judgment and ability of the Directors of the Stations, and their assistants, since the instructional work must be carried on without interference with the normal operations of the plants. The Directors must also possess aptitude for both teaching and research. The Institute is fortunate in being able to place the general organization and direction of the new Course in the hands of Professor William H. Walker. Upon his recommendation, the following Directors and assistants have been appointed, each Director having the title, "Assistant Professor of Chemical Engineering" and the assistants the title "Instructor in Chemical Engineering."

Station A. Director, Hugo H. Hanson, S.B., assisted by Wilfred A. Wylde, S.B.

Station B. Director, Guy H. Buchanan, S.B., assisted by William B. Leach, Jr., S.B.

Station C. Director, Ernest W. Wescott, Ph.D., assisted by Winthrop E. Caldwell, S.B.

Station D. Director, Leslie T. Sutherland, S.B., assisted by Edwin S. Wallace, M.A.

Station E. Director, Samuel H. Salisbury, Jr., M.S., assisted by John S. Little, S.B.

These appointees have, with one or two exceptions in the case of the instructors, already entered upon their work.

It cannot be too strongly emphasized that the extraordinary opportunity which this new Course presents depends upon the combination of the School of Chemical Engineering Practice with the fifth year of graduate work, and also that the participating students are a selected group of men of more than usual ability. It is a matter for congratulation that it has been possible to select nearly thirty such men from the class of 1917. The introduction of a new subject, involving minor research problems for these thirty men during the first term of the current year, has added materially to the demands upon the Department. The advanced subjects to be given next year will add much more to this demand, and the graduate work will require organization and correlation. The Institute has again been fortunate in being able to recall to its service Dr. James F. Norris, who has been appointed Professor of General Chemistry, and will give several graduate courses, as well as supervise the fifth year work. Dr. Norris was formerly Assistant Professor of Organic Chemistry at the Institute, but resigned to take charge of the Department of Chemistry at Simmons College, and later held the same position at Vanderbilt University. He is well-known as a successful teacher, and also through his published books and researches.

The other changes in the instructing staff during the year have been as follows: Dr. E. B. Spear has received merited promotion to an associate professorship in Inorganic Chemistry, and Dr. Earl B. Millard has been appointed assistant professor of Theoretical Chemistry. Dr. Millard has given excellent service as instructor in Inorganic Chemistry, and brings to his new position a wide knowledge of Physical Chemistry. The re-appointment of Dr. Clarence K. Reiman as Instructor in Inorganic Chemistry, after two years of study in Europe, for

which he received the degree of Doctor of Science from the University of Geneva, also restores to us the services of a capable teacher.

The appointment of Professor Frederick G. Keyes to the staff of the Research Laboratory of Physical Chemistry, referred to elsewhere, likewise strengthens the instructing staff through helpful association.

Dr. Frank H. Thorp resigned at the close of the year from his position as Assistant Professor of Industrial Chemistry, after a teaching service of nearly twenty-five years in the Department. During almost the whole of this period he has given the lectures in Industrial Chemistry. These were based upon his "Outlines of Industrial Chemistry" which has been since its first publication almost the only standard text-book used in this country for instructional purposes, and is a real contribution to all teaching in that field. The Department also owes much to Dr. Thorp for his skill in the organization and conduct of the traveling summer courses in Industrial Chemistry, which have been of so much benefit to the students who were able to participate in them. It was hoped that Dr. Thorp might become a Director of one of the Stations of the School of Chemical Engineering Practice, but he has found it desirable to withdraw altogether from teaching, at least for the present, and the Institute has lost the services of an experienced teacher.

The class-room instruction in Industrial Chemistry which Dr. Thorp has given will be in charge of Dr. Norris.

The announced determination of Professor A. A. Noyes to spend half of his time at Throop College of Technology is a source of sincere regret to his colleagues, since it involves a real loss in companionship and counsel. That his loss is not total, is a matter for congratulation.

Of the instructors of last year two, Mr. Ross H. Dickson and Dr. Walter A. Patrick have resigned, while of the assistants, Messrs. Chamberlain, Atwood, Abrams, Bigelow, Cook, Cowles, Dalton, Dickinson, Field, Snyder and Waterhouse have withdrawn. The new appointments to assistantships are as follows: Messrs. Willard R Crandall, Ralph V. Davies, Percival P. Gooding, John M. Hood, George M. Maverick, Joseph V. Meigs, Stephen G. Simpson, Marshall S. Wellington, Hsien Wu, and Earl P. Stevenson, S.B. (Wesleyan College).

Miss Helen Vincent, A.B. (Mount Holyoke) has been appointed as research assistant to carry on investigations under a grant from the Ellen H. Richards Research Fund. She is working under the direction of Dr. John F. Norton upon the "Chemistry and Biology of Activated Sludge." The investigations carried on last year under Dr. Norton's direction have led to results which will be published later.

Mr. N. D. Doane also worked under a grant from the Ellen H. Richards Research Fund during the past year. The research, carried on with Professor A. G. Woodman, comprised mainly a study of the acids present in canned tomatoes and their changes as caused by spoilage. The principal points brought out related to the effect of the sugars present on the methods of determining organic acids, which had apparently not been appreciated before, and have an important bearing on the commercial methods for detecting spoilage. The investigation showed the necessity for a study of the formation and change of sugars during the ripening of the tomato, a study which could be made only during the growing season.

Miss Ruth M. Thomas continues as Research Associate in Organic Chemistry. This is made possible by funds furnished by Dr. F. J. Moore.

The additional space now available in the Chemical Engineering laboratory affords larger opportunity for the introduction of large scale apparatus, approximating the units which are used in manufacturing operations. During the past year the Institute has been fortunate in receiving as gifts the following pieces of apparatus:—

From Emil E. Lungwitz, a Kelly filter press; from T. Shriver & Co., an 18-inch filter press; from Schaum & Uhlinger, Inc., an 18-inch basket centrifugal, 2,000 R.P.M.; and from the National Laundry Supply Company a Niswonger electrolytic cell. These gifts will prove extremely valuable in connection with our instructional work, and they are much appreciated by both the Institute and the Department.

Further progress has been made by Mr. A. C. Melcher, Purchasing Agent of the Department, in the organization of the system of purchasing and distribution of supplies, with gratifying results. The successful completion of the very difficult task of

transferring the equipment and supplies from the old to the new buildings is due to the indefatigable efforts of Mr. Melcher during the summer. His suggestions as to details of construction, and his oversight of their installation, has also been of great value.

The Summer Courses, both optional and required, were carried on in the old laboratories, with about the usual number of students. The routine Departmental work has gone on without notable incident.

The demand for graduates with chemical training is even greater in proportion to the available supply than was the case when this feature was noted in the Report of last year. It has had the effect of reducing the number of men who return for advanced work, and has increased the difficulty of obtaining and retaining competent men on the instructing force.

H. P. TALBOT.

RESEARCH LABORATORY OF APPLIED CHEMISTRY

The renewed activities of this Laboratory made possible by our new buildings are more and more taking the form of thorough scientific researches upon comprehensive problems of general interest to the community, which, while suggested by the necessities of the industries and of immediate value to them, are not supported by any one organization or carried on for private benefit. Such work is rendered possible at this time by a decision of the Laboratory to expend in this way funds accumulated during the past few years from contributions made the Laboratory as a bonus for research work successfully carried on for manufacturing companies. The expression of appreciation for the helpfulness of work already published from this Laboratory, which continues to come to us, is a strong incentive to an endeavor to enlarge the scope of its usefulness.

Among the problems now under investigation is one of very fundamental importance, carried on by Mr. Robert E. Wilson, upon the mechanism of chemical reaction. By the aid of four pumps, donated by the General Electric Company, capable of maintaining an extremely high vacuum, it is planned to produce uni-directional streams of rapidly moving molecules which will pass into a reaction chamber containing some gas at very low pressure. While the velocity of the stream and the pressure of the gas are varied between wide limits, a statistical study will be made of the number of collisions between unlike molecules, and the fraction of these collisions which results in combination. The apparatus is designed to make possible, also, the study of the properties of monatomic hydrogen, and to measure directly the mean free path of a gas, either in itself or in any other gas.

Mr. Frank Hall is making a study of the element carbon from a physical and chemical point of view. Results already obtained establish a relationship between the properties of carbon and the structure of the carbonaceous molecule from which it is prepared. Although thousands of compounds of carbon have been exhaustively studied, little is known of the element itself. It is the purpose of the Laboratory to make a comprehensive study of some of the phases of this problem.

The results of work done in previous years under the direction

of Professor W. K. Lewis upon the flow of viscous liquids through pipes has commanded such general interest that a grant of $5,000 has been made by a progressive manufacturing firm with which to continue the study. Mr. R. G. Knowland is in charge of the work, which, as now planned, will cover a number of allied subjects.

Other members of the staff are employed upon some of the problems of industrial importance in synthetic and physical chemistry of which there are so many now pressing for solution. Such involve the measurement of the vapor pressure of stearic, palmitic, and oleic acids at various pressures, the determination of the vapor-composition curves for glycerine-water mixtures evaporated in vacuo, the synthesis of a number of organic chemicals and the like.

The interest manifested in research by the industrial public is clearly indicated by the constant demand for men qualified to carry on such investigations; it is rapidly becoming a very remunerative and altogether satisfactory field for our graduates.

WM. H. WALKER.

DEPARTMENT OF ELECTRICAL ENGINEERING

MAINTAINED BY HARVARD UNIVERSITY AND THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The past twelve months have been filled with unusually exacting duties for all the staff of the Department, caused by the circumstance that the construction of new quarters for the Department required constant attention to assure their filling our needs when completed, and the circumstance that we took in hand a complete scrutiny and revision of the curriculum of the Electrical Engineering Course, which had not been thus completely scrutinized and tested since the changes and improvements of 1908.

The Department is under obligations to its committee, consisting of Professors Laws, Kennelly and Lawrence, whose devoted attention has enabled us to enter quarters admirably suited to our needs. The plan of arranging staff offices in a suite, in addition to providing special laboratory offices, is proving very convenient and is favorable to close-knit correlation in the methods of teaching. The laboratory arrangements are also proving desirable. We have now brought together in adequate space the research work which was heretofore carried on inconveniently in three locations, and greater enthusiasm accompanied by greater productiveness should result. The advantages of the new undergraduate laboratory for instruction in electrical measurements are making it practicable to carry out some improvements in the instruction, especially in the way of introducing additional and alternative apparatus and experiments to lessen routine and give more scope for student initiative. In the final rearrangements which placed the dynamo laboratory in Building 10 instead of in a backwardly projecting wing, the space available for this laboratory was considerably curtailed and extension will soon be needed for it if the classes of the Institute continue to grow as in the past. The relative space available in this laboratory compared with the student hours of instruction is not largely increased over the older quarters. It is fair to say in this connection that the number of students assigned for instruction in this laboratory was unexpectedly increased after all the plans had been made and were well along towards execution.

This is largely caused by the large class in Option 2 of Course XV and the assignment of the electrical laboratory work of the Harvard class in Engineering Sciences 8 to this laboratory. Withal, the arrangements of this laboratory are a great improvement over the old location.

As Building 10, in which the Electrical Engineering Laboratories are located, was late in being completed, there was considerable embarrassment in promptly starting the laboratory instruction at the opening of the term, but both Professor Laws and Professor Green overcame the difficulties by means of various expedients and the work was started on time. The student laboratories are so conveniently located that they are being used by students at hours other than those assigned to regular sections, so that students will be found working in them in almost all of the working hours (including the noon hour) through the week.

The committee consisting of Professors Wickenden, Laws and Adams, which studied and revised the curriculum of the Electrical Engineering Course, during the year made a strong effort to consolidate subjects so as to reduce the number of teachers to whom any student is responsible in any term, and thus open opportunity for greater concentration of effort. At the same time the proportion of study hours to class-room hours was increased, for the purpose of putting students more directly on their own resources and encouraging initiative. We expect good to result from the changes made, and they will also make more effective the grouping of classes into sections according to the powers of assimilation of the individuals, which we have heretofore tried with good results.

Recognizing that this is an age of engineering and that our present form of civilization is substantially a product of industrial applications of science, an important form of "preparedness" for any nation lies in the effectiveness of the training which the engineering schools give their students, more particularly in respect to their initiative, resourcefulness and fertility in improving on or newly applying scientific processes in national life. It is, therefore, highly important to maintain our curricula at the highest state of effectiveness, and since education is as yet a science purely experimental in its nature, there is good reason to scrutinize and revise our curricula at intervals, as has been done

with Course VI in 1908 and again during the past year, without excluding lesser changes in the intervening intervals.

The Department researches continue to progress. Three new bulletins were published during the year and a number of papers, which presented results of the researches. Other bulletins are in preparation for printing. The researches continue along the same general lines as heretofore, it being held desirable to exhaust if practicable subjects already entered upon, rather than to scatter our resources by taking up many new subjects. We now have under way researches on the behavior of diaphragms when caused to vibrate in telephone and other sound apparatus, the "skin-effect" in electrical conductors when carrying alternating currents within ordinary frequencies of current and also for the extraordinary current frequencies of radio telegraphy, further verification by means of our artificial transmission lines of the formulas of current flow, the electrical and magnetic losses in the iron cores of electrical machinery, the insulation of cables, the physical qualities of long span transmission circuits, certain problems of photometry, and problems relating to the traffic of electric railways.

During the course of the summer, Stone & Webster were so good as to add a No. O solid copper conductor and a No. O stranded copper conductor to the set of composite conductors already on our transmission span. These will aid in the observations which we have been carrying on regarding the effects of temperature, ice loading and wind on sag.

An extended report of the past work of the electric railway traffic research has been prepared during the summer and will soon be published.

The cataloguing of the Vail Library has progressed satisfactorily. Approximately ten thousand, or about five-sixths, of the books have been catalogued and their binding is nearing completion so that they can go into service. Circulation of these books will be made available from Room 3–003 until the general library is in working order. Approximately one-third of the eleven thousand pamphlets in the Vail Library have been catalogued and their binding is commenced. A good start has also been made on binding the very numerous volumes of periodicals.

The design of a bookplate for the Vail Library has been undertaken by an artist distinguished in such matters. He has already provided the design of a designating stamp which is being applied to the backs of all Vail Library book bindings so as to clearly distinguish the books of this important collection.

The most important needs of the Department now are another and larger storage battery, a 200,000 volt transformer equipment of not lest than one hundred kilowatts capacity with regulating apparatus, and assurance of the permanency of funds for the support of research.

The year has seen many important changes in the instructing staff. Professor Clifford returned from the leave of absence due to his sabbatical year. Associate Professor Harrison W. Smith withdrew from his Faculty post to become a research associate. Assistant Professor Wickenden was promoted to an associate professorship. Mr. Lyon and Mr. Hudson were promoted from the rank of instructor to the rank of assistant professor.

Mr. Norman Osann, instructor, resigned and was succeeded by Mr. Claire W. Ricker. Mr. Chester L. Dawes, Harold B. Richmond and Mr. Rudolph F. Zecha were added to the staff as instructors. By these appointments an experienced instructor (Mr. Dawes) is added to the teachers assigned to the Electrical Measurements Laboratory, where heretofore only assistants have been available to aid Professor Laws.

Mr. Schurig was promoted from the rank of Research Assistant to that of Research Associate.

The following men were appointed as teaching assistants: Mr. Paul H. Burkhart (University of Illinois '16), Harold F. Dodge (Technology '16), William T. Haines (University of Montana '16), Walter B. Littlefield (Technology '16) and George W. Wyman (Technology '16). These men take the places of Messrs. Butz, DeBeech, Eaton, Alger and Muzzey, whose appointments had expired. Mr. Alger desired an appointment as research assistant and he was so appointed.

