MASSACHUSETTS INSTITUTE OF TECHNOLOGY

ANNUAL REPORT

OF THE

PRESIDENT AND TREASURER

DECEMBER 10, 1902

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GEO. H. ELLIS CO., PRINTERS, 272 CONGRESS STREET
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TABLE OF CONTENTS.

Members of the Corporation.

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Secretary.
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Treasurer.
GEORGE WIGGLESWORTH.

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HOWARD STOCKTON.
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CHARLES F. CHOATE.
HIRAM F. MILLS.
PERCIVAL LOWELL.
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SAMUEL M. FELTON.
DESMOND FITZGERALD.
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GEORGE A. GARDNER.
WILLIAM H. LINCOLN.
J. B. SEWALL.
CHARLES L. LOVERING.
A. LAWRENCE LOWELL.
JAMES P. MUNROE.
WILLIAM L. PUTNAM.
CHARLES G. WELD.
EBEN S. DRAPER.
ROBERT S. PEABODY.
ELIHU THOMSON.
ELLIOT C. LEE.
JAMES P. STEARNS.
LUCIUS TUTTLE.
FREDERICK P. FISH.
FRANCIS L. HIGGINSON.
CHARLES A. STONE.

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HON. MARCUS P. KNOWLTON, *Chief Justice of the Supreme Court.*
HON. FRANK A. HILL, *Secretary of the Board of Education.*

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CHARLES C. JACKSON. J. B. SEWALL.

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PERCIVAL LOWELL. WILLIAM L. PUTNAM.
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Departments of Chemistry and Chemical Engineering.

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HIRAM F. MILLS. CHARLES W. HUBBARD.
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PRESIDENT'S REPORT.

To the Members of the Corporation:—

The year which has passed since my last report has been one of great activity in all the directions in which the work of the Institute lies. The opening of the last term brought an incoming class of more than five hundred, an increase in registration so great as to make necessary the immediate consideration of certain questions to which I shall ask your attention in the course of this report.

Changes in the Corporation.

During the year two members of this body, Mr. Arthur T. Lyman and Mr. Eliot C. Clarke, have resigned on account of the pressure of other duties. One notable figure has passed from our group never to return, Professor and former President Runkle, who died on the 8th of July last not long after his appointment as professor emeritus. Professor Runkle was the last survivor in the Faculty of the group of men who originally formed the Institute. As teacher, as executive officer, and as member of this body he had been with the Institute since its birth, and his death takes away one strong and tender tie which linked us to the past.

I cannot avoid at this moment the mention of one other change which the year has brought. Mr. Alexander S. Wheeler, for twenty-five years a member of the Executive Committee, has found it necessary to give up the active duties which membership in that committee imposes. No truer friend and no wiser counsellor than he has served your body.

We have welcomed to membership with us three new members: Mr. Frederick P. Fish, Mr. Francis L. Higginson, and Mr. Charles A. Stone.

Changes of Faculty and Instructing Staff.

The appointment of Dr. Duncan as head of the new Department of Electrical Engineering is elsewhere referred to. Professor Tyler, who resumed teaching last year, has been appointed head of the Department of Mathematics. The death of Professor Runkle left vacant the Walker professorship of mathematics, to which Professor Osborne has been appointed. Professor W. H. Niles, head of the Department of Geology, after thirty years of service to the Institute, tendered his resignation during the latter part of last year. In accepting it the Executive Committee spread upon its records an expression of its appreciation of his long and faithful service, and conferred upon him the title Professor Emeritus. He still remains, therefore, a member of the Faculty.

During the year the Corporation has elected two non-resident professors. This title has been given to men of distinguished attainments who, while not being bound to the full duties of a professor, nevertheless give courses of instruction. Under this arrangement Mr. Elihu Thomson has been elected Non-resident Professor of Applied Electricity, and Mr. Percival Lowell, Director of the Lowell Observatory at Flagstaff, Arizona, has been elected Non-resident Professor of Astronomy.

Assistant Professors Crosby and Clifford have been promoted to associate professorships in the Departments of Geology and Electrical Engineering respectively. Dr. William H. Walker has been appointed Associate Professor of Industrial Chemistry. Dr. F. Jewett Moore, an instructor of last year, has been promoted to an assistant professorship in the Department of Chemistry, and Dr. James Locke has been newly appointed Assistant Professor of Analytical Chemistry.

Mr. Harrison W. Hayward, an assistant of last year in the Department of Mechanical Engineering, has been promoted to the rank of instructor.

Newly appointed instructors are Dr. George W. Field, in the Department of Biology; Dr. Charles N. Haskins and Mr. Ernest A. Miller in the Department of Mathematics; Mr. Frederick R. Kneeland in Chemistry, Dr. Hermann Kurrelmeyer in Modern Languages, and Mr. Charles Beardsley in Economics. Mr. Robert G. Valentine returns to the Institute this year after an absence of two years, as Instructor in English.

Instructors and assistants who have terminated their connection with the Institute are Messrs. C. M. Fosdick, F. B. Driscoll, and S. L. Wonson of the Department of Civil Engineering; James W. Smith and H. L. Kehl in Mechanical Engineering; John Boyle, Jr., W. W. Garrett and F. H. Sexton, in Mining Engineering; John W. Smith, F. E. Busby, R. W. Balcom, C. Ellis, E. P. Beckwith, and A. C. Davis in Chemistry; W. I. Bickford, F. W. Freeman, H. H. Kennedy and G. Le R. Mitchell in Physics; Miss Alice Loring in Architecture; C. W. Hodsdon and J. C. Woodsome in Mechanical Drawing; J. P. Sanborn in English; and J. A. Frizzell and W. S. Newell in Mechanic Arts and Naval Architecture respectively.

The following assistants have been appointed: Messrs. Allen L. Appleton and Charles F. Willard in Naval Architecture; Chauncey C. Batchelor in English; Dr. Lewis P. Chapin and Messrs. Samuel C. Lind, Benjamin G. Macintire, Champion H. Mathewson, Royal L. Wales, Herbert S. Walker, Francis C. Ware and Robert S. Williams in Chemistry; Arthur Elson, Arthur L. Goodrich, Charles W. Sawyer, and Willis H. Towne in Mechanical or Freehand Drawing; David L. Wing in Economics; Roy G. Burnham, Henry A. Ferrin, Archibald Gardner and Clarence D. Starr in Mechanical Engineering; Kenneth C. Grant, Walter S. Hanna and Arthur T. Nelson in Civil Engineering; Herbert L. Sherman

in Geology; Charles B. Hollis, Charles A. Sawyer, Jr., and Charles H. Sisson, in Mining Engineering and Metallurgy; William H. Reed in Modern Languages; and Clifford M. Swan, Newell C. Page, Fred C. Randall, Irving W. Reynolds, and Orlando S. Stockman, in Physics.

Reorganization of Administrative Work.

The beginning of the present term finds the Institute working under an organization more complete than that which has served it hitherto. The Secretary has for many years had charge of varied duties: not only has he done the work of the Secretary of the Faculty, but he has supervised the registration, the recording, and the work of consultation with students. With the growth of the Institute these duties had become too varied and pressing for one man to perform, and, with the approval of the Executive Committee, the present year has seen a new distribution of duties, by means of which the Secretary is now able to give his time in part to the supervision of the Mathematical Department, and in part to the general duties of administration. The work of registration and of recording has been assigned to other officers, while the general work of consultation with students and the supervision, in particular, of the entering class, has been assigned to a new officer, the Dean. The office of Dean is held by Professor Alfred E. Burton, a graduate of Bowdoin College in the Class of 1878, who has been for some years a professor in the Institute. The office of Registrar is held by Mr. Walter Humphreys, a graduate of the Institute in 1897, while the office of Recorder is held by Mr. O. F. Wells, already familiar with this work through his service in the Secretary's office. Under this arrangement not only is a separation of duties and a corresponding clearness of responsibility attained, but, in addition to this gain, it is made possible for the first-year class to receive as never before the direct attention of an administrative officer.

The needs of student life are being this year further met by the appointment of a Medical Adviser, who has office hours at the Institute twice a week, during which he may be consulted by any student without charge. The services of this officer have been gratefully accepted by the students, many of whom come to Boston as strangers, with no knowledge of medical authorities, and are therefore glad to avail themselves of the advice of a physician who knows from personal experience the problems of student life. The Executive Committee has appointed to this office Dr. Franklin W. White, a graduate of the Institute in the Class of 1890, and of the Harvard Medical School in the Class of 1896.

Some three months ago Mr. Albert M. Knight, who had for thirteen years faithfully served the Institute in the office of Bursar, resigned on account of ill health. He has been succeeded by Mr. F. H. Rand.

Gymnastics and Athletics.

The gymnasium maintained by the Institute, while not of the most modern construction, affords nevertheless full opportunities for exercise. The classes in gymnastics conducted by Dr. Skarstrom, the director of the gymnasium, have been well adapted to meet the physical needs of students. Any student may obtain in the gymnasium such medical advice as he needs and the means for healthful exercise. The gymnasium is under the general direction of the Dean.

For the last two years the athletic efforts of the students have been directed toward class contests rather than toward the more ambitious inter-college contests. After a full discussion by the students, inter-college foot-ball was given up, and the energy which had formerly gone into it was concentrated upon the freshman-sophomore contest, which forms the chief field event of the fall. Outside of this the athletic efforts of students have gone in the main toward the development of track athletics. This is a direction in which the individual

can work without great loss of time, and it seems on the whole the most available direction in which students of technical schools can enter into athletic competition.

Changes in Courses.

For some years members of the instructing staff have conducted summer courses, to which have been admitted both students of the Institute and those who expected to offer themselves for examination in the following autumn. Until the past summer the conduct of these courses has been a personal matter with the instructors, to whom the fees were turned over. A change from this plan was made this year, the Institute assuming charge of these courses and paying the salaries of the instructors. The change has in every way justified itself, from the standpoint both of expense and of service.

By vote of the Executive Committee, it has been decided to discontinue the Course in General Studies, at least in the form in which it is now offered. This course was intended to appeal, from its nature, to a large number of men, being a general rather than a technical course. This has not followed; and, while the work of the course itself and the training which students receive in it have commanded the highest approval, the course has during its existence appealed to but a small number.