The following men (in addition to Mr. Alger) were appointed research assistants: George Y. Allen (Stevens '15), E. W. Bowler (Technology '14), Robert S. Burnap (Technology '16), Russell N. Hunter (Worcester P. I. '15), John B. Peterson (Miss. A. & M. College '14), Charles W. Whitall (S. M. Technology '16),

Walter E. Wynne (Union '16). They take the places of Messrs. Taylor, Affel, Dana, Eksergian, McGrath, Rudolph and Webber.

The assistants' appointments for teaching and for research are made for one year and are often renewed for a second year. They, however, are temporary positions affording the holders a serviceable opportunity for correlating and digesting the engineering science studied in their undergraduate courses. At the same time their work for the Institute is of such an important nature that it is of primary importance for us to be able to select only well adapted men for the positions. Our success in this is gratifying, although the salary is small.

The salary problem is a distressing one in the cases of instructors and assistant professors, who are of an age to have, and generally do have, families. With the general rise in the cost of the necessaries of life, it is just to urge a revision upward of the standard of salaries of these men.

DUGALD C. JACKSON.

BIOLOGY AND PUBLIC HEALTH

The year covered by this report was the seventeenth passed by the Department in the Henry L. Pierce Building at 30 Trinity Place. Quarters which in 1899 seemed spacious had been long outgrown and it was with the utmost relief and satisfaction that the present year was begun in the new buildings in Cambridge. Sixteen years of slow development of the Department in the Rogers Building, followed by seventeen years of more rapid growth on Trinity Place, have witnessed an extension of engineering education on all sides with a notable recent tendency to include more of human and social engineering. At the moment, public health is everywhere highly regarded and everywhere sought after, and there are abundant signs that this is only the first wave of a new tide in science, technology, and education, partly due to the World War, which will require more widespread and profound studies of life, of disease, of food, of work and of rest, and of human activities in general, in which biology must take the leading part.

The new laboratories of the Department, planned chiefly by Professors Prescott and Bigelow, have proved to be both commodious and convenient. They will in due time be elsewhere fully described. By the kindness and generosity of friends of the Department an Equipment Fund has been provided for the proper furnishing of the laboratories with new microscopes and other apparatus, and to these and all other friends who have aided us we tender our most grateful thanks.

Professor Prescott reports an extension of the work in bacteriology, both general and applied, and even more in micro-biology and zymology, subjects which he is rapidly making his own. He is editing a translation of a Belgian work on bio-chemical catalysers, a companion volume to a translation brought out by him several years ago of a work upon enzymes and their applications.

His researches upon the diseases of certain tropical plants of large industrial and economic importance have been continued, with the preparation of two important Bulletins, one on the Scope and Aim of the Research Laboratory which he conducts in Costa Rica, and the other a technical bulletin on Diseases

of the Banana. At present he is engaged upon further investigations of the same kind both at the Institute and in the Boston Bio-Chemical Laboratory,—of which last he is the efficient Director.

Professor Bigelow reports a gratifying strengthening of his courses in Vertebrate Anatomy, Histology, Embryology, etc., and comments upon the improved conditions available for these classes in the new buildings. The work in this division of the Department is in highly satisfactory condition and furnishes not only a thorough preparation for the courses in Physiology and Parasitology, which follow, but also an excellent discipline in minute, careful, and painstaking laboratory work in general.

Professor Gunn's courses in Industrial Hygiene and in the Biology of Infectious Diseases are attended by large and interested classes drawn partly from the Department itself and partly from the School for Health Officers. I very much doubt if anywhere in the country better courses in these subjects are given, partly because of the favorable location of the Institute in a great industrial center, but chiefly because of the intimate practical acquaintance which Professor Gunn has had with these subjects through his recent personal connection with the State Board of Labor and Industries and the State Department of Health.

Mr. Ingham, first instructor in General Biology, has taken charge of the courses in Elementary Bacteriology, thereby setting free more of Professor Prescott's time for attention to advanced students. Mr. Ingham also conducted efficiently the Summer Courses of the Department and has been much occupied during the year in an intensive investigation of sanitary conditions in certain rural districts of Massachusetts, as Field Agent of the Public Health Committee of the Massachusetts Medical Society. This work is likely to continue and to grow and is of obvious importance to the public welfare.

Mr. Turner, second instructor in Biology, has in addition to his principal work as Associate in the Sanitary Research Laboratory, conducted with success the courses in Theoretical Biology, General Botany, and General Zoölogy, subjects for which his previous training has especially prepared him.

Mr. F. J. Funk served the Department faithfully during the

year as assistant in Biology, and then proceeded to the tropics as special research assistant in the work upon plant diseases there carried on under the direction of Professor Prescott. Mr. Funk's place has been satisfactorily filled by the appointment of Mr. Maurice P. Horowitz, a graduate of the College of the City of New York, and a Master of Science from this Department of the Institute in 1916.

Additions to permanent equipment this year have been so numerous and valuable as to require more space than can well be spared here, and will accordingly be elsewhere described and acknowledged.

W. T. SEDGWICK.

SANITARY RESEARCH LABORATORY AND SEWAGE EXPERIMENT STATION

The following are the principal pieces of work carried on during the year:

(1) *Further Studies upon the Digestion of a Sewage-Filter Effluent by a Small Stream*, the effluent being that of the municipal filters of the city of Brockton, which discharge into an otherwise unpolluted stream. This problem has now been extensively and thoroughly studied by the staff of the Station for more than two years, and a report is in press (Vol. X of the Contributions from the Sanitary Research Laboratory) in which the experiments are described and the results recorded. This report will comprise upwards of 100 pages and include numerous illustrations, besides maps and one colored plate.

(2) A new series of investigations was begun during the year by Messrs. F. J. Funk and H. W. Hamilton and has been further prosecuted during the summer by Mr. Hamilton with the assistance of several advanced students. The research in question bears upon *The Effect of Temperatures between 0°C. and 0°F. upon the life of Bacteria* of various kinds. Some years ago a paper was published by the Director and Mr. (now Professor) C.-E. A. Winslow, upon *The Effect of Freezing upon Bacteria.* Since that time observations have been made which have seemed to throw doubt upon some of the conclusions then reached. Accordingly it has been decided to re-open the whole question—which is one of fundamental economic and sanitary importance—and to make a much more elaborate series of studies than any hitherto made in this direction. It may be mentioned in passing that the recent enormous growth of the ice cream industry has made especially important and germane such a study as that referred to.

(3) Mr. M. P. Horowitz, a candidate for the Degree of Master of Science in June, took as his thesis subject "*A Comparative Biological Study of Two Massachusetts Cities*, namely, *Quincy and Taunton.*" This study had many of the features of a sanitary survey but was so planned and conducted as to go more deeply into questions bearing upon public health and social welfare,

industrial hygiene, economic and racial conditions, and the like. An abstract of the paper will soon be published.

(4) Opportunity having arisen during the summer for *A Sanitary Survey of Canton, Mass.*, a suburban community presenting sanitary problems of interest, a senior student of the Institute, Mr. W. T. Fales, was employed as field agent under the direction of Mr. H. E. Berger, Jr. (in charge of the Coöperative Health Boards of Wellesley and vicinity), to conduct the investigation required. The results, some of which are of more than local interest and importance will, it is hoped, soon be published.

Once more we have to express our profound gratitude to the anonymous donor, whose intelligent and sympathetic devotion to our cause for more than a decade, have greatly strengthened the Department and added incalculably to its educational no less than its research facilities.

W. T. SEDGWICK,
Director.

SCHOOL FOR HEALTH OFFICERS

This School, conducted by special arrangement in coöperation with Harvard University, has further demonstrated during the year its usefulness and success.

The time is now at hand, if indeed it has not already arrived, when the School should be put on a more secure foundation, provided with staff, building and appliances of its own, and broadened out into an Institute of Public Health, worthy of Boston, Massachusetts and New England.

The establishment of the Rockefeller School for Public Health in connection with Johns Hopkins University, and the recent munificent gifts to create a medical center of the most modern type in Chicago make it all the more important that Massachusetts and New England should see to it that the northeastern section of the United States, with its traditional leadership in public health matters, shall not be allowed to fall behind. Baltimore and Chicago naturally serve large areas of the United States remote from Boston and even from New York, and there is no question that an equally important field should be served by Boston. This area includes not only the whole of New England, and the upper portions of the Empire State, but all of Eastern Canada, and especially its tide-water Provinces which have long looked to Boston and will probably always look to it as their natural Metropolis.

The demand is constant and great for graduates of the School having personal qualifications for public service, and there is no question that there is here awaiting our best endeavors a new and fertile field for scientific education and public service.

W. T. SEDGWICK,
Chairman Administrative Board.

DEPARTMENT OF PHYSICS

The past year has been one of expectancy and preparation rather than of especial accomplishment. Much time and thought have been devoted throughout the whole year and the vacation as well by the staff of the Department to matters incident to moving to the new quarters of the Institute. The conditions have not, therefore, been favorable for material development in the various courses of instruction in Physics.

One important change, however, which has been previously referred to in the Report of the Department, has been successfully completed during the past year. I refer to the transfer of a portion of the lectures in general physics and part of the laboratory work from the first term of the third year into the second year so as wholly to complete this work in the latter year.

For a great many years past, the lectures on heat given to substantially all students and the concluding portion of their course in the laboratory of general physics have occupied the first and last halves respectively of the first term of the third year. Formerly this arrangement was entirely satisfactory but in later years the insertion of an increased amount of professional studies in the second year introduced a condition which made it evident that it was highly desirable to have the general work in physics completed at an earlier time. The matter had been under consideration for several years but serious difficulties were found in making the various changes involved whereby the necessary time could be secured in the second year to replace that given up in the third year. Finally, however, by a transfer of the hours assigned to history a feasible arrangement was possible and was adopted a year since. To secure the desired result, the fifteen lectures on heat, previously given by Professor Norton, were replaced by ten lectures on the same subject which constituted the concluding portion of the lecture course in the second year. Space was found for these ten lectures by diminishing the number of lectures on mechanics at the beginning of the course while these were replaced by the introduction of fifteen additional exercises in the classroom running through the first term of the second year.

As was stated in the last Report, the results up to the completion of the lectures on mechanics at the date of writing then seemed to be satisfactory although, of course, it was impossible to speak positively prior to the completion of the whole course. As a result of our experience of last year, all of us who have had to do with the instruction either as lecturers or instructors in the class room feel that on the whole the change has justified itself. It is true that the loss of the experimental lectures referred to is to be regretted, but on the other hand the students are more interested in the concluding lectures than if they came a term later when professional work is more pressing and so far as mere practice is concerned the additional class-room exercises quite offset the lost lectures. The diminution, in the actual number of these, however, introduces a certain element of disjointedness so that there is an increased difficulty in keeping the recitations in close touch with the lectures.

With regard to the transferred laboratory exercises, doubtless when a normal condition is reached the change will prove wholly advantageous. The experience of last year, however, did not give the arrangement a fair test because the transfer of work from the third year back into the second year involved simultaneous instruction in the laboratory of both the second- and third-year classes. This, of necessity, greatly overcrowded the laboratories so that the work of the students was hampered thereby. Moreover, owing to the impossibility of securing speedy delivery of new apparatus, notwithstanding the promises of the makers, it has proved impossible even up to the present time to complete such modifications of the laboratory work as will best meet the new arrangement of lectures and recitations just referred to. This will be done, however, as soon as the new equipment has been received.

The new laboratories have proved to be admirably adapted for purposes of instruction. Their spaciousness is of the greatest advantage, preventing as it does the confusion formerly accompanying the crowding which has been experienced for a long time and the excellent lighting and good ventilation are very fully appreciated. It is earnestly hoped that at some time in the near future more provision may be made for scientific research and more of the time of the instructors made avail-

able for it than is possible at present. This would of course necessitate such an increase in the staff as would considerably reduce the number of hours required from them in the classroom.

The equipment of the laboratory for the study of electric discharges in vacua, which is in the care of Dr. Hollnagel, has been completed to a very considerable extent though this has been hampered by unavoidable delay in the delivery of apparatus. Regular class exercises have been held from the opening of the present year. The rooms occupied are excellently suited to the work. The laboratory for the study of radio-activity, which will be in charge of Dr. Barss, has not yet been equipped.

During the past year a number of valuable pieces of apparatus have been added to our collection, two of which should be particularly mentioned, a Weston lecture room ammeter and voltmeter of the largest size which will be permanently mounted in the great general lecture room in which the lectures in physics to the second-year class are given, and also a Stark speed lathe likewise of the largest size for use in the work-shop of the mechanician of the department. These will bear an inscription indicating that they have been purchased from the gift of the late Mrs. Augustus Lowell.

It is worthy of notice in connection with the work of transferring the great collection of physical apparatus from the Walker Building to the present location regarding which apprehensions of possible damage were felt especially when the unexpected necessity of great haste became apparent, that this was successfully carried out with practically no injury even to the most delicate articles. The utmost care was exercised in conveying it under the immediate supervision and control of members of the departmental staff. The greatest credit is due to the skill and care with which these duties were performed. Everything was put in order prior to the transfer so that all apparatus should be ready for immediate use at the beginning of the new term. We may well congratulate ourselves on this absence of breakage as much of the apparatus would be practically irreplaceable at the present time.

The work of the photographic laboratory has been carried on without attempt at extension during the past year; in part because of the impending removal to new quarters and in part

because of the difficulty of procuring needed apparatus, certain kinds of which must be imported while in the European countries from which exports are possible to America, the mobilization of industry for war purposes has brought about almost as complete a stoppage of exports of apparatus as if a blockade were actually in force.

The equipment received from the Eastman Kodak Company is a most welcome gift and will greatly increase the facilities of the laboratory which are further supplemented by the availability for use of the personal apparatus of Professor Derr. The equipment is, however, still incomplete and for several years further appropriations will be needed. I am glad to say that we find the new buildings sufficiently free from vibration to make it possible to do certain delicate work which could not be done in the Walker Building. The increased amount of space devoted to the photographic laboratory which was urgently needed is now proving its usefulness daily.

During the past year the electrochemical laboratory has been taxed to its utmost capacity but by judicious choice of theses which could be carried out at the desks, we were able to get through the year without excessive crowding in the furnace laboratory which it was important to avoid. A number of these theses have proved of sufficient interest and value to warrant publication. The demand for graduates trained in electrochemistry has of late been large and under the present conditions of industry seems likely to continue to be so. The opening of the new laboratory of electrochemistry had to be postponed several weeks owing to the delay in the delivery of the main switchboard upon which the current supply for the whole laboratory depends. So far as can be judged up to the present time, the equipment and general arrangements are eminently satisfactory.

CHARLES R. CROSS.

DEPARTMENT OF GEOLOGY

During the present year the Department has transferred its work to the commodious and roomy quarters in the new Institute buildings. In connection with this transfer a great deal of extra work has been involved, which to some extent has interfered with the research activity of the members, although its duties in teaching have been carried on without interruptions or delay.

Instructing Staff.—In April, 1916, Dr. J. D. MacKenzie, our instructor in Economic Geology and Mineralogy, resigned from his position in order to join as volunteer in the British Army. The Department regrets Dr. MacKenzie's departure greatly as he had proved himself most valuable and efficient during his stay of five years. Mr. John G. Barry, a mining engineer, who graduated from the Institute in 1907, was engaged to fill Dr. MacKenzie's place. Mr. Barry has had many years' experience, both in teaching and active practice of mining geology in the United States and in Mexico.

No lectures were given this year by Dr. Ralph Arnold, but the Department hopes to secure his services for a course of lectures during the next term.

By agreement with the Geological Department of Harvard University, Professor Louis C. Graton, as special lecturer, will give a short course on "Ore Deposits" during the coming spring term. By the same agreement Professor Lindgren will give a series of lectures at Harvard University on "Gold-Bearing Ore Deposits."

Course Scheme.—The recent changes in the Mining Engineering course were described in the last report. We are at present in a transition period in which various matters have had to be adjusted. It is too early, as yet, to say anything regarding the success of the new course laid out for Course III.

Two new courses have been introduced this year entitled respectively, "Historical Geology" and "Geological Seminar"; both are primarily intended for students of Course XII, Historical Geology including the subjects heretofore taught under Index Fossils, together with various additions The Seminar is intended to give the students of Course XII an extensive acquaintance with contemporary geological literature.

Advanced Students.—During the year the Department has had three candidates for the degree of Doctor of Philosophy. These are Messrs. J. D. MacKenzie, W. L. Whitehead, and Victor Dolmage. Dr. MacKenzie was granted his Doctor's degree in April, 1916. In addition there have been several students from other institutions taking one or more special subjects, and instruction has been given during the present term to three advanced students from Harvard University.

Students.—As usual the majority of students in the Department are those from the Civil Engineering Course. During the present fall term eighty-three students attended the Course. The number of mining students is again increasing, the class of fourth-year men now numbering twelve.

In addition instruction has been given to smaller classes from the Departments of Architecture and Sanitary Engineering.

Collections and Instruments.—An unusually great number of donations have been received for the collections of the Geological Department. The collections have now been completely rearranged in the new rooms of the Department. In one of these, provisions have been made for eleven show cases, in which a suite of exceptionally fine specimens, numbering about one thousand, have been displayed. The arrangement comprises specimens of all the more important metallic ores, as well as non-metallic subjects. This Museum, which will be readily accessible, will, it is believed, be of great value to the students. The exceptionally fine collection of building stones has been similarly arranged in another room, while the mineralogical collections are also displayed in the Laboratory for Mineralogy. There have been many small additions to the collections of rocks and minerals by purchase and gifts. A part of an old collection of minerals from many classic German localities, originally gotten together by the late Mr. Richard Pearse, of Roxbury, was added to the collections, and a gift of foreign rocks was received from Mrs. John Heard, of Boston.

Three additional microscopes have been purchased for the Department. Several minor pieces of apparatus have also been purchased for the Mineralogical Laboratory, and much more must be added in order to bring these laboratories up to their proper efficiency.

Professional Work.—In December, 1915, Professor Lindgren devoted about a week to a report on certain mines in the Sudbury Nickel District, Canada. During the spring term, 1916, Professor Lindgren, upon request of the Geological Department of Columbia University, New York, delivered there a course of ten special lectures on "Ore Deposits." Considerable time was given to the study of South American geology and a paper on this subject was prepared. Professor Lindgren also devoted some time to a research on the deposition of the various forms of quartz in mineral deposits, and a paper on this subject was also prepared. The summer was spent in geological studies in the Yellowstone National Park, as well as in Colorado, Utah, and California, during which many mining districts were visited.

During the past year Professor Warren has been almost entirely occupied with instruction; the amount of which was doubled by reason of a change in the schedule of the Mining Course, and with the task of moving and settling the collections, etc., to the new site. This rendered impossible the completion of several pieces of research work which were under way.

Professor Shimer during the year was at work upon a paleontological report of a section in the Canadian Rockies for the Canadian Geological Survey, and during the summer did some work in Central New York for the New York State Geological Survey.

Doctor Lahee completed the manuscript of his book on "Field Geology," and submitted it to the publishers. Much of his time in the spring was devoted to correction of proofs. He spent two weeks in making a topographic survey of land in the vicinity of Lake Sunapee, New Hampshire, and was engaged from time to time in professional advice respecting certain mica deposits. In the summer of 1916 he was instructor in the Harvard Summer School of Field Geology in the San Juan Mountains, Colorado.

Publications.—During the past twelve months sixteen papers on scientific subjects have been published by members of the Department, most of these representing original investigations of geological subjects. One text-book on "Field Geology" was published by Professor F. H. Lahee. During the previous year fifteen papers were published.

W. LINDGREN.

DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING

The present temporary location of the Department in our new buildings has proved to be convenient for present requirements; it is to be expected that in the near future the increasing number of students in the Department taking Naval Architecture, Naval Construction and Aëronautical Engineering will call for an extension of facilities and it is hoped that the special building for the Department will not be long delayed.

In the report of last year attention was called to the urgency of the demands on the shipbuilding establishments of the country; the conditions are now even more urgent and are considered by those best informed certain to last for a period of years. At the same time the large building program for our navy has called for a large and immediate increase in the Corps of Naval Constructors. To meet this demand the Department has taken extraordinary steps to hasten the course of instruction of student-officers: to wit: (*a*) instruction was provided during the summer for the class due to graduate in June, 1917, so that they entered regular service in September of this year; (*b*) the same facilities will be given the succeeding class who will become available in August, 1917; (*c*) as for the class entering this fall one section of five had advantage of instruction at the Post Graduate School at the Naval Academy as detailed in the report of last year and they are expected to graduate in June, 1918, having special instruction during the summer of 1917; (*d*) another section of ten officers were detailed directly from the sea and are to receive special instruction during the summer months of both 1917 and 1918 and are expected to finish the course in August, 1918. The student-officers have sufficient maturity to undertake such concentrated work without impairment of the essentials of the Course for Constructors and on completion of the Course are expected to take the customary degree of Master of Science. The Department can meet the present conditions with the facilities now available, but if the Navy makes more extensive demands larger space for drawing-rooms and other purposes will be necessary next year.

The following changes in the instructing staff have been made: Mr. Evers Burtner has been promoted to be instructor in Marine

Engineering and Mr. Harold Larner, '16, was appointed assistant in Naval Architecture.

Mr. Burtner is a graduate of the Department of the class of 1915 and served last year as assistant. He has been official measurer of the yacht clubs of Massachusetts Bay for the season just closed.

The Graduate Course in Aëronautical Engineering has had two prosperous years under the direction of Assistant Naval Constructor, Jerome C. Hunsaker, U. S. N., he, having had among other students, three officers of the Aviation Corps of the Army, and having given instruction in aëronautics to the officers taking Naval Construction. Dr. Hunsaker's detail terminated in June and he returned to his Corps to serve as expert in aëronautics for the Navy. During his residence of three years at the Institute he put the Course in Aëronautical Engineering on a firm foundation and in a leading position and both the Institute and the Navy have benefited from his service. Having fulfilled all the requirements of the Institute in a distinguished manner he was awarded in June the degree of Doctor of Engineering.

Instruction in Aëronautical Engineering and Design is given this year by Mr. Alexander Klemin and Mr. Thomas H. Huff, instructors in Aëronautical Engineering. Mr. Klemin was graduated in 1909 with degree of Bachelor of Science from the University of London, and the Associate Diploma of the City and Guilds College, Imperial College, London, and was graduated last June from the Course in Aëronautical Engineering of the Institute with the degree of Master of Science. After graduation in 1909 he had experience in teaching in London especially in preparing candidates for degrees who went up for the examinations of the University of London. Mr. Huff was graduated in 1915 from the Department of Mechanical Engineering and served last year as assistant in the Course in Aëronautical Engineering.

Reference has been made separately in former reports to the leading part taken by Professor Edwin B. Wilson, Ph.D., in the establishment of the Course in Aëronautical Engineering, and to the original investigations made by him in the stability of aëroplanes under conditions experienced in service. Our confidence in the continuance of the high standards of our Course is due largely to his continued interest in our work.

C. H. PEABODY.

DEPARTMENT OF DRAWING AND DESCRIPTIVE GEOMETRY

The changes in the instructing staff have been as follows: Mr. H. H. Whitcomb resigned his instructorship to take up professional work in Mechanical Engineering; Mr. W. J. Hauser has been promoted to the grade of instructor; Mr. Charles M. Wareham, a graduate of the Department of Sanitary Engineering in the class of 1916, has been appointed full-time assistant; and Mr. G. R. Stevens, of the class of 1917 in the Electrical Engineering Department, has been made half-time assistant.

The Department is rapidly adjusting itself to its more commodious quarters, the Mechanical Drawing, Descriptive Geometry and First-Year Freehand Drawing in the new building at Cambridge, and the advanced Freehand Drawing in the Rogers Building. In addition to the space in the Rogers Building the Department uses two rooms for lectures, and nine drafting rooms in the new building.

The first part of the new book by Professors Kenison and Bradley was issued and is being used by the present first-year class in Descriptive Geometry. It is expected that the completed book will be ready for the next school year. The Syllabus prepared by Mr. Gracey for the First-Year Freehand Drawing is also in the hands of the present freshman class. Important changes in the courses in Mechanical Drawing and Descriptive Geometry have been made during the past year with satisfactory results. Professor A. E. Norton has prepared separate notes and problems for his own sections with the idea of testing a new method of approaching the Descriptive Geometry problems. Revised and improved data and problem sheets have been furnished the students in all these sections.

It is planned for the coming year to extend the scope of the departmental work by taking over the instruction in Stereotomy, hitherto given by the Department of Civil Engineering.

Beginning with the next school year, it is intended that for most of the engineering courses the instruction in Descriptive Geometry shall be completed in one year. Unfortunately this will require a reduction of the time given to Mechanical Drawing, but at present this seems to be the best arrangement.

ALFRED E. BURTON.

DEPARTMENT OF ENGLISH

During the year action taken by the Faculty resulted in considerable increase in the time alloted to English. In the second term of the first year an addition of thirty hours was obtained, making the amount of time given to English in the first-year course 30–30 throughout the year. In the second year, a considerable addition of time was obtained for Course VI; for students in Electrical Engineering the English course is now 30–45 for the entire year. In Course XI fifteen hours were added in the first term. These changes take effect in the present year. In the third year a new course consisting of thirty hours of class work and thirty hours of preparation has been established; for men in Course III the work is given this year; for men in Courses I and XI it will not be given until 1917–1918. In the fourth year, two new courses were established: one for men in Course IV, running throughout the year; another for men in Course VI, given in the second term. This latter course will be given during the present year.

These very gratifying evidences of recognition on the part of the Faculty of the importance for engineers of thorough training in English have come in connection with the revision of the schedules of various courses. It is greatly to be hoped that the precedent thus set will be followed by other courses in the revision of their schedules.

In the regular course in English required of first-year and second-year students several changes in methods of instruction and administration have been effected. In the first term of the first year the work is under the charge of Professor Robinson. He has arranged a schedule of hours so that the entire class can meet on occasion in three large sections, in order to listen to talks by the administrative officers of the Institute and by other men whom the members of the first-year class will be interested in hearing. The benefit of this arrangement has been shown in the work of the members of the class, and it has also helped them to gain a better insight into the spirit and methods of work of Institute life. Furthermore, instead of separating composition and literature, the attempt is being made to teach them in conjunction, so that the advantage of progress made by the

student in one of these subjects will accrue to his work in the other. The new book by Professor Aydelotte entitled "Engineering and English," which is to be studied by the first-year class next term, has been planned upon this principle; by the study of this book the student should be able (1) to apprehend clearly the relation between ideas and expression, both as it is found in literature and as he encounters it in his oral and written work; and (2) to form for himself some conception of the true place of English in engineering education and in the life of an engineer.

Two new courses have been given by the Department during the year, each constituting required work for men in the third year of the new Course in Engineering Administration. In the course in Report Writing, which was given by Messrs. Green and Goodwin, a new and difficult thing was attempted, namely, to give men training in the form in which technical information should be presented, but apart from the technical studies they were pursuing. In spite of the difficulties of organizing the new work, results were very successful. In the course this year, which is still under the charge of Mr. Green, still further progress is being made. He is assisted by Mr. C. H. Sutherland, instructor in the Department of Civil Engineering. The course in Composition and Literature introduced into the schedule in the second term has a more liberal allotment of time than any English course provided curriculum. The course consists of oral and written discussions of problems in science, based on the reading of engineering addresses and of English essayists of the nineteenth century. It was conducted by Professor Aydelotte with marked success.

More than one-half the students attending the Institute are taking work in English. Last year the new courses given the students in Engineering Administration made an increase of over fifty in the number of students to be instructed. In the present year there is a further addition of some sixty men; and next year the number will be increased by over one hundred more. A demand of a different sort is also made upon the Department in the necessity of devising for these new courses programmes of study which shall be specially adapted to the needs of the upperclassmen taking them.

Numerous changes have taken place in the staff of the Department. Messrs. C. C. Batchelor and C. H. Collester, who have taught in the Department since 1902 and 1904, respectively, have retired. Messrs. H. W. Smith and T. G. Goodwin have also left. In their places have been appointed Messrs. W. A. Crosby, a graduate of Williams College; W. B. Pressey, a graduate of Trinity; W. Prescott, a graduate of Harvard, and J. K. Torbert, of the University of Texas. All these men have come from recent study at Harvard, where they received the Master's Degree in 1916.

HENRY G. PEARSON.

DEPARTMENT OF ECONOMICS AND STATISTICS

The special interest of the Department during the past year has centered upon the development of the curriculum called for by the creation of Course XV. Dr. Tosdal, whose appointment was noticed last year, was obliged unfortunately, on account of illness, to take a leave of absence in March, which was made permanent by his resignation in June. A temporary arrangement for instruction in his course in Industrial Organization was made by the engagement of Mr. F. E. Richter, of the Graduate School of Economics of Harvard University. This position has now been permanently filled by the appointment of Mr. Floyd E. Armstrong, of the University of Michigan, as assistant professor.

For the new course in Business Management is to be noted the appointment of Mr. E. O. Christiansen, a graduate of the Institute of Technology in 1910, Course I; and for lecturer in the course in Business Law, Professor L. F. Schaub, of the Harvard School of Business Administration. The number of students who elect the new course remains about constant, the number in the second year being 53 as compared with 51 last year. In the third year there are 44, and in the fourth year, 40. The total number, therefore, in the three upper years is now 137.

A departure was made from the usual method of instruction in the course in Securities and Investments by inviting a number of gentlemen from bond and stock houses as well as business specialists to lecture on assigned topics. These lecturers, with their subjects, were as follows: Charles C. Jackson, "The Qualities of a Desirable Investment"; S. B. Pearmain, "A Comparison of the Stock Exchanges of London, Paris, New York, and Boston" and "A Day's Business on the Stock Exchange"; Homer Albers, "Corporate Stocks as Investments"; Henry J. Horn, "Analysis of Railway Statistics"; W. F. Wyeth, "Investments of the Institute of Technology"; William L. Garrison, Jr., "The Business of a Bond House"; George S. Baldwin, "The Stock Exchange"; George E. Farrington, "Securities of Reorganized Properties"; Montgomery Rollins, "Convertible Bonds" and "Irrigation Bonds"; A. P. Brown, "Commercial Paper"; J. B. Hardon, "Mining Securities"; James A. Parker, "Railway

Bonds"; F. A. Merrill, "Municipal Bonds"; W. L. Raymond, "Government Bonds" and "State Bonds"; George B. Baker, "Water Power Bonds"; George N. Towle, "Speculation"; John A. Oldham, "Public Utility Bonds"; E. L. Carey, "Railroad Financing and Stocks"; L. R. Nash, "Public Utility Financing"; E. K. Hall, "Telephone Securities and Telephone Financing"; and Roger W. Babson, "Investments."

Along with these lectures, class work was assigned in order that there might be continuity and sequence; and it is believed that the results were sufficiently successful to justify a continuance of the plan.

The work in Statistics was made as practical as possible, attention being confined to material that business men will be likely to use. In large part it was done under the supervision of the instructor, but supplemented by individual reports. In order to make the instruction concrete, the class visited the office of the Babson Statistical Organization at Wellesley Hills and the Statistical Bureau of the New England Telegraph Company. An exhibition was also given of calculating and computing machines. A number of these machines were obtained from various departments of the Institute, as: The Millionaire, Dalton Adding Machine, Cylindrical Slide Rule, and Burroughs Adding Machine. Demonstrations were made by Boston representatives of the Ensign Company, Monroe Calculating Machine, Ellis Adding Typewriter, Brunsvega Midget Calculating Machine, and Edison Rotary Mimeograph.