No successor has been appointed as head of the Department of Geology, to succeed Professor Niles, whose retirement is earlier referred to, but the work is being conducted, under the general direction of Professor Crosby, by members of the department, with the co-operation of members of the Department of Geology at Harvard University. This co-operation has been effected in the main by the courtesy of the Harvard professors in undertaking courses of lectures and of recitations at the Institute, in part by the admission of Institute students to field courses jointly with Harvard

students, and in part by the admission of advanced students of the Institute to classes at Harvard. Under this co-operation the students of the Institute have enjoyed the opportunities for study offered by both the Institute and the University, and have been able to avail themselves of the instruction offered in the geological departments of both faculties.

The Lowell Laboratory of Electrical Engineering.

In a former report I have called attention to the generosity of two members of our Corporation, Mr. A. Lawrence Lowell, and Mr. Percival Lowell, and of their three sisters, Miss Amy Lowell, Mrs. William L. Putnam and Mrs. T. J. Bowlker in their gift of $50,000. for the purpose of a laboratory of electrical engineering. To this sum Mr. George A. Gardner, another member of the Corporation, added $10,000., Mrs. W. S. Fitz $2,000., and Mr. C. C. Jackson $3,000., making in all a sum of $65,000. In recognition of the great service rendered to the Institute by the late Mr. Augustus Lowell, the Corporation voted to give to the new laboratories his name.

The separation of the Department of Electrical Engineering from that of Physics was announced to your body last year. Last spring the Executive Committee called to the head of the new department Dr. Louis Duncan, some time professor of electrical engineering in Johns Hopkins University, and for some years past a practising engineer in New York City. Dr. Duncan has twice been elected President of the American Institute of Electrical Engineers, and comes to his work as head of our new department with an unusual experience and a thorough and varied training. In view of immediate needs the Executive Committee determined last year to erect on the Trinity Place land a building to serve for this department, and to provide at the same time additional class-rooms for other instruction. This building was begun in July and was pushed to completion with re-

markable rapidity during the summer vacation. It houses, in addition to the Department of Electrical Engineering, part of the work of the Department of Chemistry and the entire Department of Modern Languages. The building is, for the purposes of the Department of Electrical Engineering, almost ideal, and, when the equipment which has been purchased is in place, we shall have in Boston one of the most perfect and at the same time one of the most practical electrical laboratories in the world. The Institute has every reason to congratulate itself upon this step, and upon the prospect which opens before it for a unique contribution to the training of men for this great branch of modern engineering. It may be said in passing that the addition of the forty thousand square feet of laboratory and recitation rooms which this laboratory affords us came none too soon. With the entrance of the freshman class this year, the Institute found its facilities taxed to the utmost, and without this building it would have been almost helpless.

Graduate School of Engineering Research.

Upon the recommendation of the President and Faculty the Executive Committee has determined to inaugurate, with the beginning of the next academic year, a school of engineering research intended to provide facilities for a small number of advanced students who show capacity for original investigation.

While this addition to the work of the Institute is intended as a fitting crown to its structure, and while its purpose is to hold up before our students the idea of a higher professional life and the hope of direct contributions to the world's knowledge, it is also to be remembered that this step is a necessary one in our competition with the technical schools of other countries. The events of the past five years have served to draw attention most sharply to the connection between commercial and industrial advance and commercial and industrial

education. The world has awakened to the fact that education and training in the end outstrip natural ability and untrained initiative, and the civilized nations of the world are bending their energies, in proportion as they are alert, to the problems of technical education. We in America must keep step with the needs of our own country and the efforts of other countries in this direction, and the time has now come when the American engineer must be capable, not only of the most modern practice, but also of conducting investigation and research. To show how clearly our work in this direction is watched and followed, I venture to quote from the inaugural address of the present Rector of the great technical school at Charlottenberg.

"The German need fear in the industrial world neither the Englishman nor the Frenchman, only the American; and to compete with the American engineer, we must strive constantly to improve and extend our engineering courses."

The time has come when the Institute must be not only a teaching body, but it must as well lay the foundations for a school of investigation in the physical sciences. To do this it must establish the conditions which foster that quiet spirit of research upon which all advance and all discovery rest.

Publications of the Institute.

In another part of this report will be found a list of papers and books — in most cases technical — published during the year by members of the instructing staff. The current publications, the Catalogue, the Department Circulars, the Technology Quarterly and the Technology Review have been issued in the usual manner. The Review contains in an interesting and complete form the news of the year, appropriate space being devoted to the discussion of such questions as arise in the conduct of the work itself. It is hoped that

members of the Corporation and of the Alumni may find here an interesting and satisfactory means of keeping in touch with the work of the Institute.

The Increase in Tuition Fee.

The Corporation, since my last report, has voted to raise the annual tuition fee from $200. to $250., this advance to take effect with students entering in September, 1903.

Two distinct plans for providing higher education have been adopted in the various states of the Union. In the great Western States the State University, built and maintained by the people of the whole state, offers the facilities of the college and of the technical school without payment of tuition fee. In our Eastern institutions the state has furnished but a small part of the money necessary to build and maintain colleges and technical schools. These institutions have been in the main founded by private citizens, and are maintained in part by endowment, also the outcome of private generosity, and in part by tuition fees paid by students. Whether the plan of free tuition be the better or not, it would seem practically certain that colleges in New England must depend to a greater or less extent upon tuition fees.

In no institution does the student pay the full cost of his education. The actual cost per student which any college will be called upon to bear will depend upon several factors: the number of students, the facilities offered, and the number and excellence of the instructing staff. In a technical school not only is the expense per student greater than in academic education, but growth of numbers means a far greater growth of expense as compared with college expenses, for such growth means increase in laboratories, expensive in their first cost and expensive to maintain, and it involves a far greater increase in instructing staff than in the case of the teaching of Latin or Greek or history.

The Institute of Technology has but a small endowment in comparison with the larger universities. In addition, a large part of its trust funds is devoted to scholarships, and, as each student costs much more than the amount of tuition, every gift for scholarship purposes increases the load which the endowment carries.

In view of these considerations it has seemed wise to increase the tuition. It is believed that, with a larger grant than heretofore from the Austin Fund for scholarships, this increase will not impose upon students of small means greater difficulties than now present themselves. The annual fee, even with this increase, is still far below the average cost to the Institute for each student.

In comparison with the cost of the ordinary college education it is to be remembered that the technical school not only expends upon each student a much larger sum than the college, but it is also true that the graduate of the college must still prepare himself for a profession after completing his college course, while the graduate of the technical school finds himself in possession of a training which commands an immediate remuneration. For some years the demand for graduates of the Institute has been far in excess of the number of graduates. The value of its diploma will be greater for each graduate in just such measure as its instruction and its facilities are keeping abreast of progress and are in position to profit by all advances.

State Aid to Higher Education.

The difference in the method by which higher education is maintained in the older states of the Union and that adopted in the newer states of the West has already been alluded to. Perhaps few appreciate, however, the difference of cost thereby thrown upon the individual student in the effort to obtain an education.

The University of Michigan, for the year 1901–2, had a

registration of 3,509 students, exclusive of those in the summer school. Of these 2,052 were from the state of Michigan, each of whom paid an annual tuition fee of from $30. to $35. The remaining 1,456 were from other states and territories and from foreign countries. Each of these paid from $40. to $45. annual tuition fee. A matriculation fee of $10. is paid upon entrance. The entire student body of 3,509 students paid into the University treasury tuition and matriculation fees to the amount of $148,515. During the same year 1,415 students in the Institute of Technology paid tuition fees to the amount of $253,000. The difference in the cost to the individual student was made possible by the fact that the University of Michigan received from the state, for the expenses of that year, a contribution of $450,000. Counting interest at 4 per cent. this income is equivalent to that arising from an endowment of more than eleven millions of dollars.

Purchase of Land in Brookline.

During last spring, under the authority granted by the Corporation, the Executive Committee purchased a tract of land, consisting of about twelve acres, in Brookline, in a most attractive region, within easy reach of Jamaica Pond. This purchase was brought about by several considerations, but it was due in the main to the generosity of a member of this Corporation, Mr. Samuel Cabot, who made a gift to the Institute of his share in the property, a gift of the value of some twenty thousand dollars. The Executive Committee was influenced, furthermore, by the fact that this was almost the only remaining piece of land in this region which could be acquired for a reasonable sum, and it was felt that, with the growing needs of the Institute, a use for it would readily be found. A study of the land for the purposes of a student community is now being made.

The Pressure of Increasing Numbers.

Elsewhere, in the statistical part of this report, is given the customary information which is collected from year to year concerning the membership of the student body. I quote from these data the figures which give the registration for the past four years.

1899–1900	1,178
1900–1901	1,277
1901–1902	1,415
1902–1903	1,608

An inspection of these figures shows that the registration of the Institute has increased by more than four hundred in three years, an increase of approximately thirty-five per cent. A further inspection of this registration brings to light several other interesting facts. The distribution of the students of the Institute is very wide. Students are attracted not only from all parts of the Union, but from some twenty foreign countries; and it is particularly interesting to find amongst these numbers a growing attendance from the West and South. One cannot but feel that the bringing together of students from all states is a contribution, not alone to technical education, but to national strength and citizenship as well.

Another interesting and suggestive characteristic of our registration is the increasing number of men who come to us for a technical training after having already received a college education. Approximately one hundred and fifty men enrolled as students at the Institute hold the Bachelor's degree, either of Arts or of Science. The increase in the number of such students is most gratifying. As I have formerly pointed out, the presence of students from outside the United States and from distant states is, perhaps, the best barometer we have for measuring our own standards of work; but from another standpoint, this great growth of registration brings the Corporation face to face with a most serious admin-

istrative problem. Notwithstanding the increase in tuition, the preliminary examinations for next year indicate an entering class in 1903 as large as that of the present year. Upon such growth certain fair limitations, which the Faculty will doubtless impose, may be placed by a more strict scrutiny of the examination papers ; but such restriction as this may in the end have no marked effect upon the attendance, for the rejection of weaker men will continually make the Institute more attractive to the stronger men. While certain causes, such as industrial depression, might temporarily stop the growth of the Institute, there seems no reason to doubt that we may expect, under ordinary conditions, a fairly regular increase in our numbers.