In Business Management we have also secured the coöperation of outside lecturers. Those who have met the class during October and November of the current year, with the topics on which they spoke, are as follows: S. W. Wilder, president and treasurer of the Merrimac Chemical Company, "Organization of the Merrimac Chemical Company"; W. H. Blood, Jr., "Organization of the Stone and Webster Company"; W. E. P. Howell, purchasing agent of the Dennison Mfg. Co., "Purchasing for Dennison Company"; J. M. Davis, purchasing agent of the General Electric Company, "Purchasing for the General Electric Company"; Howard Coonley, president of Walworth Manufacturing Company, "The Problem of the Location of a Plant"; Walter Goodenough, chief engineer of Stone & Webster Co.,

"Purchasing for Stone and Webster"; Professor P. T. Cherington of the Harvard University School of Business, "Sources of Raw Material and Supply"; J. J. Gillespie, consulting mechanical engineer of the United Shoe Machinery Company, "Factory Equipment"; L. C. Loewenstein, power engineer of the General Electric Company, "Power Equipment"; Professor G. B. Haven, "Power and Transmission"; Henry P. Kendall, treasurer of Plimpton Press, "The Art of Management"; and F. G. Coburn, naval constructor, United States Navy, "Introduction of Scientific Management."

Stenographic reports of the lectures have been made and condensations distributed to the members of the class. In this course, the instructor, Mr. Christiansen, is also meeting the class at regular exercises to discuss the problems raised by the lecturers as well as to supervise the reading of the students. Visits are made to manufacturing establishments, to which we have been given access with generous liberality and courtesy.

In Business Law Professor Schaub is following the case method with success, though it is believed that more time should be given to the subject and it is hoped that this may be accomplished by readjustment of the schedule.

During the past year the students of Course XV have organized a new student society, known as Corporation XV, which is regularly incorporated under the laws of Massachusetts. It is believed that this society will develop into a useful adjunct of the course.

Professor Dewey has continued to serve as managing editor of the *American Economic Review* and Professor Doten as secretary of the American Statistical Association. During the past summer Professor Shugrue went to South America, visiting Brazil, Uruguay, and Argentina, and as far as opportunity was given with his limited time, gave special attention to commercial problems and economic conditions.

DAVIS R. DEWEY.

DEPARTMENT OF MODERN LANGUAGES

The work of the Department of Modern Languages has proceeded along the lines of previous years. The interest in the optional courses of the third year has been very gratifying, and the number of students has steadily grown. In the second year, Courses I, III, and XI have decided not to require the study of any foreign language beyond the first year, herein joining Courses IV and XIII which alone heretofore had no foreign language work in the second year.

The demand for Elementary German and Elementary French has made it necessary to arrange five sections in German, and two sections in French. A marked interest in Spanish has made itself manifest so that four sections for beginners have been formed this year.

The work in German has been distributed among eight instructors (two on part time) in thirty-six sections averaging twenty-three students each, with fifteen hours of instruction per week for each instructor on full time.

The work in French is given by two instructors (one on part time) in four sections averaging twenty-six students each, in eleven hours of instruction per week.

Spanish is given in four sections averaging twenty-three students each, by two instructors with two and six hours of instruction respectively per week. Italian is given in one section twice a week.

It is interesting to note that in German two hundred and eight, and in French one hundred and seventy-eight of the applicants for admission from other colleges were able to satisfy wholly, or in great part, the requirement of the Institute course which they wished to enter.

It is noteworthy that among those entering the freshman class this year, two hundred and fifteen presented Latin as an elective admission subject, forty-two German, thirty-six French, and three Spanish.

Professor Vogel has again served as Chief Reader, and Mr. Meister as Reader in German for the College Entrance Examination Board in New York last June.

The following changes in our staff are to be noted. Mr.

Charles Ganson Cook resigned to continue his studies at Harvard. We have been fortunate in extending the coöperation between Harvard and the Institute of Technology in this Department, by the appointment as part-time instructor, of Dr. Frederick W. C. Lieder, instructor in German with faculty rank at Harvard; also as part-time instructor, of Dr. Frank S. Cawley, instructor in German at Harvard; and as part-time instructor in Spanish, of Mr. Guillermo Rivera, S.B., A.M., instructor in Spanish at Harvard.

I have further the sad duty to report the loss by death of Mr. Joseph Blachstein, who joined our teaching force in 1892, and who through his kindly, genial manner had endeared himself to the successive generations of Technology students. He was a painstaking and helpful teacher, who will long be gratefully remembered by large numbers of Tech men.

FRANK VOGEL.

DEPARTMENT OF MATHEMATICS

Special classes conducted during the past year by members of the Department have included Least Squares by Professor Bartlett, Theory of Functions, Advanced Calculus and Differential Equations by Professor Woods, Fourier's Series by Professor Bailey, Hydrodynamics, Fluid Dynamics and Dynamics of Rigid Bodies by Professor Wilson, Mechanics by Professor Moore, Thermodynamics by Professor Phillips, and Mathematical Laboratory by Dr. Lipka.

The principal classes numbered:

	Students.	Sections.
In the first term:		
Trigonometry, Math. 10	390	19
Analytic Geometry, Math. 11	461	22
Calculus, Math. 21	440	20
Differential Equations, Math. 31	108	5
In the second term:		
Analytic Geometry and Calculus, Math. 12	435	22
Calculus, Math. 22	394	19
Differential Equations, Math. 35, 38	74	4

Sections thus averaged 21 students.

We are continuing to use Phillips' Analytic Geometry, and Osborne's Calculus supplemented by Leib's Problems in Calculus. The revised Course in Mathematics by Professors Woods and Bailey is expected to be ready for use in the second term of the current year.

It sometimes happens that in large institutions the first-year sections in fundamental subjects are assigned only to teachers of comparatively little experience, and this is probably thought to be the case by the general public more frequently than it actually happens. It may not be inappropriate to remark that in our own first-year mathematics (Analytic Geometry), seven sections of the twenty-three are taught by full professors, eight more by junior professors, and only eight by instructors, of whom but four are of recent appointment. A similar situation obtains in the second-year work in Calculus.

Continued attention has been devoted to the question of credit to be given for previous college work in mathematics. It has seemed on general principles proper to require for un-

qualified credit an amount of time at the previous institution not less than our own requirement, and preferably somewhat greater, with records better than the lowest passing mark. In particular cases where reasons for special consideration exist, provisional credit is given, contingent on the successful performance of later mathematical work, or on recommendation from the head of the professional department. Recognition has also been given to the needs of men of greater maturity, holding college degrees. It is appreciated that while the undergraduate coming to us after perhaps two years in college has a fresher knowledge of the elementary mathematics he has taken, this may be more than offset by the wider range of attainment on the part of the graduate, and by the relative hardship he would incur if denied admission to dependent work.

Among subjects discussed at Department meetings during the year has been the question of abandoning separate entrance examinations in favor of those conducted by the College Entrance Examination Board. In favor of this change it has been urged that the Board's work is now so well known and so carefully conducted that there is no need for our duplicating it by holding separate examinations, and that the schools will find it simpler to prepare for the examination of the Board alone rather than for both. In some of the other entrance subjects the case seems clearer than in Mathematics. Mathematics is a much more fundamental and important subject for Institute candidates than for those entering any other institution where certificates are not accepted. It is, therefore, a correspondingly serious matter for the Institute to delegate the responsibility of setting the examinations in mathematics to any other agency. Again, the present program of the Board's examinations would make it necessary for candidates taking all mathematical examinations in a given year to concentrate them in a single day with a schedule of not less than seven hours. It seems impossible that candidates should do themselves full justice under such a program. Division of examinations between different years is an obvious remedy, but not effectual unless two examinations are passed as preliminaries. It has also seemed to us important to preserve a relatively close relation with secondary schools and teachers by holding our own examinations. In order to base any conclusions

on the fullest available information, a circular letter was addressed to teachers of mathematics in a large number of schools. While some of them favored the change, the balance of opinion was distinctly adverse.

The transfer to the new building has been accomplished without material difficulty, and present conditions appear to be on the whole very favorable for our work, particularly in the closer proximity of the offices and class-rooms, and the freer communication among members of the Department which this facilitates. We suffer, however, some inconvenience from having no departmental headquarters, and from having (as yet) inadequate blackboard space for our large sections.

In September the Mathematical Association of America held its summer meeting at the Institute—the first national society to make use of our new building. In spite of some difficulties as to preparation, the meeting was quite successful and the opportunity was much appreciated by the considerable number of members in attendance.

Professor Bartlett, after many years of continuous service, has been granted leave of absence for the current year, his work being distributed among other members of the Department. In the absence of any general plan for sabbatical leave, it has seemed feasible in the Mathematical Department to obtain a partial equivalent by such redistribution of the work that the teacher in question takes a moderate excess of teaching before and after the year or half-year in which the absence is desired.

Professor Webster Wells—a graduate of the Institute, in the class of '73, and a member of this Department from the time of his graduation until his retirement, in 1911—died in May, after several years of illness and disability.

I have completed service as chairman of the New England Committee on High School Mathematics, of which the final report was published in the *Mathematics Teacher* for June, 1916. The subject is now under consideration by a committee of the Mathematical Association of America, under the chairmanship of Professor J. W. Young of Dartmouth College.

H. W. TYLER.

Society of Arts

During the season 1915–1916 two new members were admitted to the Society. Two lectures have been given in Huntington Hall, Massachusetts Institute of Technology, as follows:

693rd meeting, January 21, 1916. "World Meteorology." By Mr. H. Helm Clayton of the Weather Service Commission of Buenos Ayres, Argentina, South America.

694th meeting, April 20, 1916. "Some Artificial Lights and Their Colors." By Professor Louis Derr, Professor of Physics, Massachusetts Institute of Technology.

The publication of *Science Conspectus* has been continued during the year.

I. W. LITCHFIELD,
Secretary.

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J. LIPKA.—Mathematical Laboratory. Nomographic Charts for Conveyor Belt Calculations, by R. E. Hazlett, in *Metallurgical and Chemical Engineering*, pp. 8–9, January 1, 1916.

J. LIPKA.—A Nomographic Blast-Pressure Chart, by L. H. Bailey, in *Metallurgical and Chemical Engineering*, p. 295, March 15, 1916.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

TREASURER'S REPORT

FOR THE YEAR ENDED JUNE 30, 1916

Treasurer's Report.

To the Corporation of
The Massachusetts Institute of Technology:

I have the honor to submit herewith statements showing the financial condition of the Massachusetts Institute of Technology as of June 30, 1916, as well as the financial transactions during the fiscal year ended on that date.

The following gifts and legacies have been received during the year:

Capital Gifts:

Anonymous Donor, for New Buildings	$321,886.15	
Estate Frederick W. Emery	120,561.80	
Charles Hayden, for New Mining Building	71,666.00	
P. S. du Pont, for New Mining Building	71,666.67	
T. C. du Pont, for New Mining Building	71,666.00	
Estate Horace W. Wadleigh	20,000.00	
Geo. Wigglesworth	10,000.00	
Anonymous Donor, for Equipment	5,000.00	
Estate Rose Hollingsworth	5,000.00	
S. W. Winslow, for New Buildings and Equipment	5,000.00	
Eli Forbes, for Equipment, New Mining Building	1,000.00	
Eben S. Stevens, for Equipment, New Mining Building	1,000.00	
C. W. Barron, for Equipment	500.00	
Whitney Conant, for Equipment, New Mining Building	300.00	
W. E. Stone, for Equipment, New Mining Building	200.00	
H. C. Geer, for Equipment, New Mining Building	100.00	
Buffalo Steam Roller Co., for Equipment	325.00	
P. S. du Pont, for General Endowment Fund	500,000.00	
Irenée du Pont, for General Endowment Fund	100,000.00	
Lammot du Pont, for General Endowment Fund	100,000.00	
Class of 1893, for General Endowment Fund	1,893.00	
Geo. C. Kenney and L. Gordon Frazer, for General Endowment Fund	100.00	
Frederick C. Moore, for General Endowment Fund	50.00	
Anonymous Donor, for School of Chemical Engineering Practice	300,000.00	
Estate Edmund K. Turner, for Civil Engineering Department	177,962.25	
Harriet A. Henshaw, for Architectural Department	15,000.00	
Estate Caroline L. W. French, for General Purposes	95,620.56	
Estate Lucius Tuttle, for General Purposes	50,000.00	
Estate William Endicott, for General Purposes	25,000.00	
Estate Caroline L. W. French (Jonathan French Fund), for General Purposes	23,906.80	
Estate Wm. J. Walker, for General Purposes	11,128.05	
Estate Samuel C. Cobb, for Salaries	30,000.00	
Estate Helen Collamore, for Fellowships	10,100.00	
Estate Rose Hollingsworth, for Scholarship	5,000.00	
Estate Frank W. Boles, for Relief	10,000.00	
Estate Morrill Wyman, for Relief	38,286.00	
Estate Edward Whitney, for Whitney Fund, for Research	439.28	
Anonymous Donor, Technology Matrons' Teas	2,000.00	
		$2,202,357.56

Gifts for Research (Schedule B–1, Gifts for Minor Funds):

Anonymous Donor, for Sanitary Research	$5,000.00	
Henry A. Morss, for Seismological Fund	500.00	
Mrs. W. Scott Fitz, for Seismological Fund	250.00	
		5,750.00

Gifts for Research (Schedule B–1, Included in Minor Funds Earnings):			
Am. Tel. and Tel. Co., for Library Fund		$4,264.53	
Am. Tel. and Tel. Co., for Research		8,916.52	
Berlin Mills, for Applied Chemistry		566.42	
General Electric Co., for Elec. Ry. Traffic Research		1,000.00	
			$14,747.47
Miscellaneous Gifts:			
Sumner B. Pearman, for Books		$40.00	
Geo. E. Farrington, for Books		20.00	
Frank A. Merrill, for Books		20.00	
Montgomery Rollins, for Books		20.00	
Robert Livermore, for Current Expenses		500.00	
Geo. S. Baldwin, for Current Expenses		20.00	
Herbert E. Fales, for Current Expenses		250.00	
Wm. L. Garrison, Jr., for Salaries		20.00	
Chas. C. Jackson, for Salaries		20.00	
Prof. F. J. Moore, for Salaries for 1916–17		750.00	
Estate Frances E. Weston, for			
Frances E. Weston Scholarship	$200.00		
Samuel Martin Weston Scholarship	200.00		
		400.00	
Chas. W. Eaton, for Summer Camp		57.50	
			2,117.50
			$2,224,972.53

Also acknowledgment is made of:

One 100 H. P. Terry Turbine from Schumaker Santry Co.
One Triplex Plunger type Double Hydraulic Ram from Goulds Mfg. Co.
One 60 H. P. Gas Producer and Producer Gas Engine from Westford Water Co.
One five-ton Ammonia Absorption machine from Carbondale Machine Co.
One 175 H. P. Hydraulic Turbine from S. Morgan Smith Co.
One 16-saw Cotton Gin from the International Cotton Gin Co., Birmingham, Ala.
One 40" Cotton Card from the Saco-Lowell Co., Newton Upper Falls.
One, one-delivery Evener Drawing Frame from Saco-Lowell Co., Newton Upper Falls.
One, two-delivery Drawing Frame with electric stop motion, Howard and Bullough, Pawtucket, R. I.
One, two-head Cotton Comber, Whitin Machine Works, Whitinsville, Mass.
One 72 spindle Slubber, one 80 spindle Coarse Intermediate, one 80 spindle Fine Intermediate Roving Frame, from the Woonsocket Machine and Press Co., Woonsocket, R. I.
One 72 spindle Ring Spinning Frame from Fales and Jencks Machine Co., Pawtucket, R. I.
One new Loom from the Draper Company, Hopedale, Mass.
One automatic Moisture Control with turbo heads from G. M. Parks Co., Fitchburg, Mass.

Of the above total $2,224,972.53, the sum of $21,864.97 was given for current expenses or research and has been carried into the income for the year. The sum of $750 has been set aside toward next year's expense.

Respectfully submitted,

FRANCIS R. HART,
Treasurer.

November 1, 1916.

Schedule A.

FINANCIAL RESULT OF THE YEAR ENDED JUNE 30, 1916, COMPARED WITH THE PREVIOUS YEAR.

	1915–16.	*1914–15.*
Current Income, Schedule B–1	$754,378.70	$721,703.79
Current Outgo, Schedule C–1	708,655.13	678,782.18
Excess of Income	$45,723.57	$42,921.61
Gifts for general purposes, Schedule B–1	770.00	250.00
Net income for year	$46,493.57	$43,171.61
LOSSES AND GAINS DURING YEAR.		
Gains and credits, Schedule S	$12,094.17	$4,379.77
	$58,587.74	$47,551.38
Losses and charges, Schedule S	1,544.74	11,540.43
	$57,043.00	$36,010.95
Income transferred to Funds—net	15,463.80	19,805.20
Increase of current surplus	$41,579.20	$16,205.75

Schedule B–1.

INCOME.

	Regular courses.	*Research and funds.*	*Total.*
INCOME FROM STUDENTS:			
Tuition fees	$429,436.72		
Entrance examination fees forfeited	680.00		
Locker fees	580.75		
Supplies, chemicals, laboratory materials, etc.	17,311.32		
Sale of lecture notes, etc.	1,014.88		
Registration fees	55.00		
	$449,078.67		$449,078.67
INCOME FROM INVESTMENTS:			
Endowments for general purposes, Schedule P	69,410.53	$531.21	
Endowments for scholarship purposes, applied	25,425.00		
Endowments for other designated purposes, Schedule Q recapitulation	12,831.94	40,168.14	
	$107,667.47	$40,699.35	
Other Income not applied to Funds	8,187.50		
	$115,854.97	$40,699.35	
Less:—			
Accrued interest on purchases	8,187.50		
Net	$107,667.47	$40,699.35	148,366.82
GRANTS BY NATION AND STATE:			
Annual grant from Commonwealth of Massachusetts	100,000.00		
Federal Aid Income from land grant,			
Act 1862	5,306.68		
Act 1890	16,666.67		
	$121,973.35		121,973.35
GIFTS FOR			
Minor Funds:			
Sanitary Research Fund		$5,000.00	
Seismological Fund		750.00	
		$5,750.00	5,750.00
Other Purposes:			
Salaries	$750.00		750.00
MINOR FUNDS EARNINGS:			
American Tel. & Tel. Research Fund		$8,916.52	
American Tel. & Tel. Library Fund		4,264.53	
Course XV Fund		100.00	

	Regular courses.	*Research and funds.*	*Total.*
MINOR FUNDS EARNINGS—*Continued.*			
Dormitory Fund		$52.79	
Edison Electric Vehicle Fund		.30	
Electric Railway Traffic Fund		1,000.00	
Jacques Fund		14.85	
Letter Box Fund		22.41	
Naval Architectural Fund		499.50	
Physico-Chemical Research Fund		216.08	
Research Laboratory of Organic Chemistry		32.25	
Research Laboratory of Applied Chemistry		566.42	
Roentgen Ray Experiment Fund		13.67	
Sanitary Research Fund		84.34	
		$15,783.66	15,783.66
INCOME FROM OTHER SOURCES:			
Interest	$6,344.47		
Rents, Huntington Hall	3,500.00		
Rents, Additional, Grundman Studios	500.00		
Sales of electricity	1,084.37		
Bursar's Fund reimbursements		423.25	
	$11,428.84	$423.25	11,852.09
INCOME FROM SOCIETY OF ARTS:			
Dues	824.11		824.11
Total income, Schedule A	$691,722.44	$62,656.26	$754,378.70
GIFTS FOR			
General Purposes, Schedule A	$770.00		$770.00

Schedule C–1.

OUTGO.

	Regular courses.	*Research and funds.*	*Total.*
SALARIES OF TEACHERS:			
Professors	$157,124.84		
Associate Professors	53,238.06		
Assistant Professors	53,590.81	$1,259.83	
Instructors	87,492.75	422.25	
Lecturers	5,145.00		
Assistants	34,697.05	17,012.92	
	$391,288.51	$18,695.00	$409,983.51
WAGES ACCESSORY TO TEACHING:			
Stenographers and Assistants	8,109.47	1,391.40	9,500.87
DEPARTMENT SUPPLIES AND REPAIRS (Schedule C–2):			
Supplies $43,787.16			
Wages 5,595.35	49,382.51		49,382.51
ADMINISTRATION AND GENERAL EXPENSE:			
Salaries of officers	26,633.32		
Salaries of assistants, stenographers, etc.	25,248.16		
Lecture notes	1,553.92		
Advertising and printing	12,820.49		
Insurance	6,103.03		
General expense	26,838.28		
	$99,197.20		99,197.20
OPERATION AND MAINTENANCE OF PLANT:			
Mechanicians' wages	$6,033.18		
Building Service, etc.	55,471.74	1,050.81	
Light, heat and power	34,129.27		
Repairs (Schedule C–3) viz.:			
wages $4,138.72			
stock 3,176.42	7,315.14		
	$102,949.33	$1,050.81	$104,000.14
EXPENSES OF MINOR FUNDS (excluding salaries):			
American Tel. & Tel. Research Fund		1,249.70	
American Tel. & Tel. Library Fund		1,386.00	
Edison Research Fund (Electric Vehicle tests)		.47	
Electric Railway Traffic Fund		374.73	
Macy Research Fund		72.16	
Physico-Chemical Research Fund		2,366.81	
President's Fund		551.09	
Research Laboratory of Applied Chemistry		481.47	

	Regular courses.	*Research and funds.*	*Total.*
EXPENSES OF MINOR FUNDS—*Continued.*			
Roentgen Ray Experiment Fund		$24.82	
Sanitary Research Fund		1,132.09	
Seismological Research Fund		750.00	
Vehicle Research Fund		187.97	
		$8,577.31	$8,577.31
AWARDS:			
Edward Austin Fund awards		6,825.00	
Teachers' Fund awards		6,774.86	
Bursar's Fund awards		569.10	
Fellowship awards		1,900.00	
Architectural Prizes		200.00	
		$16,268.96	16,268.96
MISCELLANEOUS EXPENSES:			
Premiums charged off—			
General Investments	$1,847.40		
Rogers Memorial Investments	166.50		
Draper Fund Investments	24.00		
Edna Dow Cheney Fund		$88.45	
Ellen H. Richards Fund		120.53	
Whitney Fund		1,000.00	
Summer Camp expense (net)	3,700.00		
Phys-Chem. Research Fund	3,000.00		
Tech Union expense (net)	158.72		
	$8,896.62	$1,208.98	$10,105.60
INTEREST	115.72		115.72
SOCIETY OF ARTS. Expenses	1,523.31		1,523.31
Total Outgo, Schedule A	$661,462.67	$47,192.46	$708,655.13

Schedule C–2.

DETAIL OF DEPARTMENTS.

	Expense.		*Repairs.*			
Dept.	*Supplies.*	*Salaries and wages.*	*Stock.*	*Wages.*	*Total.*	*Overdraft.*
Architecture	$1,359.21	$200.00	$128.76	$162.03	$1,850.00	$179.28
Biology	1,546.89	4.50	14.34	34.27	1,600.00	1.07
Chemistry	4,019.40	50.00	151.55	279.05	4,500.00	36.44
Chemical Supply Room	9,926.97	—	31.43	41.60	10,000.00	1,193.24
Civil and Sanitary Eng'g	1,816.24	—	97.13	86.63	2,000.00	62.04
Drawing	224.43	2.25	.80	8.60	236.08	—
Economics	755.01	340.22	.47	4.30	1,100.00	73.97
Electrical Engineering	3,646.38	24.33	215.79	113.50	4,000.00	29.72
English	146.20	3.80	—	—	150.00	—
General Library	2,051.36	—	.75	1.36	2,053.47	—
Geology	1,160.67	47.00	4.87	6.19	1,218.73	—
History	385.90	314.10	—	—	700.00	8.44
Mathematics	213.35	386.65	—	—	600.00	13.81
Mechanical Engineering	5,640.70	1,200.70	285.65	252.95	7,380.00	185.98
Military Science	1,158.95	350.75	—	—	1,509.70	—
Mining	1,305.88	2.98	50.47	13.83	1,373.16	—
Modern Language	77.00	333.00	—	—	410.00	32.87
*Naval Architecture	289.74	1,241.59	.85	5.16	†1,537.34	202.05
Physical Training Gymnasium	194.49	128.75	26.71	15.05	365.00	15.12
Physical Training Athletic Field	1,632.46	1,174.19	30.92	60.62	2,898.19	—
Physics	5,087.61	—	107.83	204.56	5,400.00	216.93
	$42,638.84	$5,804.81	$1,148.32	$1,289.70	$50,881.67	$2,250.96
Expense items brought down			42,638.84	5,804.81		
Total stocks and supplies			$43,787.16			
Total salaries and wages				$7,094.51		
Grand total					$50,881.67	
Less Salaries of Teachers (included elsewhere)				1,499.16	1,499.16	
Total, Schedule C–1				$5,595.35	$49,382.51	
Department overdrafts (Schedule D—Current Assets)						$2,250.96

* Including aeronautics.
† Gift of $40.00 for aeronautics (1914–1915) deducted.

Schedule C–3.

DETAIL OF PLANT REPAIRS.

	Labor.	*Stock.*
Rogers Building	$518.92	$144,64
Walker Building	410.86	97.72
Lowell Building	248.28	189.66
Engineering A and B	322.35	148.50
Engineering C	192.72	113.92
Pierce Building	145.36	37.87
Mechanical Laboratory	156.35	55.73
Gymnasium	76.79	35.95
Boiler Room	334.76	98.01
Power Plant	225.06	101.86
Shop Maintenance	266.13	26.59
Furniture	546.74	46.53
General Roofing	7.85	—
Clocks	82.72	—
Garage	3.67	.50
Undistributed	600.16	*2,078.94
	$4,138.72	$3,176.42

* Includes unused stock on hand in Carpenter, Electrical and Pipe shops.

Schedule D.

TREASURER'S BALANCE SHEET

1

INVESTMENT ASSETS.

Securities and Real Estate, Schedule H	$4,729,425.86
Cash: In banks for Investment and New Buildings, Schedule E	436,163.22
Total	$5,165,589.08

2.

CURRENT ASSETS.

Cash available for general purposes, Schedule E			$144,743.55
Accounts Receivable, Schedule F-2			7,128.56
Accrued Interest paid, account Investments for 1916-17			11,108.36
Unexpired Insurance			14,090.44
Advances—account 1916-1917	Department Appropriations	$2,250.96	3,300.27
	Summer Camp	1,049.31	
Purchases—account 1916-1917—Dining Room			50.00
Total			$180,421.18
Excess of Investment Assets (per contra)			171,569.94
Total			$351,991.12

3.

EDUCATIONAL PLANT ASSETS.

Lands, Buildings and Equipment. Nominal Values.	
Total book value at beginning of year	$4,853,355.92
Additions during year (net), Schedule K	2,434,511.81
Total book value at end of year	$7,287,867.73
Unexpended balance in investments as above	168,274.52
Total	$7,456,142.25

M. I. T. ALUMNI FUND. ASSETS.

Appropriated for Equipment of New Buildings, Walker Memorial and Dormitories	$365,000.00
Balance, Cash in bank (Schedule E)	35,651.60
	$400,651.60

WALKER MEMORIAL FUND. ASSETS.

Securities (Schedule H)	$78,144.50
Cash in bank for investment (Schedule E)	80,344.03
	$158,488.53

IMPROVEMENT FUND. ASSETS.

Securities (Schedule H)	$21,422.00
Cash in bank for investment (Schedule E)	1,968.52
	$23,390.52

CILLEY FUND. ASSETS.

Securities (Schedule H)	$59,710.00
Cash in bank for investment (Schedule E)	5,446.36
	$65,156.36

Schedule D.

JUNE 30, 1916.

1.

ENDOWMENT AND OTHER FUNDS.

Funds, Schedule Q recapitulation		$4,811,385.14
Minor Funds, Schedule R		14,359.48
Total funds		$4,825,744.62
Excess of investment assests (carried down per contra)	$171,569.94	
New Site cash	168,274.52	339,844.46
		$5,165,589.08

2.

CURRENT LIABILITIES.

Accounts Payable	$1,904.20
Tuition in advance, 1916–17	11,186.00
Summer Camp, 1916, Fees and Deposits	709.67
Summer Camp, Outside Students' Fees	200.00
Entrance Examination fees	5,425.00
Students' deposits in advance	2,935.50
Students' deposits outstanding	1,161.91
Locker deposits outstanding	197.50
Alumni New Site Fund	823.60
Gifts, anticipated	750.00
Total	$25,293.38
Surplus available for current expense, Schedule S	326,697.74
	$351,991.12

3.

EDUCATIONAL PLANT AND CAPITAL ACCOUNTS.

Notes Payable	$400,000.00
Anonymous Donation for New Buildings	3,500,000.00
Estate of F. W. Emery, for New Equipment	120,561.80
Donations for Mining Building	215,000.00
Alumni Fund for Equipment, Dormitories and Walker Memorial	365,000.00
T. C. du Pont, Donation for Land	500,000.00
Anonymous Donation for Dormitories	100,000.00
Other New Site and Buildings Funds	629,426.63
Other funds and capital (not analyzed)	1,626,153,82
	$7,456,142.25

M. I. T. ALUMNI FUND.

Balance at beginning of year	$295,730.82
Subscriptions and net income for year added to fund	104,920.78
	$400,651.60

WALKER MEMORIAL FUND.

Balance at beginning of year	$150,663.60
Net income for year added to fund	7,824.93
	$158,488.53

IMPROVEMENT FUND.

Balance at beginning of year	$22,329.97
Net income for year added to fund	1,060.55
	$23,390.52

CILLEY FUND.

Balance at beginning of year	$62,565.13
Net income for year added to fund	2,591.23
	$65,156.36

Schedule E.

CASH RECEIPTS AND DISBURSEMENTS.

FOR THE YEAR.

Total Cash Disbursements	$4,906,316.19
Total Cash Receipts	4,066,579.11
Excess of Disbursements	$839,737.08
Cash balance at beginning of year	1,544.054.36
Cash balance at end of year	$704,317.28

CASH BALANCE

Cash on deposit at banks:		
For Walker Memorial		$80,344.03
For Improvement Fund		1,968.52
For Cilley Fund		5,446.36
For Alumni Fund		35,651.60
For Investment and New Buildings		436,163.22
For General Purposes	$144,573.97	
Cash at office:		144,743.55
For General Purposes	169.58	
Cash balance as above		$704,317.28

Schedule F–2.

ACCOUNTS RECEIVABLE.

For Tuition:	
12 Students (U. S. Government)	$6,000.00
5 Students	554.30
Miscellaneous:	
Chemical Breakage	418.67
Checks returned unpaid	75.00
Debit balances of Accounts Payable	80.59
	$7,128.56

Schedule H.