How serious a problem this is may be judged from the statement which I have made in saying that without the addition of the Lowell Laboratory of Electrical Engineering, which was made ready by an unusual effort, the Institute would have been unable, this year, to deal efficiently with the students who came to it. With any continuance of such growth as we have experienced it is absolutely necessary that larger quarters and additional room be furnished within the next two years. At the present time the Institute has at its disposal, not covered with buildings, about 20,000 square feet of land on Trinity Place and 25,000 square feet on Garrison Street. In addition it has the Grundman Studio building on Clarendon Street, which could on the expiration of the present lease be torn down, and which covers a space of 23,280 feet, in all approximately 70,000 square feet. It is evident that these small tracts of land afford no permanent or adequate relief for the development of the immediate future, nor do they solve the difficulty which comes from the overcrowding of the Rogers and Walker Buildings. This question is one which is before you for decision, and at the earliest practicable date. Shall we fit the life and the growth of the school to its present quarters, or shall we find for it a site where it may have room for such growth as it may normally and naturally expect?

The Limitation of Numbers.

The idea has been more than once brought forward that an arbitrary limit should be set to the number of undergraduate students admitted to the Institute, and the plan has long been in force in certain foreign schools of high standing.

While it is desirable to impose conditions of stricter scrutiny upon candidates for admission, so as to keep out those who are intellectually and physically weak, or who are insufficiently prepared, I should be sorry to see arbitrary limitations placed upon incoming students who are well qualified for our work, whether those limitations come in the form of high tuition or in the form of limitation of the number of students. In a growing country, where a continually enlarging demand for technical education will as a matter of course send an increasing number of students into the technical schools, a steady growth in numbers is a natural feature of institutional development. The technical school may well share with the country itself the problem of meeting the demands which a growing constituency implies.

There is, however, another consideration constantly to be kept in mind, and that is the relation of numbers to efficiency. If increase in the number of students is to mean decrease in the efficiency of instruction, then every increase above the point of maximum efficiency is a positive wrong to the students themselves, and will in the end bring down the standard of instruction. Is it possible to allow numbers to increase without any other restriction than those imposed by the requirement of thorough preparation, and yet keep up the standard of instruction or advance it?

I have no hesitation in saying that the problem of maintaining and of improving the efficiency of instruction in technical studies in the face of a growing registration is purely one of administration and of income. A department of civil engineering, for example, with a registration of three hundred students, can be as effectively conducted as a department in

which the registration is only one hundred, but the organization must be fitted to the problem. In the latter case the head of the department will give a large part of the instruction, while in the first he will give only enough to keep in touch with the work, and he will occupy himself in large measure with the administration of the department. But this is only part of the problem. There will be certain subjects in which one man may lecture to three hundred students quite as effectively as to one hundred; but there will be other subjects where one man can teach effectively, thirty, seventy-five or one hundred students, as the case may be, and in these subjects students must be taught in such sections as experience has shown to be effective, and the instructing staff must be increased to meet the new organization. Thus, if the number of students in bridge design becomes too large to be effectively served by one teacher, a second must be provided, and this must not be a young assistant or instructor, but another professor of equal standing with the first.

It is at this point that the dilution of instruction generally begins. As numbers grow, two methods are ordinarily adopted in institutions of learning to meet the demands of the growing classes. The first device is to form the class into a larger number of sections and impose upon a professor who is already working nearly to the limit the heart-breaking task of teaching the same subject two, or even three, times daily to different groups of students. There is no quicker means of killing the enthusiasm of a teacher than to harness him to this sort of intellectual treadmill.

The other method of dealing with the problem is to appoint an additional assistant or instructor. This is better than the first, and, if the assistant or instructor proves to be an able and efficient man, it may solve the problem in many cases. But in certain subjects the work can be done only by a man of experience and of ripe knowledge, and in such cases the institution should face the problem squarely and add to its staff two or three or four professors in the same subject, until

the point of highest efficiency is reached. It goes without saying that such increase in instructing staff carries with it some increase in laboratories, in drawing-rooms, in lecture rooms, and in similar facilities. For, even when the additional professor is secured, he must have a place in which to work, and this in accordance with a feasible scheme of hours and rooms.

Still the essential fact remains that the real limit of the work of an institution is not to be found in the number of its students, but lies rather in the limitations of its administration, of its instructing staff, or of its facilities. If these are made to keep pace with the growth in numbers, the quality of instruction may not only be maintained, but it may be continually advanced. The institution, however, which enters upon such a policy should face the whole situation, it should strengthen its instructing staff to keep pace with its student growth, and should so plan its buildings and its laboratories that they may be expanded with expanding needs.

In closing my reference to this subject, I wish to call attention to the fact that the institution which is large enough to require the services of several teachers in the same technical branch and has resources sufficient to secure men of high quality has a marked advantage in the very fact that a subject is being presented to students by more than one man. For some reason there has been in American colleges a great hesitation to start two men in the same institution upon parallel lines of instruction. Yet this feature of the German university is one of its sources of strength. The fact that the German student may choose not only his subject but his teacher in that subject is a powerful stimulus to good work, and forms one of the influences whereby the competition which goes on in the German universities, instead of being as with us a competition between institutions — too often a competition along purely material lines,— becomes a competition between individuals in the noble rivalry of scholarship. There is no reason why we should not in our institutions avail our-

selves of this same means for quickening the intellectual life and for keeping alive the intellectual alertness of our teachers.

The Problem of the Institute's Location.

As I have already pointed out, the Institute has at command about 70,000 square feet of land upon which it may build. This is wholly inadequate to serve as a basis of development for the future. To purchase additional land adjoining our present site seems to me not only beyond our means, but undesirable as well. It is essentially uneconomical for an institution of learning to occupy land having so high a commercial value.

The time has come, in my judgment, when we should ask the General Court to remove from the land which we own on Boylston Street the restrictions that were placed upon it in the act of gift. In case this is granted, we should then look about for a site of not less than thirty acres, which shall still be near enough to be in touch with the industrial life of the city, which shall be accessible from the various railroad stations, and where the Institute may develop in such way as the demands of the future clearly indicate.

For a discussion of the advantages and disadvantages of such a plan, I refer you to the July number of the *Technology Review*, which most of you have doubtless seen. The arguments on both sides are there summed up as follows.

"These, then, seem to be the seven main disadvantages resulting from a removal of the Institute from Copley Square to some region more distant from the city's centre: —

"1. The labor and controversy of an appeal to the General Court.

"2. A loss of the moral support due to sentiment.

"3. The giving up at least to a considerable degree, of its pre-eminence as the educational focus of Boston.

"4. At least a partial separation of the Institute from those industrial and mercantile interests which have been its main support, and from certain other educational agencies.

"5. Inconvenience of access, causing loss of time and increased expenditure on the part of the students.

"6. The many complications which must arise from the establishment of the residence system.

"7. An increased delay in providing much-needed new buildings."

"The main advantages in favor of removal may then be summed up as: —

"1. Increase of public interest through the conspicuousness of so radical a step.

"2. The possible creation of a new sentiment and affection for the Institute, stronger even than that already existing.

"3. The replanning of the buildings upon a more suitable and unified scheme.

"4. The better housing of the students, together with a supervision of their social life.

"5. Relief from the noise and disturbance inseparable from the present location.

"6. A segregation of buildings and increase in dignity that will make the greatness of the Institute's work more patent.

"7. Closer relations among the officers of instruction, and between them and the undergraduates."

To my thinking the arguments in favor of a transfer of the Institute to an accessible site greatly outweigh those against it. Not only is it true that the overcrowded condition of our buildings is becoming every year more of a source of weakness, that the loss of time in passing from one group of buildings to another is becoming more difficult to bear, but the inconvenience of sending 1600 students back and forth across a crowded highway like Boylston Street is causing each year an increasing loss of time. There is a general ground upon which the whole question rests, which seems to me still more worthy of consideration. It is this: the Institute of Technology exists, not simply as a school to train men for architecture or for engineering, but it exists also as a center of

intellectual and moral activity. As such it should exhibit in the conduct of its work the principles for which it stands. Thus, it has a school of architecture, ably conducted; its buildings ought to express architectural beauty and truth, while standing at the same time for academic simplicity. We maintain courses in heating and ventilation and sanitation, and we should show in the management of our own lecture rooms and laboratories the same principles which we teach. It is impossible to do this in the overcrowded condition of our present buildings.

The Increasing Cost of Student Life.

Over and above all other things, I believe the time has come, particularly in New England, when institutions of learning should set before the eyes of students their own ideals of a wholesome, democratic, and simple college life. Any student of the conditions of American college life can but be alarmed at the increasing sum which is required to send a boy through college; and it is time that some institution should deliberately set itself to work to solve the problem of setting forth a college life that should give to the poor student the opportunity of economical living, and at the same time the opportunity of social intercourse with his fellows. College life has been set at such a pace that the poor student is practically barred from participation in social life, unless he be, perhaps, an athlete and finds his expenses met by his athletic abilities, a state of affairs not wholly desirable. To my thinking there is no better problem to which the Institute can devote itself than to that of furnishing to its students such facilities as will make the student life economical and simple, yet attractive to rich and poor alike.

Should the Institute adopt a plan of removal, I hope that it may undertake to deal with this problem; and in order to do so a system of dormitories or student houses would need to be erected upon the new site. To accom-

plish the end in view, these dormitories or student houses must be maintained in a different way and upon a different principle from those ordinarily adopted. They must not be counted on as a source of revenue, but must be used to furnish the best means of living at little more than cost. I would suggest as an experimental plan some such arrangement as the following: two quadrangles, consisting of four buildings each, each quadrangle accommodating approximately five hundred students, the lower floor of each building to be devoted to sitting rooms and dining rooms, and the upper floors to bedrooms and occasional suites for those who desire more expensive quarters. I should call these houses rather than dormitories, as they will in their essential features be more akin to the English University Houses than to the American dormitories. Each house would form a union, its students meeting in the dining hall and for social intercourse. The entire group of houses would be lighted and heated by a central power plant, in which would be located the central kitchen, a refrigerator plant, and a laundry. With such a plant I believe we might successfully undertake to solve the problem of the economical housing and feeding of students. With proper system and with business methods, buying provisions at wholesale, I have no question but that we could offer the student lodging and food at prices far less than our students now pay for uncomfortable lodgings and for unsanitary food, with the additional advantage that the general mass of students would be thrown together under the influence of a simple and democratic social life.