SECURITIES: BONDS, STOCKS,

Bonds.	*Description of securities.*	*Due.*	*Balance at beginning of year.*
$1,000.00	Adirondack Elec. Power Corp. 5% . .	1962	—
26,000.00	Am. Dock and Improvement Co. 5% .	1921	$26,420.00
115,000.00	Am. Tel. & Tel. Co. 4%	1929	114,025.00
30,000.00	Am. Thread Co. 4%	1919	—
26,500.00	Atch., Topeka & Santa Fé R. R. Co. 4% .	1995	25,000.00
100,000.00	Atch., Topeka & Santa Fé Ry. Co. 4½% .	1962	—
1,000.00	City of Baltimore 4%	1961	—
34,000.00	Baltimore & Ohio R.R. Co. 3½% . . .	1925	30,090.00
1,000.00	Belt R.R. and Stock Yds. Co. 4% . .	1939	—
30,000.00	Blackstone Valley Gas & Elec. Co. 4½% .	1919	—
50,000.00	Blackstone Valley Gas & Elec. Co. 5%	1939	—
10,000.00	Boston & Northern St. Ry. Co. 4% . .	1954	9,250.00
70,000.00	Brooklyn Rapid Transit Co. 5% . . .	1918	50,000.00
1,000.00	Buffalo, Rochester & Pitts. Ry. Co. 4½%	1921	—
1,000.00	Burlington & Mo. River R.R. (Neb.) 6%	1918	1,000.00
1,000.00	Bus. R. E. Trust, Boston, Trustees 4% .	1921	—
1,000.00	Central Ill. Public Service Co. 5% . .	1952	—
50,000.00	Central Pacific Ry. Co. 4%.	1954	—
43,000.00	Chesapeake & Ohio Ry. Co. 5% . . .	1939	47,473.00
38,000.00	Chicago, Burlington & Quincy R.R. 4%	1958	38,084.00
1,000.00	Chi., Burlington & Quincy (Neb. ext.) 4%	1927	1,000.00
1,000.00	Chi., Burlington & Quincy 3½% . . .	1949	—
50,000.00	Chi. Junc. Rys. and Union Stock Yds. 4%	1940	49,250.00
35,000.00	Chi. Junc. Rys. and Union Stock Yds. 5%	1940	9,850.00
1,000.00	Chi., Mil. & Puget Sound Ry. Co. 4% .	1949	—
55,000.00	Chi., Mil. & St. Paul Ry. Co. 5% . . .	2014	25,495.00
2,000.00	Chicago & Northwestern Ry. Co. 4% .	1926	—
100,000.00	Chi. and West Michigan Ry. Co. 5% .	1921	100,525.00
1,000.00	City of Cincinnati (St. Imp.) 4½%. . .	1933	—
25,000.00	Cleveland & Pittsburgh R.R. Co. 4½% .	1942	25,773.50
1,000.00	Concord & Montreal R.R. Co. 4% . .	1920	—
51,000.00	Cumberland Tel. & Tel. Co. 5% . . .	1937	49,340.75
17,000.00	Delaware & Hudson Co. 4%	1943	17,270.00
30,000.00	Delaware & Hudson Co. 5%	1935	—
50,000.00	Detroit Edison Co. 5%	1933	51,008.00
50,000.00	Detroit Edison Co. 5%	1940	—
1,000.00	Dom'n Power & Transmission Co. 5% .	1932	—
—	Eastern Texas Electric Co. 6%	1916	24,500.00
1,000.00	Electrical Securities Corp. 5%	1942	—
25,000.00	Electrical Securities Corp. 5%	1943	25,000.00
1,000.00	Erie R.R. Co. 5%	1917	—
70,000.00	General Electric Co. 5%.	1952	25,902.00
22,000.00	Georgia Ry. & Electric Co. 5%	1932	—
3,000.00	Illinois Central R.R. Co. 4%	1951	3,000.00
2,000.00	Illinois Central R.R. Co. 3½%	1952	—
1,000.00	Illinois Central R.R. Co. 4%	1955	—
25,000.00	Indianapolis Union Ry. Co. 5% . . .	1965	24,906.25
7,000.00	Kan. City, Clinton & Spfd. Ry. Co. 5%	1925	6,289.21
50,000.00	Kan. City, Fort Scott & Mem. R.R. 6%	1928	54,353.00
8,500.00	Kan. City, Mem. & Birming. R.R. 4%.	1934	8,287.50
37,000.00	Kan. City, Mem. & Birming. R.R. 5% .	1934	34,225.00
18,000.00	Kentucky Central Ry. Co. 4%	1987	17,910.00
1,000.00	Lackawanna Steel Co. 5%	1923	—
3,000.00	Lake Shore & Mich. So. Ry. Co. 4% .	1928	3,000.00
85,000.00	Lake Shore & Mich. So. Ry. Co. 4% .	1931	84,087.50

Schedule H.

REAL ESTATE AND MORTGAGES.

Purchases and charges during year.	*Sales and credits during year.*	*Balance at end of year.*	*Accrued int. paid.*	*Interest received.*
$920.00	—	$920.00	—	—
—	$80.00	26,340.00	—	$1,300.00
—	—	114,025.00	—	4,600.00
29,587.50	—	29,587.50	—	—
1,410.00	—	26,410.00	—	1,030.00
97,525.00	—	97,525.00	$278.13	562.50
950.00	—	950.00	—	—
—	—	30,090.00	—	1,190.00
900.00	—	900.00	—	20.00
30,000.00	—	30,000.00	—	—
50,250.00	11.00	50,239.00	—	1,250.00
—	—	9,250.00	—	400.00
20,050.00	—	70,050.00	—	2,500.00
1,000.00	—	1,000.00	—	22.50
—	—	1,000.00	—	60.00
950.00	—	950.00	—	20.00
880.00	—	880.00	—	—
40,918.75	—	40,918.75	721.11	2,000.00
—	194.00	47,279.00	—	2,150.00
—	2.00	38,082.00	—	1,520.00
—	—	1,000.00	—	40.00
837.50	—	837.50	—	—
—	—	49,250.00	—	2,000.00
24,893.75	—	34,743.75	175.00	1,125.00
895.00	—	895.00	—	—
30,625.00	11.00	56,109.00	727.78	2,750.00
1,900.00	—	1,900.00	—	—
—	105.00	100,420.00	—	—
1,032.50	1.50	1,031.00	—	22.50
—	29.50	25,744.00	—	1,125.00
940.00	—	940.00	—	—
965.00	—	50,305.75	—	2,500.00
—	10.00	17,260.00	—	680.00
32,250.00	118.00	32,132.00	—	—
—	59.00	50,949.00	—	2,500.00
50,125.00	—	50,125.00	76.39	833.33
910.00	—	910.00	—	25.00
500.00	25,000.00	—	—	1,406.65
990.00	—	990.00	—	—
—	—	25,000.00	—	1,250.00
1,000.00	—	1,000.00	—	25.00
46,125.00	56.00	71,971.00	893.79	3,500.00
22,440.00	—	22,440.00	—	—
—	—	3,000.00	—	120.00
1,570.00	—	1,570.00	—	—
875.00	—	875.00	—	20.00
—	—	24,906.25	—	1,250.00
—	—	6,289.21	—	—
—	362.00	53,991.00	—	3,000.00
—	—	8,287.50	—	340.00
—	—	34,225.00	—	—
—	—	17,910.00	—	720.00
927.50	—	927.50	—	25.00
—	—	3,000.00	—	120.00
—	—	84,087.50	—	3,400.00

Schedule H. (*Continued.*)

Bonds.	*Description of securities.*	*Due.*	*Balance at beginning of year.*
$100,000.00	Long Island R.R. Co. 4%	1949	$96,137.50
25,000.00	Los Angeles, City of, 4½%	1942	—
25,000.00	Los Angeles, City of, 4½%	1943	—
100,000.00	Maine Central Ry. Co. 4½%	1935	—
25,000.00	Manchester Traction Light & Power Co. 5%	1918	—
1,000.00	Maryland, Delaware & Va. Ry. Co. 5%	1955	—
50,000.00	Massachusetts Gas Co.'s 4½%	1931	49,312.50
—	City of Melrose Note	1915	—
50,000.00	Milwaukee Gas Light Co. 4%	1927	—
50,000.00	City of Minneapolis 4%	1927	—
50,000.00	Minneapolis General Electric Co. 5%	1934	50,535.00
50,000.00	Minn., St. Paul & Sault St. Marie 4%	1938	—
—	Missouri Pacific Ry. Co. 6%	1914	16,952.40
50,000.00	City of Montreal, Canada, 5%	1936	—
1,000.00	Montreal Tramways Co. 5%	1941	—
1,000.00	National Dock Trust 4½%	1940	—
50,000.00	New England Tel. & Tel. Co. 4%	1930	50,300.00
10,000.00	New England Tel. & Tel. Co. 5%	1932	10,126.00
52,000.00	N. Y. C. & H. R. R.R. Co. 4%	1998	46,046.65
4,000.00	N. Y. C. & H. R. R.R. Co. 3½%	1998	—
1,000.00	N. Y. C. Lines Equipment 4½%	1919	—
36,000.00	N. Y. C. Lines Equipment 5%	1919	34,740.00
2,600.00	N. Y. Central R.R. 6%	1935	—
100,000.00	N. Y. Connecting R.R. Co. 4½%	1953	—
31,000.00	N. Y. N. H. & H. R.R. Co. 6%	1948	34,805.00
80,000.00	New York Telephone Co. 4½%	1939	24,187.50
29,000.00	Nipe Bay Co. 6%	1917	—
1,000.00	Northern Me. Seaport R.R. Co. 5%	1935	—
159,000.00	Northern Pacific—Gt. No. R.R. Co. 4%	1921	50,500.00
75,000.00	Northern Pacific Ry. Co. 4%	1997	—
25,000.00	Old Colony St. Ry. Co. 4%	1954	22,750.00
50,000.00	Oregon R.R. & Navigation Co. 4%	1946	50,907.00
50,000.00	Oregon Short Line R.R. Co. 4%	1929	48,500.00
500.00	Oregon Short Line R.R. Co. 5%	1946	—
75,000.00	Pacific Tel. & Tel. Co. 5%	1937	25,017.60
—	Pennsylvania R.R. Co. 3½%	1915	48,187.50
18,000.00	Pennsylvania R.R. Co. 4½%	1960	18,660.00
25,000.00	Pennsylvania R.R. Co. 4½%	1965	—
1,000.00	Pere Marquette R. R. Co. 4%	1951	—
25,000.00	Portland General Electric Co. 5%	1935	25,517.00
1,000.00	City of Portland, Ore., 4%	1936	—
50,000.00	City of Portland, Ore., 4½%	1945	—
—	Public Utilities Corp., Me., 6%	1916	—
50,000.00	City of Quebec 5%	1920	49,375.00
50,000.00	Rio Grande Western Ry. Co. 4%	1939	49,180.00
1,000.00	City of Saginaw, Mich., 3½%	1922	—
15,000.00	City of Saginaw, Mich., 4%	1924	15,000.00
15,000.00	City of San Francisco 5%	1937	—
10,000.00	City of San Francisco 5%	1939	—
19,000.00	Seattle Electric Co. 5%	1929	18,430.00
6,000.00	Seattle Electric Co. 5%	1930	6,258.00
1,000.00	Somerset Ry. Co. 4%	1955	—
22,000.00	Southern Bell Tel. & Tel. Co. 5%	1941	—
—	Southern Pacific Co. 4%	1950	40,568.33
25,000.00	Southern Railway Co.	1951	24,875.00

Schedule H. (*Continued.*)

Purchases and charges during year.	*Sales and credits during year.*	*Balance at end of year.*	*Accrued int. paid.*	*Interest received.*
—	—	$96,137.50	—	$4,000.00
$26,192.50	—	26,192.50	—	—
26,217.50	—	26,217.50	—	—
100,125.00	—	100,125.00	$6.26	1,125.00
24,750.00	—	24,750.00	116.39	1,250.00
800.00	—	800.00	—	—
—	—	49,312.50	—	2,250.00
10,000.00	$10,000.00	—	—	—
46,812.50	—	46,812.50	—	—
48,175.00	—	48,175.00	555.56	2,000.00
—	30.00	50,505.00	—	2,500.00
46,500.00	—	46,500.00	—	—
—	16,952.40	—	—	1,005.83
50,000.00	—	50,000.00	—	—
890.00	—	890.00	—	—
925.00	—	925.00	—	22.50
—	20.00	50,280.00	—	2,000.00
—	8.00	10,118.00	—	500.00
—	—	46,046.65	—	2,080.00
2,905.00	—	2,905.00	—	—
985.00	—	985.00	—	—
—	—	34,740.00	—	1,800.00
2,694.25	5.25	2,689.00	—	78.00
98,625.00	—	98,625.00	—	—
—	118.00	34,687.00	—	1,860.00
53,093.75	—	77,281.25	303.75	2,475.00
29,471.25	—	29,471.25	—	—
850.00	—	850.00	—	25.00
104,937.50	—	155,437.50	194.45	2,180.00
67,875.00	—	67,875.00	—	2,250.00
—	—	22,750.00	—	1,000.00
—	30.00	50,877.00	—	2,000.00
—	—	48,500.00	—	2,000.00
522.50	.75	521.75	—	—
48,897.50	—	73,915.10	563.47	2,500.00
1,812.50	50,000.00	—	—	583.50
—	15.00	18,645.00	—	810.00
25,156.25	3.25	25,153.00	420.00	1,012.50
440.00	—	440.00	—	—
—	27.00	25,490.00	—	1,250.00
950.00	—	950.00	—	—
51,000.00	34.00	50,966.00	600.38	2,250.00
1,000.00	1,000.00	—	—	30.00
—	—	49,375.00	—	2,500.00
—	—	49,180.00	—	2,000.00
946.25	—	946.25	—	17.50
—	—	15,000.00	—	600.00
16,448.25	69.25	16,379.00	—	—
11,014.90	44.90	10,970.00	—	—
—	—	18,430.00	—	950.00
—	18.00	6,240.00	—	300.00
850.00	—	850.00	—	—
22,110.00	—	22,110.00	—	—
1,909.17	42,477.50	—	—	1,291.65
—	—	24,875.00	—	1,000.00

Schedule H. (*Continued.*)

Bonds, shares.	*Description of securities.*	*Due.*	*Balance at beginning of year.*
—	St. Croix Paper Co. 5%	1915	$24,517.50
$50,000.00	City of St. Paul 4½%	1935	—
1,000.00	City of Toledo 4½%	1931	—
1,100.00	Toledo Terminal R.R. Co. 4½%	1957	—
5,000.00	Terminal R.R. Assn. of St. Louis 4%	1953	5,000.00
50,000.00	Terminal R.R. Assn. of St. Louis 4½%	1939	—
50,000.00	Union Pacific R.R. Co. 4%	1947	51,312.00
70,000.00	United Fruit Co. 5%	1918	29,550.00
8,000.00	United Fruit Co. 4½%	1923	7,642.50
42,000.00	United Fruit Co. 4½%	1925	16,156.25
1,000.00	U. S. Envelope Co. 5%	1924	—
26,000.00	U. S. Steele Corporation 5%	1963	27,010.00
1,000.00	Washington Co. Ry. Co. 3½%	1954	—
—	West End St. Ry. Co. 4%	1915	30,000.00
100,000.00	West End St. Ry. Co. 4%	1917	100,270.00
16,000.00	Western Telephone & Telegraph Co. 5%	1932	—
25,000.00	Western Electric Co. 5%	1922	24,875.00
2,000.00	Western Union Telegraph Co. 4½%	1950	—
1,000.00	Westinghouse Electric & Mfg. Co. 5%	1917	—
8 shares	American Mfg. Co.		—
4 "	American Mfg. Co. Pfd.		—
46 "	American Tel. & Tel. Co.		—
65 "	Amoskeag Mfg. Co. Pfd.		4,950.00
23 "	Amoskeag Mfg. Co.		—
1 "	Bates Manufacturing Co.		—
6 "	Boston & Lowell R.R. Corp.		—
295 "	Boston & Albany R.R. Co.		60,911.50
16 "	Boston & Maine R.R. Com.		—
19 "	Boston & Maine R.R. Pfd.		—
10 "	Boston Ground Rent Trust		900.00
64 "	Boston Real Estate Trust		68,461.64
12 "	Boston Wharf Co.		—
31 "	Boston Woven Hose & Rubber Co. Com.		—
20 "	Boston Woven Hose & Rubber Co. Pfd.		—
12 "	Boylston Market Assn		—
75 "	British Westinghouse Elec. & Mfg. Co. Pfd.		—
12 "	Calumet & Hecla Mining Co.		—
4 "	Cambridge Gas Light Co.		—
91 "	Central Wharf & Wet Dock Corp.		14,700.00
	Chesapeake & Ohio Ry. Co.		—
93 "	Chi., Milwaukee & St. Paul Ry. Co. Pfd.		5,703.00
33 "	Chi., Milwaukee & St. Paul Ry. Co. Com.		—
29 "	Chicago & Northwestern Ry. Co.		—
3 "	Concord & Montreal R.R.		—
2 "	Coöperative Publishing Co.		2.00
7 "	Copley Square Trust Pfd.		—
5 "	Delaware & Hudson Co.		—
2 "	Dwight Manufacturing Co.		1,600.00
	Easthampton Rubber Thread Co.		—
27 "	Essex Company		3,780.00
54 "	Fitchburg R.R. Co. Pfd.		2,025.00
	Glendale Elastic Fabric Co.		—
31 "	Great Falls Mfg. Co.		3,472.00
56 "	Hamilton Woolen Co.		5,390.00
18 "	Illinois Central R.R. Co.		—

Schedule H. (*Continued.*)

Purchases and charges during year.	*Sales and credits during year.*	*Balance at end of year.*	*Accrued int. paid.*	*Interest received.*
$482.50	$25,000.00	—	—	$625.00
50,875.00	46.00	$50,829.00	$156.25	1,125.00
1,030.00	2.00	1,028.00	—	22.50
825.00	—	825.00	—	24.75
—	—	5,000.00	—	200.00
50,000.00	—	50,000.00	—	—
—	42.00	51,270.00	—	2,000.00
40,350.00	—	69,900.00	—	1,500.00
—	—	7,642.50	—	360.00
24,468.75	—	40,625.00	—	765.00
1,000.00	—	1,000.00	—	25.00
—	21.00	26,989.00	—	1,300.00
750.00	—	750.00	—	—
—	30,000.00	—	—	600.00
—	270.00	100,000.00	—	4,000.00
16,078.75	—	16,078.75	—	—
—	—	24,875.00	—	1,250.00
1,860.00	—	1,860.00	—	45.00
1,000.00	—	1,000.00	—	25.00
896.00	—	896.00	—	28.67
376.00	—	376.00	—	13.33
5,730.00	—	5,730.00	—	284.00
1,470 00	—	6,420.00	—	309.75
1,495.00	—	1,495.00	—	51.75
241.00	—	241.00	—	12.00
780.00	—	780.00	—	24.00
—	—	60,911.50	—	2,581.25
530.00	—	530.00	—	—
855.00	—	855.00	—	—
—	2.50	897.50	—	52.50
—	—	68,461.64	—	2,880.00
1,323.00	—	1,323.00	—	57.00
7,750.00	—	7,750.00	—	186.00
2,340.00	—	2,340.00	—	60.00
16,800.00	—	16,800.00	—	210.00
600.00	—	600.00	—	46.43
6,000.00	—	6,000.00	—	540.00
1,030.00	9.50	1,020.50	—	30.00
4,200.00	—	18,900.00	—	602.00
6,174.00	6,174.00	—	—	—
1,664.00	—	7,367.00	—	560.00
3,168.00	—	3,168.00	—	—
3,770.00	—	3,770.00	—	101.50
276.00	—	276.00	—	15.75
—	—	2.00	—	—
686.00	—	686.00	—	17.50
750.00	—	750.00	—	33.75
—	—	1,600.00	—	120.00
6,250.00	6,250.00	—	—	75.00
—	—	3,780.00	—	297.00
2,030.00	—	4,055.00	—	197.50
34,604.00	34,604.00	—	—	422.00
—	—	3,472.00	—	372.00
—	—	5,390.00	—	336.00
1,890.00	—	1,890.00	—	45.00

Schedule H. (*Continued.*)

	Description of securities.		*Balance at beginning of year.*
50 shares	Lancaster Mills		$5,519.00
1 "	Lawrence Gas Co.		—
101 "	Maine Central R.R. Co.		—
5 "	Merchants Warehouse Co. Pfd.		—
50 "	Nashua Manufacturing Co.		32,500.00
3 "	Nat'l Grand Bank of Marblehead		—
7 "	Newburyport Gas & Electric Co.		—
33 "	New Eng. Tel. & Tel. Co.		4,110.00
65 "	N. Y. C. & H. R. R.R. Co.		—
50 "	N. Y., N. H. & H. R.R. Co.		1,725.00
27 "	Old Colony R.R.		—
10 "	Pemberton Company		—
64 "	Pepperell Mfg. Co.		2,789.50
8 "	Pennsylvania Railroad Co.		—
50 "	Pray Building Trusts		2,500.00
197 "	Pullman Co.		—
"	Quincy Market Realty Co.		—
50 "	Samson Cordage Co.		—
6 "	State Street Exchange		—
25 "	South Terminal Trust		2,000.00
20 "	Union Pacific R.R. Co.		—
3 "	Union Pacific R.R. Co. Pfd.		—
300 "	United Fruit Co.		—
70 "	Vermont & Mass. R.R. Co.		—
11 "	Wash. Water Power Co. of Spokane		—
188 "	Westinghouse Elec. & Mfg. Co.		—
100 "	Westinghouse Elec. & Mfg. Co. Pfd.		—
5 "	York Manufacturing Co.		—
	MORTGAGE NOTES:		
	E. V. & C. T. Bigelow		4,500.00
	W. H. Partridge		7,000.00
	Sam'l Carr et al. Trustee		—
	REAL ESTATE:		
	Back Bay, Boston, Land & Building, Equity		25,000.00
	Clarendon Street Land and Buildings		142,762.94
	Newbury Street Land and Building		—
	Pearl Street, Boston, Equity		44,764.32
	Portland, So. Portland & Mt. Desert, Maine		—
			$2,652,581.84
	INVESTMENTS, W. B. ROGERS MEMORIAL FUND:	*Due.*	
$25,000	Atchison, Top. & St. Fé Ry. Co. 4%	1995	$24,470.00
6,000	Baltimore & Ohio R.R. 3½%	1925	5,310.00
7,000	Chesapeake & Ohio Ry. Co. 5%	1939	7,730.00
1,000	Chi., Burl. & Quincy R.R. 4%	1958	1,000.00
40,000	Chi. Junc. Rys. & U. Stock Yds. Co. 5%	1940	39,400.00
4,000	Cin., Ind., St. Louis & Chi. Ry. 6%	1920	4,000.00
37,500	Detroit, Grand Rapids & West'n R.R. 4%	1946	37,500.00
5,000	Fort St. Union Depot Co. 4½%	1941	34,825.00
27,000	Kansas City Belt Ry. 6%	1916	27,000.00
31,000	N. Y. C. & H. R. R. R. 4%	1934	30,225.00
1,000	N. Y. Central Lines Equipment 5%	1919	965.00
24,000	Rome, Watertown & Ogdensburg R.R. 5%	1922	24,800.00
4,000	United Electric Securities 5%	1940	4,035.50
			$241,260.50

Schedule H. (*Continued.*)

Purchases and charges during year.	*Sales and credits during year.*	*Balance at end of year.*	*Accrued int. paid.*	*Interest received.*
—	—	$5,519.00	—	—
$1 5.00	—	165.00	—	$8.00
9,740.00	—	9,740.00	—	168.00
475.00	—	475.00	—	6.25
—	—	32,500.00	—	2,500.00
324.00	—	324.00	—	9.00
1,190.00	—	1,190.00	—	42.00
390.00	—	4,500.00	—	231.00
5,768.75	—	5,768.75	—	81.25
2,000.00	—	3,725.00	—	—
3,780.00	—	3,780.00	—	189.00
850.00	—	850.00	—	—
1,586.00	—	4,375.50	—	1,024.00
440.00	—	440.00	—	12.00
—	—	2,500.00	—	50.00
31,520.00	—	31,520.00	—	570.00
800.00	$800.00	—	—	24.00
5,000.00	—	5,000.00	—	75.00
390.00	—	390.00	—	15.75
—	—	2,000.00	—	87.50
2,635.00	—	2,635.00	—	40.00
243.00	—	243.00	—	6.00
40,200.00	1,837.50	38,362.50	—	1,800.00
8,680.00	—	8,680.00	—	210.00
924.00	—	924.00	—	13.75
9,212.00	—	9,212.00	—	141.00
6,450.00	—	6,450.00	—	87.50
425.00	—	425.00	—	30.00
—	—	4,500.00	—	225.00
—	—	7,000.00	—	350.00
125,000.00	50,000.00	75,000.00	—	—
—	—	25,000.00	—	*141.65
—	—	142,762.94	—	*5,500.00
12,168.00	—	12,168.00	$1,640.93	—
—	—	44,764.32	—	*1,641.37
4,625.00	—	4,625.00	—	—
$1,998,402.82	$301,950.80	$4,349,033.86	$7,429.64	$138,606.91
—	—	$24,470.00	—	$1,000.00
—	—	5,310.00	—	210.00
—	$31.00	7,699.00	—	350.00
—	—	1,000.00	—	40.00
—	—	39,400.00	—	2,000.00
—	—	4,000.00	—	240.00
—	—	37,500.00	—	—
—	—	34,825.00	—	1,575.00
—	—	27,000.00	—	1,620.00
—	—	30,225.00	—	1,240.00
—	—	965.00	—	50.00
—	134.00	24,666.00	—	1,200.00
—	1.50	4,034.00	—	200.00
—	$166.50	$241,094.00	—	$9,725.00

* Net income.

Schedule H. *(Continued.)*

	Due.	Balance at beginning of year.
INVESTMENTS EBEN S. DRAPER FUND:		
$20,000 C., M. & St. Paul Ry. Co. 5%	2014	$20,396.00
16,000 Georgia Ry. & Elec. Co. 5%	1932	16,300.00
24,000 Indianapolis Union Ry. Co. 5%	1965	23,880.00
20,000 New York Tel. Co. 4½%	1939	19,395.00
20,000 Wilmington City Elec. Co. 5%	1951	19,600.00
		$99,571.00
INVESTMENTS THOS. WENDELL BAILEY FUND:		
5 shares Swift & Co.		$525.00
Trinity Copper Co.		30.00
Miscellaneous Oklahoma Properties		1,152.00
		$1,707.00
INVESTMENTS JOY SCHOLARSHIP FUND:		
Mass. Hospital Life Ins. Co.		$5,000.00
INVESTMENTS SUSAN H. SWETT SCHOLARSHIP FUND:		
Mass. Hospital Life Ins. Co.		10,000.00
INVESTMENTS RICHARD LEE RUSSEL FELLOWSHIP FUND:		
$2,000 Fiske Wharf and Warehouse Trust		1,980.00
*INVESTMENTS JONATHAN WHITNEY FUND:		
$21,000 United Elec. Securities Co. 5%	1940	21,098.00
INVESTMENTS GEO. H. MAY FUNDS:		
E. I. du Pont de Nemours Powder Co. Pfd.		8,500.00
*INVESTMENTS EMMA ROGERS FUND:		
Real Estate, Temple Place, Boston		291,000.00
Grand Total, Schedule D		$3,332,698.34
INVESTMENTS WALKER MEMORIAL FUND:		
$30,000 Am. Tel. & Tel. Co. 4%	1929	$30,278.00
10,000 Chi., Burl. & Quincy R.R. Co. 4%	1958	10,000.00
— Cleveland Elec. Ill. Co. 5%	1939	5,940.00
— Detroit Edison Co. 6%	1925	8,486.00
17,000 Electrical Securities Corporation 5%	1940	16,915.00
— N. Y. C. & H. R. R.R. (L. S.) 4%	1998	47,986.35
14,000 Oregon Short Line R.R. 5%	1946	16,235.00
5,000 St. Louis Iron Mt. & So. R.R. 4%	1933	4,812.50
Total		$140,652.85
INVESTMENTS IMPROVEMENT FUND:		
$4,000 Cleveland Elec. Illum. Co. 5%	1939	$3,960.00
8,000 Electrical Securities Corporation 5%	1940	7,960.00
9,000 U. S. Steel Corporation 5%	1963	9,513.00
Total		$21,433.00
INVESTMENTS M. I. T. ALUMNI FUND:		
$75,000 Loan through First National Bank		$75,000.00
— Chi., St. L. & New Orleans 5%	1915	25,000.00
Total		$100,000.00
INVESTMENTS FRANK HARVEY CILLLEY FUND:		
$15,000 Nashville, City of, 5%	1917	$15,084.00
40 shares Boston & Albany R.R. Co.		8,000.00
10 " Boston & Providence R.R. Cpn.		2,500.00
30 " Edison Elec. Illum. Co.		7,959.00
50 " Fitchburg R.R. Pfd.		5,000.00
75 " Massachusetts Gas Co.'s Pfd.		6,825.00
50 " N. Y., N. H. & H. R.R.		4,700.00
25 " Springfield Ry. Co.'s Pfd.		2,125.00
50 " West End St. Ry.		3,600.00
South American Properties		1.00
D. C. Aznive, Mortgage Note		1,600.00
Jacob Levenson, Mortgage Note		2,400.00
A. J. Diamond, Mortgage Note		666.66
Total		$60,460.66

* Balance of funds invested in securities included in General Investments

Schedule H. (*Continued.*)

Purchases and charges during year.	*Sales and credits during year.*	*Balance at end of year.*	*Accrued int. paid.*	*Interest received.*
—	$4.00	$20,392.00	$200.00	$1,000.00
—	20.00	16,280.00	224.44	800.00
—	—	23,880.00	—	1,200.00
—	—	19,395.00	—	900.00
—	—	19,600.00	333.42	1,000.00
—	$24.00	$99,547.00	$757.86	$4,900.00
—	—	525.00	—	38.75
—	30.00	—	—	—
—	—	1,152.00	—	48.00
—	$30.00	$1,677.00	—	$86.75
—	—	5,000.00	—	212.50
—	—	10,000.00	—	425.00
—	—	1,980.00	—	80.00
—	4.00	21,094.00	—	1,050.00
—	8,500.00	—	—	125.00
—	291,000.00	—	—	1,343.16
$1,998,402.82	$601,675.30	$4,729,425.86	$8,187.50	$156,554.32
—	$21.00	$30,257.00	—	$1,200.00
—	—	10,000.00	—	400.00
$150.00	6,090.00	—	—	287.50
2,131.00	10,617.00	—	—	492.50
—	—	16,915.00	—	850.00
—	47,986.35	—	—	2,443.34
—	75.00	16,160.00	—	700.00
—	—	4,812.50	—	200.00
$2,281.00	$64,789.35	$78,144.50	—	$6,573.34
—	—	$3,960.00	—	$200.00
—	—	7,960.00	—	400.00
—	$11.00	9,502.00	—	450.00
—	$11.00	$21,422.00	—	$1,050.00
—	$75,000.00	—	—	$1,687.50
—	25,000.00	—	—	625.00
—	$100,000.00	—	—	$2,312.50
—	$84.00	$15,000.00	—	$750.00
—	—	8,000.00	—	350.00
—	—	2,500.00	—	100.00
—	—	7,959.00	—	360.00
—	—	5,000.00	—	250.00
—	—	6,825.00	—	300.00
—	—	4,700.00	—	—
—	—	2,125.00	—	100.00
—	—	3,600.00	—	175.00
—	—	1.00	—	—
—	—	1,600.00	—	96.00
—	—	2,400.00	—	120.00
—	666.66	—	—	25.00
—	$750.66	$59,710.00	—	$2,626.00

Schedule J.

LANDS, BUILDINGS AND EQUIPMENT.

EDUCATIONAL PLANT:

Land, Buildings, Book Values.

	Balance June 30, 1915.	*Balance June 30, 1916.*
Land and Buildings, Boston	$1,590,072.01	$1,590,072.01
Summer Camp, East Machias, Me.	36,081.81	36,081.81
New Technology, Land	840,251.43	840,251.43
New Technology, Buildings and Equipment	2,386,950.67	4,821,462.48
Total	$4,853,355.92	$7,287,867.73

Schedule K.