I am satisfied that few appreciate the economic and hygienic waste which comes in the housing and feeding of a body of students taking up their work in a new and, to most of them, unknown city. Boston is an expensive place as American cities go. The student who comes here from a distant place, particularly if his means are limited, undertakes to house and feed himself as cheaply as possible. In his effort to do so he not only isolates himself from his fellows, but he

oftentimes finds himself in quarters which are morally and physically undesirable. A number of students eat unwholesome and insufficient food, and pay for it prices which, under such a plan as that I have outlined, would furnish wholesome and sufficient food. The entire lack of any plan for the housing and feeding of students involves a moral, economic, and social waste, and I know of no better problem with which an institution like this may deal than that of stopping this waste.

How much the economic waste alone amounts to in the matter of food may be judged from a comparison of the prices paid by our students with the cost of food for the West Point Cadets. The Cadets are, perhaps, the best fed student body in the world. Their meals are simple and wholesome, but are chosen from the best material that the market supplies, and they are cooked after modern sanitary methods. The cost of food and service amounts to but fifty cents a day per man, or $3.50 a week, which is just what the cheapest boarding houses charge Boston students for food far from satisfactory.

This question is worth considering, not only from the standpoint of the student and of his social and physical needs, but also from that of the educational interests of Boston and New England. Boston is not only interested in the work of education, it is interested also in the business of education, and it seeks to encourage by every right means the coming to it of men seeking education. Such exchange increases in the best way the ties which bind New England to the other states, ties which we desire in all ways to foster. Our New England institutions were begun and have prospered as private institutions, without large grants from the state, and they have therefore always been conducted on the theory that a fairly high charge for tuition could rightly be made. The great Western institutions, like those at Madison and Ann Arbor, have grown up under a different theory. In those states the Commonwealth itself undertakes to furnish a free

education of the most complete sort, and the state university forms the apex of the state educational system. The incomes of the state universities are growing year by year, and the facilities which they offer are rapidly becoming comparable with those offered by the strongest New England institutions. Tuition is free, or at most is but a nominal sum, living is cheap, and a student may go to one of these great Western institutions and live for a whole year for the sum required for his tuition alone at the Institute. All these considerations are making, as time goes on, stronger reasons why boys from Texas and California and Missouri and Georgia and other distant states should consider these institutions, rather than those of New England, as places of residence for their student life. Any intelligent plan under which the coming of the student to Boston may be made easier and less expensive, and particularly any plan which will free the stranger from the uncomfortable task of finding quarters in unknown surroundings, which will offer to the student of limited means an easy and direct choice of his student home, and which will make the problems of that home simple, will act as an offset to the considerations which I have mentioned, and will make easier the way of the student to a New England education. The man who can afford it will always come from distant states to New England, so long as our institutions maintain their high standing, so long as their faculties are composed of great teachers, and so long as their facilities are better than those of other regions; but the burden of a high tuition and of expensive living will become a continually increasing barrier, a sort of educational tariff, erected against the student of limited means. The son of the clergyman, of the teacher, of the clerk, of the man of small income, will find it each year harder to obtain an education from us, and will be forced by reason of the increasing cost to turn elsewhere.

An increasing number of students is being attracted each year from New England, from the states of New York and

Pennsylvania, and from the Southern states to the great universities of the central West. No true citizen of the Union regrets this. It will be a fortunate day for our country when the colleges of Louisiana and of the Carolinas are so strong in teachers and equipment as to attract students from Massachusetts and from New Hampshire. But I should be sorry to see the time come when the cost of education in Boston was so great as to limit the number of those who come to us from distant states to the families of the well-to-do, or to those who receive aid from the college endowment.

A member of the Executive Committee will present for your consideration a Memorial to the General Court, praying the removal of the restrictions upon the property of the Institute granted to it by the state in 1861; and this Memorial, if approved by you, will be presented to that body. Pending that action I ask you most earnestly to consider the question which I have presented to you.

Reports of the Departments and Statistics.

There are given in the following pages brief reports by the heads of the various departments, together with statistical information prepared in the office of the Registrar. The information contained in these reports is of the greatest interest, and I commend the statements and tables there presented to your careful inspection.

HENRY SMITH PRITCHETT,
President.

BOSTON, December 10, 1902.

REPORTS FROM THE DEPARTMENTS.

Courses I. and XI. Civil and Sanitary Engineering.

No changes have been made in the course of instruction other than some slight transfers of time made necessary by the rearrangement of the work in geology. The only changes in the force of instruction have been the substitution of three new assistants for three who left last year to engage in practical work. An additional assistant was authorized by the Corporation, but it was impossible to find any one for the position. We have, therefore, a smaller instructing force this year than last, owing to the retirement of Professor Burton from active participation in the work of surveying, of which he previously had charge. The capacity of our drawing rooms, moreover, is severely taxed.

Independent of the increased number of students, the department is seriously hampered by lack of room, on account of the necessity of enlarging the Engineering Library. This library is used by students in Civil and Mechanical Engineering and in Naval Architecture, in which three departments there are more than three hundred students in the upper classes. The library has but three tables available, seating about thirty-six students; while the number of books is increasing so rapidly that another bookcase is imperative, the installation of which will reduce the number of tables to two. In another year or two there will be practically no room in this library for readers. It should be so extended as to include the entire front of the Engineering Building, now occupied by the office of the head of the department and the model room, and additional space should be provided for the department in the Pierce Building. The space now occupied in

that building by the Chemical Department and by the second-year architectural drawing-room is the only space into which this department can expand, and such expansion will soon be necessary, unless the Engineering Library is to become a mere store-room for books.

There has been an even greater demand for our graduates this past year than before. Including the retiring assistants, forty men were available for positions last June. From May 1 to Nov. 1, applications were received for between one hundred and fifty and one hundred and sixty men, and such applications continue to be received almost daily.

The fifteenth session of the Summer School of the department was held during the past summer at Ellsworth, Me. Eleven students were in attendance. The school was in charge of Professor Burton, assisted by Professor Robbins, Professor Barton, Mr. Sweet and Mr. Hosmer, together with Mr. Nelson and Mr. Seabury of the class of 1902.

There was the usual field practice in base-line measurement and triangulation. On the triangulation was based a plane-table survey, the scale being 1 to 5000, with a contour interval of 10 feet. A tide gauge was set up, and a datum plane established as a basis for all levels. A profile was made of some four miles of the Union River valley, and hydraulic measurements were made by means of floats and meters to determine the discharge of this river. An interesting geological section was surveyed with transit and stadia. Astronomical observations were made for the determination of latitude, meridian, and time.

In order to connect the Ellsworth survey with the general system of triangulation of the Atlantic coast, the United States Coast and Geodetic Survey stations on Green Mountain and Blue Hill were occupied, and angles were measured to a new triangulation station in Ellsworth.

On July 2 a portion of the school made a trip to Nova Scotia, visiting the Joggins Coal Mines and fossil beds. On the return a stop was made at Moncton, N.B., and photographs were obtained of the tidal bore.

Course II. Mechanical Engineering.

Attention is again urged to the need for certain additional apparatus, which must be obtained if the laboratory is to continue to hold the position it has held in the past, both in view of the increasing number of students to be provided for, and to enable the department to pursue investigations along certain new lines of great importance from an engineering standpoint. The last addition of any considerable magnitude was made nearly three years ago. A small amount of apparatus is made at the Institute, but these additions are very limited in amount, and much time is required for their completion. An attempt is being made, however, to add to our equipment for testing cement in this way.

A valuable addition has been made to the apparatus of the laboratory in the form of a gift from the Westinghouse Air Brake Company consisting of an entire air brake equipment for a freight train consisting of a locomotive and twenty-five cars. This will make it possible to investigate practical and important questions concerning the working of air brakes.

The drawing-rooms are inadequate for the number of students. In order to accommodate those now taking this work, it will be necessary to substitute tables containing two drawers for those with one, and to assign two students to each table; and this will be necessary, not only throughout the entire room occupied by the second-year class, but also for a considerable portion of that occupied by the third-year class. Additional space will be absolutely essential next year.

During the past summer Professor E. F. Miller visited a large number of European Engineering Laboratories. His observations emphasize the importance, if we are to maintain our place in competition with the great technical schools of the world, of providing additional apparatus of considerable magnitude. Professor Miller's report will appear in an early number of the *Technology Review*.

The American Society of Mechanical Engineers held their spring meeting at the Institute in May, their opening session being held in Huntington Hall. At this meeting addresses of welcome were made by the President of the Institute and by the President of the Boston Society of Civil Engineers. The Society made its headquarters in the Engineering Buildings of the Institute, and the members of the Society visited and inspected the laboratories of the department. The attendance was larger than at any previous meeting, the members and guests present numbering nearly nine hundred.

The American Foundrymen's Association held a successful meeting at the Institute in June, during which the members paid a visit to the laboratories of the department.

In September an enthusiastic meeting of the National Association of Stationary Engineers was held in the rooms of the department, and its laboratories were visited by members of the Association. This meeting was the largest and most successful yet held by the Association, fourteen hundred and sixty-four members and guests being in attendance.

Course III. Mining Engineering and Metallurgy.

During the past year many minor changes have been made in the mining and metallurgical laboratories, as well as important additions to their equipment, all aiming at increased efficiency. Owing to the rapid growth of the department and the introduction of new subject-matter in the work of fourth-year students, there is a strongly felt need for additional space. Particularly is this true as regards the departmental library, which needs more room for additional book-cases and for reading tables.

The departmental library has been enriched by the addition of three complete sets of important periodicals, for one of which, the "Australian Mining Standard," it is indebted to Mr. G. M. Hyams.

The summer school of Mining Engineering was held in Nova Scotia and Cape Breton, thus affording a good opportunity to see the mining of gold and of coal, as well as the coking of coal, the smelting of iron, and the making of steel in open hearth furnaces. Gold mining was studied at Waverley, N.S., where the plant was turning out, stamping, amalgamating, and concentrating fifty tons a day. Visits were made for the study of coal mining to the Drummond Colliery at Westville, N.S., where the slope is about a mile deep, and the whole of the coal is taken out at one time by the use of timbers; later to the collieries of the Dominion Coal Company near Glace Bay, where the coal is mined in rooms, the pillars being removed later; and finally to North Sydney, where the coal has been mined by the pillar and stall method some two miles under the sea. A study was made of the smelting of iron at Ferrona, N.S., where pig iron is made for the steel works at Trenton from Newfoundland ore, and later at the extensive works of the Dominion Iron Company, Cape Breton, where the iron furnaces, steel furnaces and rolling mills are all placed systematically together. The kindness of those in charge of the various mines and works visited, and the many courtesies extended, are here gratefully acknowledged.

The instructing staff consisted of Professor Richards, Mr. Locke and Mr. Sawyer, and nineteen students took advantage of the opportunity.

Course IV. Architecture.

Reference was made last year to the gratifying increase in the number of students returning for graduate work. This year the graduate class is one larger than last. Six of this class, one of whom is a graduate of the Option in Landscape Architecture and another of that in Architectural Engineering, are candidates for the degree of Master of Science.

The choice of studies leading to the advanced degree being made largely by the students themselves, although with the aid and advice of the instructors, it has been of interest to compare for a term of years the selections which have been made, with a view to formulating therefrom a regular graduate course which shall at once be attractive to graduate students and acceptable to the Faculty, and which shall lead to the degree of Master of Science. The department is exceedingly well fitted to care for graduate work, and the evolution of a definite graduate course is not intended to interfere with the present latitude as regards choice of work. It will remain as now a simple matter to make slight variations in individual schedules, according to the option graduated from. The graduate students invariably make much of a course of scientific construction, which is as it should be.

The number of students taking the Option in Architectural Engineering, curiously enough, does not increase, although the demand for its graduates is steady, and exceptionally good positions and salaries have been found for them as soon as they were ready to go forth.

If the time devoted to practical problems based on previously taught theory could be extended through the entire first term of the fourth year, the regular student would gain much and the demand for Option 2 would come only from those to whom the æsthetics of architecture do not appeal.

The department is this year working to its full capacity, and it has been found necessary to make use of the exhibition room for recitation purposes.

The greatest need of the department is a museum of building-models and appliances. The demand is for the best practical training that can be given for immediate usefulness when office life begins, and as an aid to this a well-equipped museum, to which manufacturers would be glad to contribute, would be invaluable.

Courses V. and X. Chemistry and Chemical Engineering.

The most important changes in this department are those made in the instruction in inorganic chemistry and in industrial chemistry. Special effort has been made to enrich the instruction in first-year inorganic chemistry and to increase its effectiveness. The lectures are given by Professor Talbot and nine other members of the instructing staff coöperate with him in the conduct of the recitations and laboratory work. Radical changes have been inaugurated in the laboratory work in industrial chemistry in connection with the appointment of Professor W. H. Walker.

Notwithstanding the expansion of laboratory facilities during the past year, involving adequate provision for the first-year class of five hundred students, there is an imperative need of additional space if the department is to maintain its efficiency. Particularly is this true in connection with the instruction in analytical chemistry: this year all but four desks are occupied, and next year will probably show an increase of thirty students in this branch, for whom provision must be made, with a considerable further increase in 1904. It is impossible that the Walker Building should long accommodate both the Department of Physics and that of Chemistry, and, if the Institute is to remain in its present location, it will be absolutely necessary to provide one or more new buildings for these departments.

With each year the need of additional small laboratories for the use of students in connection with thesis work or advanced research is felt more keenly.

As was pointed out in the report of last year, there is great need of an increase in the instructing force of the department, that each member may be able to devote some time to research and to study, and to summon for this work something more than the remnants of energies practically exhausted by long hours of instruction in the laboratory. This increase, however, will be impossible until provision for

additional space is made, as nearly all space available for a working table or even a writing desk is at present occupied.

A Summer School of Industrial Chemistry was inaugurated last June, attended by fifteen students. The plan of instruction included visits to typical manufacturing plants, representing important chemical industries, the series of visits covering a period of two weeks. The details of the trip were carefully worked out in advance by Professor Thorp, who, with Professor Talbot, accompanied the students, and in connection with the inspection of the plants, conferences were held each evening, at which a brief statement of the principles underlying the processes to be inspected on the following day was given by Dr. Thorp, and reports were made by each member of the school upon a specially assigned portion of the plants inspected during the previous day. Elizabeth, N.J. was made the headquarters of the party for the first week, and Philadelphia for the second week.

The following establishments were visited: — Murphy Varnish Co., Newark, N.J.; Passaic Print Works, Passaic, N.J.; Carl H. Schultz Mineral Water Co., New York; Bowker Fertilizer Co., Elizabeth, N.J.; New Jersey Zinc Co., Newark, N.J.; E. R. Squibb & Sons, Pharmaceutical Chemists, Brooklyn; National Lead Co., New York; Standard Varnish Works, Staten Island; Tide Water Oil Co., Bayonne, N.J.; Vulcanite Portland Cement Co., Vulcanite, N.J.; Bellmark Pottery Co., Trenton, N.J.; Willetts Mfg. Co., Pottery Works, Trenton, N.J.; Whitall, Tatum Co., Glass Works, Millville, N.J.; Booth, Garrett & Blair, Laboratory, Philadelphia; U.S. Mint, Philadelphia; Midvale Steel Co., Philadelphia; Harrison Bros. and Co., General Chemicals, Philadelphia; Barrett Mfg. Co., Coal-tar Distillers, Frankford, Pa.; Dungan, Hood & Co., Tanners, Philadelphia; and the Baldwin Locomotive Works, Philadelphia.

It is thus evident that the students had opportunity to study a considerable variety of processes, and there seems to be no doubt that the first summer school of industrial chemis-

try was successful. That this is true is due, in a large measure, to the courtesy and kindness extended to the Institute party by these firms, as well as by those in immediate control of the works.

It is gratifying to note the uniform earnestness of those taking part in the summer school, both with respect to the inspections during the day and the evening conferences — an earnestness which elicited favorable comment from many manufacturers and teachers with whom the party came in contact.

Course VI. Electrical Engineering.

Since the beginning of the academic year the Department of Electrical Engineering has been located in the new Augustus Lowell Laboratory of Electrical Engineering, which was erected during the summer. This laboratory covers an area of about 45,000 square feet, and, in addition to lecture rooms, contains a laboratory for electrical measurements, photometer rooms, a number of research rooms, and a main power and testing floor 300 feet in length by 40 feet in width. At the end of this testing floor, and separated from it by a wall, is a boiler room with space for boilers aggregating 750 horse-power, of which boilers of 500 horse-power have been ordered and are being installed. The main testing floor will contain the power plant, which consists of one 480-kilowatt, double current set; one 150-kilowatt, three-phase set; two 75-kilowatt, direct current, three-wire machines, and two 25-kilowatt machines, driven by a single engine. In addition there are motor-driven units which include a 100-kilowatt, three-phase, 60-cycle dynamo; a 50-kilowatt, 25-cycle, three-phase machine; a 125-kilowatt, 500-volt, direct current machine, and some smaller units. By using Scott transformers the three-phase current can be changed to two-phase. In addition to these machines there is a number of direct and alternating current dynamos and motors from 30 kilowatts down to one kilowatt, and a great deal of other apparatus such as

static transformers, etc. A very complete set of measuring apparatus is owned by the department, the greater part of which is now available for use. The new laboratory, with its unusual equipment, offers facilities for instruction and research which are unsurpassed in this country or abroad.

A number of changes are contemplated in the courses and in the methods of instruction, to take effect next year. It has not been practicable to modify the course of instruction greatly during the present academic year, though a few additional lectures will be given, including a course on electric railroad work. It is hoped that the facilities for laboratory work will be much better than those for last year, although the delivery of the additional apparatus ordered is not so rapid as could be wished.

Course VII. Biology.

The most striking feature of the year in this department has been its productiveness in research and publication. In January Mr. S. C. Prescott, Instructor in Industrial Biology, brought out, through the press of Messrs. John Wiley & Sons, a translation of an important volume on the soluble ferments, entitled "Enzymes and Their Applications," from the French of Professor Jean Effront, a European authority on the subject connected with the Zymotechnical Institute of Brussels. In May Professor Sedgwick's treatise on the "Principles of Sanitary Science and the Public Health," to which reference was made in the last report, was issued from the press of the Macmillan Company, and has met with a favorable reception both in this country and abroad.

Among the more important contributions from this department to the proceedings of learned societies or to scientific or technical periodicals during the past year may be mentioned a memoir describing the results of extensive experiments on the influence of cold upon the bacillus of typhoid fever, with special reference to the problem of ice-supply and the public health; a paper upon the results of ergographic studies on

the muscular soreness frequently observed after muscular work; the discovery of a remarkable similarity between the common intestinal bacillus often used in tracing sewage pollution and certain lactic-acid bacteria; a bacterial study of the self-purification of streams, carried out upon the Sudbury River; the conditions governing the troublesome occurrence of eels in water works, and suggestions for their control; the sanitary importance, in view of the malaria problem, of gold-fish as destroyers of mosquito larvæ; and a report to the Commissioners of Fisheries of the Commonwealth upon the scientific basis of the lobster industry and the causes of the decline of the latter, together with suggestions for radical improvement in the lobster laws of New England.

Classes in physics and chemistry from Boston University have for several years been taught in the Institute laboratories by Institute professors, and, beginning with the present year, the biological classes of that institution will be similarly conducted.

The staff of this department has been enlarged and strengthened by the appointment of George W. Field, Ph.D., as Instructor in Economic Biology. Dr. Field is a graduate of Brown University and of Johns Hopkins University and was, not long before his appointment, Assistant Professor at Brown University and Biologist to the Rhode Island Agricultural Station.

Several young men engaged professionally in fermentation or food-preserving industries, or on the biological side of sanitary engineering, have recently come to the Institute for advanced work in the laboratories of industrial or sanitary biology, and the department seems likely to be called upon henceforward to provide opportunities for the most advanced workers in these subjects, as it is doubtless true that nowhere in this country are better facilities provided for work of this kind than at the Institute. Although the number of regular students in the department has always been small, there is a steady demand, not alone for those who have taken the regu-

lar course, but also for others, especially graduate or special students, who have been able to give one or two years to the advanced work of the department. Its greatest need is larger facilities for experimental work in industrial and in sanitary biology for the benefit of such advanced students. Some relief will probably be found in this direction from the generous gift lately made to the Institute for experiments upon the purification of sewage. The administration of this gift has been placed under the general direction of Professor Sedgwick, who is making plans for its wise and effective use.