ADDITIONS TO LANDS, BUILDINGS AND EQUIPMENT.

New Construction and Equipment	$2,434,511.81

Schedule P.

ENDOWMENT FUNDS FOR GENERAL PURPOSES.

Increases and Decreases of Funds for General Purposes.

Invested funds.	*Funds June 30, 1915.*	*Investment income.*	*Other increases or decreases of funds.*	*Expenditures.*	*Funds June 30, 1916.*
Restricted.					
General Endowment Fund	—	$910.00	$702,043.00	$910.00	$702,043.00
George Robert Armstrong	$5,000.00	227.50	—	227.50	5,000.00
Charles Choate	33,932,63	1,547.00	—	1,547.00	33,932.63
Eben S. Draper	100,000.00	4,142.14	—	4,142.14	100,000.00
Martha Ann Edwards	30,000.00	1,365.00	—	1,365.00	30,000.00
William Endicott	—	273.00	25,000.00	273.00	25,000.00
Caroline L. W. French	—	2,184.00	95,620.56	2,184.00	95,620.56
James Fund	163,654.21	7,442.80	—	7,442.80	163,654.21
Katharine B. Lowell	5,000.00	227.50	—	227.50	5,000.00
Richard Perkins	50,000.00	2,275.00	—	2,275.00	50,000.00
John W. and Belinda L. Randall	83,452.36	3,799.25	—	3,799.25	83,452.36
William B. Rogers	250,225.00	9,725.00	—	9,725.00	250,225.00
Saltonstall Fund	46,738.56	2,124.85	—	*1,593.64	47,269.77
Samuel E. Sawyer	4,764.40	214.85	—	214.85	4,764.40
William J. Walker	—	500.50	11,128.05	500.50	11,128.05
Albion K. P. Welch	5,000.00	227.50	—	227.50	5,000.00
Unrestricted.					
Sidney Bartlett	$10,000.00	455.00	—	455.00	10,000.00
Stanton Blake	5,000.00	227.50	—	227.50	5,000.00
George B. Dorr	49,573.47	2,250.00	—	2,250.00	49,573.47
Jonathan French	—	273.00	23,906.80	273.00	23,906.80
Arthur T. Lyman	5,000.00	227.50	—	227.50	5,000.00
James McGregor	2,500.00	113.75	—	113.75	2,500.00
Nathaniel C. Nash	10,000.00	455.00	—	455.00	10,000.00
Frances M. Perkins	16,525.00	705.25	—	705.25	16,525.00
Emma Rogers	472,983.68	23,933.00	59,625.14	28,164.76	528,377.06
Robert E. Rogers	7,680.77	350.35	—	350.35	7,680.77
Seth K. Sweetser	25,061.62	1,137.50	—	1,137.50	25,061.62
Nathaniel Thayer	25,000.00	1,137.50	—	1,137.50	25,000.00
Lucius Tuttle	—	580.50	50,000.00	580.50	50,000.00
Charles G. Weld	15,000.00	682.50	—	682.50	15,000.00
Alexander S. Wheeler	5,000.00	227.50	—	227.50	5,000.00
	$1,427,091.70	$69,941.74	$967,323.55	$73,642.29	$2,390,714.70

* One fourth of the income applied to fund.

Schedule Q.

ENDOWMENT FUNDS FOR DESIGNATED PURPOSES.

Increases and Decreases of Funds for Designated Purposes.

Invested funds.	*Funds June 30, 1915.*	*Investment income.*	*Other increases or decreases of funds.*	*Expenditures.*	*Funds June 30, 1916.*
FUNDS FOR SALARIES:					
Samuel C. Cobb For General Salaries . .	—	—	$30,000.00	—	$30,000.00
Sarah H. Forbes For General Salaries . .	$500.00	$22.75	—	$22.75	500.00
George A. Gardner For General Salaries . .	20,000.00	910.00	—	910.00	20,000.00
James Hayward Professorship of Engineering	18,800.00	855.40	—	855.40	18,800.00
Wm. P. Mason Professorhip of Geology	18,800.00	855.40	—	855.40	18,800.00
Henry B. Rogers For General Salaries . .	25,000.00	1,137.50	—	1,137.50	25,000.00
Nathaniel Thayer Professorship of Physics .	25,000.00	1,137.50	—	1,137.50	25,000.00
Totals	$108,100.00	$4,918.55	$30,000.00	$4,918.55	$138,100.00
FUNDS FOR LIBRARY AND READING ROOM:					
Charles Lewis Flint Library	$5,000.00	$227.50	—	$227.50	$5,000.00
William Hall Kerr Library .	2,000.00	91.00	$91.75	80.00	2,102.75
Arthur Rotch Architectural Library	5,000.00	227.50	—	227.50	5,000.00
John Hume Tod Fund . .	2,500.00	113.75	247.69	9.15	2,852.29
Technology Matrons Tea Fund	—	—	2,000.00	—	2,000.00
Edna Dow Cheney for Margaret Cheney Reading Room	14,986.55	637.00	7.21	560.99	15,069.77
Totals	$29,486.55	$1,296.75	$2,346.65	$1,105.14	$32,024.81
FUNDS FOR DEPARTMENTS:					
Frank W. Boles Memorial .	—	$682.50	$15,000.00	—	$15,682.50
Samuel Cabot (Industrial Chemistry)	$57,151.19	2,595.00	—	123.50	59,622.69
Chemical Engineering Fund	—	—	300,000.00	—	300,000.00
Susan E. Dorr Fund . . .	95,955.67	4,368.00	—	4,368.00	95,955.67
George H. May Chem. Dept.	4,250.00	233.00	722.83	205.83	5,000.00
Arthur Rotch Architectural Fund	25,000.00	1,137.50	—	1,137.50	25,000.00
Edmund K. Turner Fund .	—	2,002.75	177,962.25	*1,502.06	178,462.94
Totals	$182,356.86	$11,018.75	$493,685.08	$7,336.89	$679,723.80
FUNDS FOR RESEARCH:					
Ellen H. Richards Research Fund	$16,198.02	$682.50	—	$1,033.03	$15,847.49
Charlotte B. Richardson (Industrial Chemistry) . . .	37,378.78	1,365.00	—	1,365.00	37,378.78
Whitney Fund	27,013.10	1,137.50	$439.28	1,000.00	27,589.88
Totals	$80,589.90	$3,185.00	$439.28	$3,398.03	$80,816.15

* One fourth of the income applied to fund.

Schedule Q. (*Continued.*)

Invested funds.	*Funds June 30, 1915.*	*Investment income.*	*Other increases or decreases of funds.*	*Expenditures.*	*Funds June 30, 1916.*
FUNDS FOR FELLOWSHIPS:					
Collamore Fund	—	—	$10,100.00	—	$10,100.00
Dalton Graduate Chemical	$5,600.99	$227.50	—	$150.00	5,678.49
Moore Fund	5,292.27	227.50	—	250.00	5,269.77
Willard B. Perkins	7,608.57	273.00	—	—	7,881.57
Richard L. Russel	2,286.57	80.00	—	100.00	2,266.57
Henry Saltonstall	10,863.23	455.00	—	500.00	10,818.23
James Savage	14,230.84	455.00	—	500.00	14,185.84
Susan H. Swett	10,620.45	425.00	—	400.00	10,645.45
Totals	$56,502.92	$2,143.00	$10,100.00	$1,900.00	$66,845.92
FUNDS FOR SCHOLARSHIPS:					
Elisha Atkins	$5,381.62	$227.50	—	$250.00	$5,359.12
Billings Student Fund	52,366.20	2,275.00	—	2,100.00	52,541.20
Jonathan Bourne	10,149.71	455.00	—	125.00	10,479.71
Lucius Clapp	5,243.45	227.50	—	200.00	5,270.95
Isaac W. Danforth	5,447.88	227.50	—	250.00	5,425.38
Ann White Dickinson	42,788.49	1,847.30	—	2,000.00	42,635.79
Farnsworth Fund	5,431.62	227.50	—	250.00	5,409.12
Charles Lewis Flint	5,479.13	227.50	—	250.00	5,456.63
Sarah S. Forbes	3,457.31	136.50	—	125.00	3,468.81
George Hollingsworth	—	36.40	$5,000.00	—	5,036.40
T. Sterry Hunt	3,260.97	136.50	—	150.00	3,247.47
Wm. F. Huntington	5,466.72	227.50	—	250.00	5,444.22
Joy Scholarships	10,000.00	440.00	—	440.00	10,000.00
Income Joy Scholarships	3,626.99	—	440.00	425.00	3,641.99
Wm. Litchfield	5,472.62	227.50	—	250.00	5,450.12
Elisha T. Loring	5,482.41	227.50	—	250.00	5,459.91
George H. May	4,187.50	233.00	722.82	250.00	4,893.32
James H. Mirrlees	3,031.22	113.75	—	125.00	3,019.97
Nichols Fund	5,431.62	227.50	—	250.00	5,409.12
Charles C. Nichols	5,472.91	227.50	—	250.00	5,450.41
John Felt Osgood	5,422.62	227.50	—	250.00	5,400.12
Richard Perkins	56,438.47	2,353.50	—	2,400.00	56,391.97
Thomas Sherwin	5,481.62	227.50	—	250.00	5,459.12
Susan Upham	1,064.00	45.50	—	50.00	1,059.50
Ann White Vose	65,866.25	2,730.00	—	2,900.00	65,696.25
Louis Weissbein	4,059.88	182.00	—	50.00	4,191.88
Frances Erving Weston	800.00	—	200.00	—	1,000.00
Samuel Martin Weston	200.00	—	200.00	200.00	200.00
Totals	$326,511.21	$13,714.45	$6,562.82	$14,290.00	$332,498.48
FUNDS FOR PRIZES:					
Arthur Rotch Prize Fund in Architecture	$5,331.62	$227.50	—	$200.00	$5,359.12
Arthur Rotch "Special" Prize Fund in Architecture	5,731.62	227.50	—	—	5,959.12
Totals	$11,063.24	$455.00	—	$200.00	$11,318.24

Schedule Q. (*Continued.*)

Invested funds.	*Funds June 30, 1915.*	*Investment income.*	*Other increases or decreases of funds.*	*Expenditures.*	*Funds June 30, 1916.*
FUNDS FOR RELIEF:					
Architectural Society .	$1,192.05	$45.50	$1.00	—	$1,238.55
Edward Austin . . .	371,568.62	16,380.00	50.00	$18,088.00	369,910.62
Edward Austin (income reserve)	24,627.63	—	1,638.00	—	26,265.63
Thomas Wendall Bailey	2,021.98	86.75	60.50	—	2,169.23
Levi Boles	—	273.00	10,000.00	—	10,273.00
Bursar's Fund	6,497.48	274.16	573.25	719.10	6,625.79
Teachers' Fund	124,006.65	4,550.00	—	6,774.86	121,781.79
Jonathan Whitney . .	472,261.05	18,567.50	1.24	2,200.00	488,629.79
Morrill Wyman	12,645.97	1,516.67	38,286.00	—	52,448.64
	$1,014,821.43	$41,693.58	$50,609.99	$27,781.96	$1,079,343.04

Recapitulation of Funds.

Funds for General Purposes	$1,427,091.70	$69,941.74	$967,323.55	$73,642.29	$2,390,714.70
Funds for Salaries . .	108,100.00	4,918.55	30,000.00	4,918.55	138,100.00
Funds for Libraries and Reading Room . . .	29,486.55	1,296.75	2,346.65	1,105.14	32,024.81
Funds for Departments	182,356.86	11,018.75	493,685.08	7,336.89	679,723.80
Funds for Research . .	80,589.90	3,185.00	439.28	3,398.03	80,816.15
Funds for Fellowships .	56,502.92	2,143.00	10,100.00	1,900.00	66,845.92
Funds for Scholarships	326,511.21	13,714.45	6,562.82	14,290.00	332,498.48
Funds for Prizes . . .	11,063.24	455.00	—	200.00	11,318.24
Funds for Relief . . .	1,014,821.43	41,693.58	50,609.99	27,781.96	1,079,343.04
Grand Total . . .	$3,236,523.81	$148,366.82	$1,561,067.37	$134,572.86	$4,811,385.14

Schedule R.

INCREASES AND DECREASES OF MINOR FUNDS.

	Funds June 30, 1915.	*Income and other increases of funds.*	*Expenditures and other decreases of funds.*	*Funds June 30, 1916.*
MINOR FUNDS:				
American Tel. & Tel. Library Fund	$444.46	$4,264.53	$4,831.93	*$122.94
American Tel. & Tel. Research Fund	*41.79	10,141.57	9,534.22	565.56
Commercial Research Fund	7.52	—	—	7.52
Course XV Fund	—	100.00	—	100.00
Dormitory Fund	2,639.54	52.79	—	2,692.33
Edison Electric Vehicle Fund	*103.52	26.85	110.02	*186.69
Electric Railway Traffic Research Fund	1,502.01	1,074.00	1,995.22	580.79
Jacques Fund	742.36	14.85	—	757.21
Letter Box Fund	107.86	24.66	2.25	130.27
Macy Research Fund	384.06	—	181.82	202.24
Naval Architectural Fund	71.84	499.50	—	571.34
Ozone Fund	14.18	—	—	14.18
Physico-Chemical Research Fund	1,741.47	3,216.08	4,032.92	924.63
President's Fund	64.83	500.00	551.09	13.74
Research Laboratory of Applied Chemistry	2,715.46	2,122.37	2,344.23	2,493.60
Research Laboratory of Organic Chemistry	1,612.62	32.25	—	1,644.87
Roentgen Ray Experiment Fund	683.58	13.67	24.82	672.43
Sanitary Research Fund	1,825.39	5,084.34	4,550.37	2,359.36
Seismological Research Fund	—	750.00	750.00	—
Terminal Research Fund	*9.63	—	—	*9.63
Traveling Scholarship in Architecture	750.00	—	—	750.00
Vehicle Research Fund	1,181.77	47.61	1,030.71	198.67
	$16,334.01	$27,965.07	$29,939.60	$14,359.48

* Overdrafts.

Schedule S.

CURRENT SURPLUS.

Balance July 1, 1915		$285,118.54
Net increase, Schedule A		41,579.20
Balance June 30, 1916, Schedule D		$326,697.74

Details of Losses and Gains, Etc.

LOSSES AND CHARGES:		
Refund of Students' Fees	$260.00	
Refund of Students' Deposits	5.90	
Refund of Locker Keys	2.00	
Adjustment, account President's Fund	500.00	
Adjustment, account of Tod Fund	247.69	
Adjustment, account of Kerr Library Fund	91.75	
Tuition, unpaid 1914–15 charged off	60.00	
Loss on sale of bonds	377.40	
		$1,544.74
GAINS AND CREDITS:		
Gains on Sales of Bonds	$12,044.17	
Adjustment, account of Bursar's Fund	50.00	
		$12,094.17

84 State St., Boston,
September 19, 1916.

To the Auditing Commiitee
of the Massachusetts Institute of Technology, Boston, Mass.

GENTLEMEN:

WE HEREBY CERTIFY that we have examined the books and have audited the accounts of the Treasurer and Bursar of the Massachusetts Institute of Technology for the year ended June 30, 1916.

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

The various schedules A to S inclusive, appearing in the printed report of the Treasurer for the year ended June 30, 1916, have been verified by us as being accurately drawn from the books and truly showing the intent of each schedule.

We have verified the details of the bookkeeping during the year, have examined the vouchers for disbursements and have satisfied ourselves that all receipts of money have been acknowledged on the books and deposited in the bank and that the cash balances shown by the books on June 30, 1916, were actually available and that these balances are correct.

Very respectfully,
(Signed) HARVEY S. CHASE & CO.,
Certified Public Accountants.