Course VIII. Physics.

The expectation of moving from the Walker Building made it inexpedient to attempt large changes in the arrangement or equipment of our laboratories, even when this was possible, and has hindered the development of our work, as has indeed been the case for several years past. There has, nevertheless, been a distinct gain in the facilities of the several branches of the Rogers Laboratory of Physics, and also a very embarrassing increase in the number of students pursuing special work.

The Laboratory of General Physics has been filled to its utmost capacity, and next year it will probably be necessary to keep it open to students continuously from nine o'clock until five. The introduction of a system of weekly conferences on the work of this laboratory, which was instituted last year with students from some of the Courses, has very greatly enhanced the value of the laboratory instruction for these students.

It is worthy of note that all the experimental work in connection with the proposed Insurance Engineering Experiment Station has been carried on in the Rogers Laboratory, and it is hoped that this arrangement may continue until the new station is completed.

For the Option in Electro-Chemistry eighteen students have registered this year, of whom four are graduates of

other colleges, a result which indicates an even greater demand for a course of this character than was anticipated.

The most important change in the Department of Physics has been the separation from it of the work in Electrical Engineering, and the institution of a distinct department for this, a procedure which has been in contemplation for several years, but for which the time has not heretofore seemed ripe. At the date of the institution of the Course in Electrical Engineering, and for a number of years thereafter, this subject was in reality a branch of applied physics, and it was not inappropriate that this Course, which had grown up in the Department of Physics, should remain there; but, with the application of electricity as a source of power, the principal problems to be dealt with came to be so largely of a distinctly engineering character as to make it evident that the best interests of such a course would be secured by placing it upon an independent basis when that should become feasible. It remains true, however, that the work of the Physical and the Electrical Engineering Departments is and always must be closely allied.

The space freed by the removal of the Laboratory of Electrical Engineering will be occupied by the Laboratories of Heat Measurements and Electro-Chemistry, besides affording a small amount of room for thesis work.

Course IX. General Studies.

The most important event in the work of the English Department during the year has been the development and extension of the idea of co-operation with other courses in the third and fourth years. Before this year from the Course in Mining Engineering have been received technical memoirs and from the Course in Architecture architectural studies. These, after having been examined in the several departments to which they belong, come to the English Department for criticism on clearness and effectiveness of expression. The

principle is now extended, in various forms, to the Courses in Mechanical Engineering, Chemistry, Electrical Engineering, Physics, and Sanitary Engineering. This combining of actual technical work with criticism of English has long been urged by the department. In Courses III. and IV. it has proved very helpful, and it seems likely to be no less so in the others where it has now been introduced.

The department is more and more strongly impressed by the great importance of extending freshman English through the second half of the year. By the end of the first term a large proportion of the students have been brought to the point where they have especial need of continued practice. They have gained a sufficient knowledge of the theory of composition, and they have learned to express themselves with clearness and propriety. What they need further — and most seriously need,— is to be held to the practice until their knowledge has ripened into habit. Unless it becomes a habit it is very soon lost altogether. Composition is of no value whatsoever as a mere theory; it must be a practical art or it is nothing. The work of a second term in composition should in value be triple that of the first, and cannot be too strongly insisted upon.

The only notable change in connection with the instruction in history is in dividing the European History class into two sections; and a similar division will be made in first-year United States history. The results of dealing with smaller classes have been good, and there has been a better showing on the part of the students. A new course has been given by Professor Sumner on the History and Art of the Italian Renaissance, for graduate students in architecture.

Course XII. Geology.

During the past year certain changes have been made in the curriculum, with a view to emphasizing the importance of the practical aspects of the science, by devoting more time to

mineralogy, field geology, chemical geology and ore-deposits, and economic and applied geology. Time for these subjects has been obtained by reducing the allowance for dynamical and historical geology. In brief, the idea has been, throughout, to offer to each department such courses in geology as would be most pertinent to its work and needs, and to put the instruction upon the practical basis befitting a technical school. As a general result of the changes here indicated, the more practical work in geology, heretofore restricted to the few students in the Course in Geology, is now given to those in the Courses in Civil Engineering, Mining Engineering, Architecture, and Sanitary Engineering, and to classes aggregating from one hundred to one hundred and fifty students.

Owing to the resignation of Professor Niles and the retirement of Professor Barton from all instruction excepting that given to students of Boston University, there has been a general redistribution of the work of the department, which is now being carried on under the general direction of Professor Crosby, with the co-operation of members of the Geological Department of Harvard University, who have given courses as follows: —

Dr. T. A. Jaggar, Jr., in General Geology, Experimental Geology and Field Geology.

Professor N. S. Shaler, in General Geology

Professor W. M. Davis and Mr. M. A. Read, in Physiography.

Professor R. De C. Ward and Mr. F. M. Wilder, in Climatology.

Professor J. B. Woodworth, in Glaciology.

This co-operation has been of high value to our students, the only difficulties arising being those resulting from conflicts of tabular views and the loss of students' time consequent upon the journey to Cambridge and return.

There is urgent need of more room for the storage and convenient use of the geological collections, as well as for advanced laboratory and experimental work in geology.

Course XIII. Naval Architecture.

In accordance with the decision of the U.S. Navy Department, mentioned in the report of last year, to send its cadets to the Institute for special instruction in naval architecture, four additional cadets were detailed here for the present year. At the end of last year the course provided for these cadets was carefully revised, with the aid of the corps of Naval Constructors, and may now be considered established in a complete and satisfactory form. By the elimination of certain subjects, in which the cadets proved to have had already sufficient instruction, it was found possible to augment the instruction in war-ship design, which, in the hands of Professor Hovgaard, is being developed along the most modern and scientific lines. In view of the extensive application of electricity in ship construction, a course has been laid out, with adequate training in the physical and electrical engineering laboratories.

The establishment of the course for cadets and the consequent strengthening of the department make it possible to offer a graduate course in naval architecture, open to all students properly qualified, in which provision will be made for the study of war-ship design and cognate problems.

Notwithstanding the expansion of the department during the past year, there is an urgent need for additional drawing-room space, as well as for a room for models and other similar material.

Last summer a special summer course of two weeks was given in mold-loft work. For this purpose the lines of the ship selected were drawn to a large scale and were used as the basis for the construction of a full-sized body plan and scrive board. Some of the most progressive shipyards have used similar methods for many years and have found it advantageous to make the large-scale drawings mentioned, on marble slabs. If we are adequately to develop this important method of instruction we should, in like manner, use marble

slabs or some equivalent; the material will not be unduly expensive, but space is now lacking for its proper accommodation.

Through the interest of Dr. Weld the students this year are to be each given an opportunity to make a model of the ship he is designing, in order that he may gain a proper appreciation of the form which his ship-lines represent. A room in the building on Garrison St. has been fitted up with proper benches and tools, and a competent instructor provided. Sufficient time will be allotted from the drawing hours, and it is expected that the work of finishing such models will so interest the students that they will consider it a relaxation from their regular work.

An extensive set of lithograph plates has been prepared under the direction of Mr. Leland, representing the framing and construction of ships in steel and wood, showing the standard forms of construction and various modifications, especially those that have been developed in the American yards. This will enable us greatly to improve the instruction in this important subject.

Mathematics.

The changes in the Department of Mathematics during the past year have been important.

Dr. John D. Runkle, Professor of Mathematics from the foundation of the Institute, retired from active teaching at the beginning of the year in consequence of impaired health, and after several months of failing strength, died early in July. No account of Dr. Runkle's service to the Institute in general, and to the department of mathematics in particular, need here be given. The library of the department, to which his name was attached some years ago, will preserve his memory for those who had not the good fortune of direct association with him.

Instruction in mathematics has been conducted at the In-

stitute heretofore without formal departmental organization. Since Professor Tyler's appointment as head of the department, he has endeavored to initiate, and to some extent to carry out, the following lines of policy: —

An examination of the mathematical preparation which can be secured from secondary schools;

The determination of the kind and amount of mathematical training required by the professional departments;

The better adaptation of the undergraduate courses to the work of the schools, on the one hand, and to that of the professional departments on the other;

The development of mutually helpful relations among members of the department by frequent conferences, not only in regard to mathematical instruction, but in regard to subjects of general mathematical interest.

The department has been strengthened by the appointment of two additional instructors.

Modern Languages.

The Department of Modern Languages is, this year, owing to its transference to the new Lowell Building, working under the most favorable conditions it has yet experienced. All its members have their classes and sections, with the exception of a single section, in this building, and the consequent saving of time and gain in efficiency is most gratifying. This change has made possible a long-desired reorganization of the departmental library, which will render it easier of access to both students and members of the department.

Three courses are now being given in Spanish, for the benefit of the Naval Cadets of Course XIII., and it may seem desirable that this instruction be augmented, next year, by additional exercises in conversation, preferably under the direction of a native teacher.

Mechanic Arts.

The total numbers of students receiving instruction in the Mechanical Laboratories is 347, many of whom take work in more than one subject.

The total numbers of students since 1897–98 are as follows: —

1897–98	210
1898–99	231
1899–00	238
1900–01	272
1901–02	294
1902–03	347

The number of students attending the various classes in the Summer School in Mechanic Arts was fifty-five.

Owing to the continued increase in numbers the special class in drawing and mechanic arts was discontinued this year. The number of sections taking machine-tool work was increased from two to three, all of which are now full. The number of lathes in the machine-tool laboratory should be increased from 23 to at least 30 if we are to care properly for the increasing numbers of students. The sections in forging have been increased from three to five, and nearly all now contain the maximum number of students. To carry on successfully the work in forging and chipping and filing during the second term an additional assistant will be needed.

A plain milling machine has been added to the equipment of the machine-tool laboratory, and the twist drill grinder has been replaced by a more modern one.

As was pointed out in the report of last year, instruction rooms similar to that of the machine-tool laboratory are very much needed.

Mr. R. H. Smith, Instructor in Machine-tool Work, has now nearly ready for publication a text-book of "Machine Construction" for use in his classes.

PUBLICATIONS OF MEMBERS OF THE INSTRUCTING STAFF.

Astronomy.

PERCIVAL LOWELL.— The Solar System. Six Lectures. Houghton, Mifflin & Co.

Civil Engineering.

G. F. SWAIN.— Annual Report to the Railroad Commissioners on Railroad and Street Railway Bridges. *Report of the Massachusetts Railroad Commission*, pp. 28–31, 53, January, 1902.

G. F. SWAIN.— The Value of Non-resident Lectures on Engineering Subjects. *Proceedings of the Society for the Promotion of Engineering Education*, 1902.

A. E. BURTON (with HARRISON W. SMITH and GEORGE L. HOSMER).— Report of the Massachusetts Institute of Technology Eclipse Expedition to Sumatra in 1901. *Technology Quarterly*, Vol. 15, pp. 9–50.

A. E. BURTON.— An Eclipse Expedition to the Island of Sumatra. *Technology Review*, Vol. 4, pp. 38–56.

DWIGHT PORTER.— Water Power and Coast Streams of New Hampshire. 22nd U.S. Geological Survey Report, Part IV.

G. L. HOSMER.— A Short Method of Finding Time by Equal Altitudes of Two Stars. *Technology Quarterly*, Vol. 15, pp. 81–85.

Mechanical Engineering.

G. LANZA.— Steel Rivets. *Proceedings of the American Association for Testing Materials*, 1903.

E. F. MILLER.— Waste Heat Engines. Proceedings of the New England Waterworks Association, *Engineering Record*, and *Engineering News*.

E. F. MILLER.— Report upon the Equipment of European Engineering Laboratories. *Technology Review*.

J. C. RILEY.— Apparatus for Obtaining a Continuous Record of the Position of an Engine Governor, and the Speed of the Engine which it is Governing. *Proceedings of the American Society of Mechanical Engineers*. Presented at the meeting of December, 1902.

Mining Engineering and Metallurgy.

R. H. RICHARDS.— Progress in Gold Milling during 1901. *The Mineral Industry*, Vol. 10, p. 330.

R. H. RICHARDS.— Review of the Literature on Ore-Dressing in 1901. *The Mineral Industry*, Vol. 10, p. 747.

R. H. RICHARDS.— "Ore-Dressing," in Encyclopedia Britannica Supplement.

H. O. HOFMAN.— Recent Improvements in Lead Smelting. *The Mineral Industry*, Vol. 10, p. 417.

H. O. HOFMAN.— Aluminum as a Reducing and Heat-Producing Agent. *Technology Quarterly*, Vol. 15, p. 93.

H. O. HOFMAN.— Review of A. James's "Cyanide Practice," *Technology Quarterly*, Vol. 15, p. 232.

H. O. HOFMAN.— "Lead" in Encyclopedia Britannica Supplement.

H. O. HOFMAN.— "Silver" in Encyclopedia Britannica Supplement.

Chemistry.

H. P. TALBOT.— An Introductory Course of Quantitative Chemical Analysis. Fourth revised edition. Macmillan Co. New York. 1902.

H. P. TALBOT.— The Recorded History of the Argon Group. *Technology Quarterly*, June, 1902.

H. P. TALBOT and J. W. BROWN.— A Bibliography of the Analytical Chemistry of Manganese. Smithsonian Collection, Vol. 41, No. 1313, 1902.

A. A. NOYES.— General Principles of Physical Science. 170 pp. Henry Holt & Co.

A. A. NOYES and G. V. SAMMET.— Lecture Experiments Illustrating Various Types of Catalytic Action. *Journal of the American Chemical Society*, Vol. 124, pp. 498–515. *Zeitschrift für physikalische Chemie*, Vol. 41, pp. 11–27.

A. A. NOYES and G. V. SAMMET.— The Equivalent Conductivity of the Hydrogen Ion Derived from Transference Experiments with Hydrochloric Acid. *Journal of the American Chemical Society*, Vol. 24, pp. 944–968.

A. A. NOYES and D. A. KOHR.— The Solubility Equilibrium between Silver Chloride, Silver Oxide, and Solutions of Potassium Chloride and Hydroxide. *Journal of the American Chemical Society*, Vol. 24, pp. 1141–1148.

W. H. WALKER.— A Process for Annealing Sterling Silver. U.S. Patent No. 712027. *Official Gazette*, Vol. 101, p. 707.

W. H. WALKER (with A. D. LITTLE and H. S. MORK).— The Preparation of the Fatty Acid Esters of Cellulose. U.S. Patent No. 709922. *Official Gazette*, Vol. 100, p. 2810.

W. H. WALKER (with A. D. LITTLE and H. S. MORK).— The Preparation of a Non-explosive Waterproof Artificial Silk. U.S. Patent No. 712200. *Official Gazette*, Vol. 101, p. 767.

A. H. GILL.— Gas and Fuel Analysis for Engineers. Third revised and enlarged edition. 1902.

A. H. GILL and H. R. HEALEY.— Some Thermal Properties of Naphthas and Kerosenes. *Technology Quarterly*, March, 1902.

A. H. GILL and S. B. MILLER.— The Specific Heat of Glycerine Waste Lyes and Crude Glycerine. *Journal of the Society of Chemical Industry*, Vol. 21, p. 833.

A. H. GILL, C. H. DENNISON and A. W. ROWE.— Some Data on the Analysis of Oils. *Journal of the American Chemical Society*, Vol. 24, p. 466.

W. R. WHITNEY and A. G. WOODMAN.— The Microscopic Examination of Paper Fibres. *Technology Quarterly*, September, 1902.

W. R. WHITNEY and J. E. OBER.— Ueber die Ausfällung der Kolloide durch Elektrolyte. *Zeitschrift für physikalische Chemie*, Vol. 39, p. 5.

W. R. WHITNEY.— Colloids. *Transactions of the American Institute of Electrical Engineers*, Vol. 19, No. 6, June and July, 1902.

W. R. WHITNEY and A. C. MELCHER.— An Investigation of Ammonio-silver Compounds in Solution. *Journal of the American Chemical Society*, Vol. 25, pp. 69–83.

HENRY FAY.— Absonderung von Phosphor im Eisen. *Stahl und Eisen*, Vol. 22, p. 955.

JAMES F. NORRIS, B. G. MACINTIRE and W. M. CORSE.— The Decomposition of Diazonium Salts with Phenols. *Technology Quarterly*, December, 1902.

JAMES LOCKE.— Electro-affinity as a Basis for the Systematization of Inorganic Compounds. *American Chemical Journal*, Vol. 27, p. 106.

JAMES LOCKE.— On Some Double Sulphates of Thallic Thallium and Cæsium. *American Chemical Journal*, Vol. 27, p. 280.

JAMES LOCKE.— The Periodic System and the Properties of Inorganic Compounds. IV. The Solubility of Double Sulphates of the Formula $M^{I}_{2}\ M^{II}\ (SO_4)_2\ 6\ H_2O$. *American Chemical Journal*, Vol. 27, p. 457.

JAMES LOCKE.— The Electro-affinity Theory of Abegg and Bödlander. *American Chemical Journal*, Vol. 28, p. 403.

JAMES LOCKE.— The Problem of the Systematization of Inorganic Compounds. *Zeitschrift für anorganische Chemie*, Vol. 32.

ELLEN H. RICHARDS and ISABEL F. HYAMS.— Notes on Oscillaria Prolifica (*Greville*). Second Paper: Chemical Composition. *Technology Quarterly*, September, 1902.

A. G. WOODMAN, C.-E. A. WINSLOW and PAUL HANSEN.— A Study of Self-purification in the Sudbury River. *Technology Quarterly*, June, 1902.

A. G. WOODMAN.— The Significance of Phosphates in Natural Waters. *Journal of the American Chemical Society*, Vol. 24, p. 735.

W. D. COOLIDGE (with F. A. LAWS).— An Apparatus for the Rapid Comparison of Voltameters. *Technology Quarterly*, March, 1902.

WILLIAM T. HALL. Analytical Chemistry, by F. P. Treadwell, Ph.D. Vol. I. Qualitative Analysis (Translation from the second German edition). John Wiley & Sons. New York. 1902.

Physics.

F. A. LAWS and W. D. COOLIDGE.— An Apparatus for the Rapid Comparison of Voltameters. *Technology Quarterly*, March, 1902.

H. M. GOODWIN.— Notes on Physical Laboratory Experiments: General Physical Measurements and Mechanics. Printed by the Institute.

LOUIS DERR (Editor).— Cyclopedia of Engineering. American Technical Society. Boston, 1902.

LOUIS DERR.— The Efficiency of Photographic Shutters. *Technology Quarterly*, September, 1902.

C. L. NORTON.— Tests of Sound-proof Partitions. Report No. 1 Insurance Engineering Experiment Station, July, 1902.

C. L. NORTON.— Fireproof Wood "So-Called." Report No. 2 Insurance Engineering Experiment Station, July, 1902. *Insurance Engineering*, Vol. 4, p. 30.

C. L. NORTON.— Further Researches on the Diffusion of Light. Report No. 3 Insurance Engineering Experiment Station, September, 1902.

C. L. NORTON.— Corrosion of Steel Frames of Buildings. Report No. 4 Insurance Engineering Experiment Station, October, 1902. *Technology Quarterly*, November, 1902.

C. L. NORTON.— Portland Cement as a Protection from Fire. *Insurance Engineering*, Vol. 3, p. 118.

C. L. NORTON.— Some Examples of Insurance Engineering from the Factory Mutuals. *Insurance Engineering*, Vol. 3, pp. 211.

C. L. NORTON.— Laboratory Notes on Heat Measurement, November, 1902. Printed by the Institute.

Biology.

W. T. SEDGWICK.— Principles of Sanitary Science and the Public Health. 8vo. I. Vol., 368 pp. & XI.; illustrated. The Macmillan Co. New York. May, 1902.

W. T. SEDGWICK.— On the Modern Subjection of Science and Education to Propaganda. Presidential Address, American Society of Naturalists. *Science*, N. S., Vol. 15, No. 367, pp. 44–54, January 10, 1902.

W. T. SEDGWICK (with C.-E. A. WINSLOW).— I. Experiments on the Effect of Freezing and Other Low Temperatures upon the Viability of the Bacillus of Typhoid Fever, with Considerations Regarding Ice as a Vehicle of Infectious Disease. II. Statistical Studies on the Seasonal Prevalence of Typhoid Fever in Various Countries and its Relation to Seasonal Temperatures. *Memoirs of the American Academy of Arts and Sciences*, Vol. 12, No. 5, August, 1902.

THEODORE HOUGH.— Ergographic Studies on Muscular Soreness. *American Journal of Physiology*, Vol. 7, p. 76, April, 1902.

Reprinted in *The American Physical Education Review*, Vol. 7, p. 1, November, 1902.

R. P. BIGELOW.— Articles on "Evolution," "Fission," "Gastrula," "Growth," "Heredity," "Impregnation," and "Longevity" in *Reference Handbook of the Medical Sciences* (Second Edition), Vol. 4 and Vol. 5. William Wood & Co. New York.

S. C. PRESCOTT.— Enzymes and Their Applications. Translation from the French of Jean Effront. Vol. I. John Wiley & Sons. New York. January, 1902.

S. C. PRESCOTT.— Preservatives and Their Use in Foods. *The Canner and Dried Fruit Packer*, February 27, 1902, p. 23. *The Trade*, Vol. 24, No. 27. *American Grocer*, February 19, 1902. *Technology Quarterly*, Vol. 15, pp. 335–342.

S. C. PRESCOTT.— On the Apparent Identity of the Cultural Reactions of Bacillus Coli and Certain Lactic Acid Bacteria. *Science*, N. S., Vol. 15, No. 375.

S. C. PRESCOTT.— A Note on Methods of Isolating Colon Bacilli. *Science*, N. S., Vol. 16, No. 408.

C.-E. A. WINSLOW.— The Bacteriological Analysis of Water and its Interpretation. *Journal of the New England Water Works Association*, Vol. 15, No. 6, December, 1901.

C.-E. A. WINSLOW and Miss M. P. HUNNEWELL.— Streptococci Characteristic of Sewage and Sewage-polluted Waters apparently not hitherto reported in America. *Science*, N. S., Vol. 15, No. 386, May, 1902.

C.-E. A. WINSLOW (with W. T. SEDGWICK).— I. Experiments on the Effect of Freezing and Other Low Temperatures upon the Viability of the Bacillus of Typhoid Fever, with Considerations Regarding Ice as a Vehicle of Infectious Disease. II. Statistical Studies on the Seasonal Prevalence of Typhoid Fever in Various Countries, and its Relation to Seasonal Temperature. *Memoirs of the American Academy of Arts and Sciences*, Vol. 12, No. 5, August, 1902.

C.-E. A. WINSLOW.— A Statistical Study of the Fatality of Typhoid Fever at Different Seasons. *Quarterly Publications of the American Statistical Association*, N. S., Vol. 8, No. 59, September, 1902.

G. W. FIELD.— Eels in Water Works and their Control. *Journal of the New England Water Works Association*, Vol. 15, No. 5, pp. 390–405. Abstract in *Engineering Record*, Vol. 43, No. 13, p. 303.

G. W. FIELD.— A Report upon the Scientific Basis of the

Lobster Industry, the Apparent Causes of its Decline, and Suggestions for Improving the Lobster Laws. *Report of the Massachusetts Commissioners of Fisheries and Game for 1901.* Public Documents No. 25, pp. 121–130.

G. W. FIELD.— The Biological Basis of Legislation Governing the Lobster Industry. *Science*, N. S., Vol. 15, No. 381, pp. 612–616.

W. L. UNDERWOOD.— Goldfish as Destroyers of Mosquito Larvæ. *Science*, N. S., Vol. 14, No. 365, pp. 1017–1018, December 27, 1901.

W. L. UNDERWOOD.— The Water-Garden and the Mosquito Problem. *Country Life in America*, Vol. 2, No. 4, pp. 145–147.

W. L. UNDERWOOD.— The Economic and Sanitary Importance of Cleanness in the Canned Goods Industry. *The Canner and Dried Fruit Packer*, Vol. 14, No. 6, pp. 26–29.

Geology.

W. O. CROSBY.— The Origin of Eskers. *Proceedings of the Boston Society of Natural History*, Vol. 30, pp. 375–411. *American Geologist*, Vol. 30, pp. 1–39.

W. O. CROSBY.— Geological History of the Hematite Iron Ores of the Antwerp and Fowler Belt in New York. *Technology Quarterly*, Vol. 14, pp. 162–170. *American Geologist*, Vol. 29, pp. 233–242.

W. O. CROSBY.— Origin and Relations of the Auriferous Venis of Algoma (Western Ontario). *Technology Quarterly*, Vol. 15, pp. 161–180.

W. O. CROSBY.— A Study of Hard-packed Sand and Gravel. *Technology Quarterly*, Vol. 15, pp. 260–264.

Modern Languages.

A. RAMBEAU.— Augier's "L'Aventurière" of 1848 and 1860. *Modern Language Quarterly*, Vol. 5, No. 3, p. 129.

F. VOGEL.—Storm's "Geschichten aus der Tonne." D. C. Heath & Co., 1903.

THE LIBRARIES.

The total number of additions to the Libraries during the year 1901–1902 was 3,872, of which 1,406 were by purchase, 961 from the bindery, and 1,505 were gifts. After deducting books counted twice, etc., the total net increase in the size of the library amounts to 3309 volumes, 403 pamphlets, and 136 maps. The distribution and cost of these is shown in the following table:

TABLE OF THE NET ACCESSIONS FOR THE YEAR 1901–1902, WITH THE COST OF THE SAME, AND THE TOTAL CONTENTS OF THE LIBRARIES OF THE INSTITUTE, SEPT. 30, 1902.

LIBRARIES.	Net Increase.				Total Contents.	
	Volumes.	Pamphlets.	Maps.	Cost.	Volumes.	Pamphlets and Maps.
General Library. General	331	153	—	$207.41	5,266	4,086
General Library. English	86	—	—	338.81	2,868	40
General Library. Modern Languages,	49	—	—	95.87	981	24
General Library. Military Science	5	—	—	2.33	325	7
Totals	471	153	—	$644.42	9,440	4,157
Architecture	323	15	—	611.41	3,136	228
Biology	144	28	—	229.42	2,679	494
Chemistry	328	32	—	612.32	8,696	1,670
Engineering	779	58	1	1,293.47	10,860	4,053
Geology	96	4	135	159.07	2,284	1,113
History and Economics	417	51	—	324.11	11,225	3,387
Mathematics	114	7	—	211.42	1,232	198
Mining	296	12	—	472.40	3,235	506
Physics	333	43	—	602.53	7,315	863
Margaret Cheney Room	8	—	—	—	625	13
Totals	3,309	403	136	$5,160.57	60,727	16,682

The number of serial publications received regularly by the Institute during the year 1901–1902 was 881, not including a large number of official reports and bulletins, school catalogues, and the like, which are also received regularly and duly recorded and catalogued. The following table shows the distribution of the serials, exclusive of most of the official reports:

TABLE OF PERIODICALS AND OTHER SERIAL PUBLICATIONS RECEIVED DURING THE YEAR 1901–1902.

LIBRARIES.	Number Received.					Estimated Cost.			
	Gifts.	Charged to Department.	Periodical Account.		Totals.	Departmental Account.	Periodical Account.		Totals.
			Exch.	Subs.			Exch.	Subs.	
General	35	18	16	38	107	$77.13	$32.00	$119.95	$229.08
Architecture	6	8	3	32	49	36.89	6.00	151.92	194.81
Biology	4	19	19	34	76	53.38	38.00	191.66	283.04
Geology	9	2	6	7	24	2.45	12.00	30.71	45.16
Chemistry	17	32	16	29	94*	109.77	32.00	160.68	302.45
Engineering	20	51	69	57	197	131.25	138.00	224.74	493.99
History and Economics,	51	54	2	58	165	93.93	4.00	175.68	273.61
Mathematics	—	3	—	13	16	7.66	—	53.48	61.14
Mining	8	7	28	21	64	26.64	56.00	82.66	165.30
Physics	14	18	34	23	89	63.80	68.00	114.39	246.19
Totals	164	212	193	312	881	$602.90	$386.00	$1,305.87	$2,294.77

The expenditures for the Libraries, exclusive of salaries, were as follows:

Books and Binding	$5,160.57
Periodicals	1,753.64
Supplies	244.71
Total	$7,158.92

The General Catalogue contained on September 30th the very considerable number of 55,941 cards, of which 2,831 had been added during the year. There were issued during the year 1199 orders for new books, and 1265 for binding. In

*Not including experiment station reports.

five of the libraries the number of books borrowed during the year was as follows:

General Library	1383
Engineering "	962
Chemical "	1893
Mining "	230
Biological "	157

Among the most noteworthy gifts of the year may be mentioned the sum of $210 for periodicals from Mrs. William B. Rogers; from Mrs. Waldo O. Ross, "the Gardener's Chronicle" besides 290 books and pamphlets on botanical subjects; from Miss Annie Q. T. Parsons, "Knight's Shakespere" for the Margaret Cheney Reading Room; from Professor William H. Niles, 5 volumes on biological subjects. We have received also from Mr. A. J. Sweet, and other Cornell students, "the Cornell Daily Sun." Mrs. Henry Draper has sent another part of "Die Architektur der Renaissance in Toscana." From Yale University we have received 10 volumes of the Bicentennial Publications.

STATISTICS.

The Corps of Instructors.

The Catalogue of this year shows the number of instructors of all grades to be 165, inclusive of those concerned with the mechanic arts, but exclusive of those who are announced as lecturers for the year only. The addition of these raises the total to 183. This year's Catalogue will show a decrease of twenty-two in the number of lecturers and some changes in the grades of professors and instructors. Without counting lecturers, the number of instructors to that of students bears the proportion of one to nine and seven-tenths. The following table shows the distribution among the several classes of instructors, in comparison with last year: —

	1901–02.	1902–03.
Professors	29	28
Associate Professors	9	12
Assistant Professors	25	25
Instructors	50	54
Assistants	36	46
Lecturers	40	18
Total	189	183

Students and Graduates.

The registration of this year, as shown by the Catalogue, amounts to 1,608. The following table shows the registration of successive years from the foundation of the Institute: —

Year.	No. of Students.	Year.	No. of Students.
1865–66	72	1870–71	224
1866–67	137	1871–72	261
1867–68	167	1872–73	348
1868–69	172	1873–74	276
1869–70	206	1874–75	248

Year.	No. of Students.	Year.	No. of Students.
1875–76	255	1889–90	909
1876–77	215	1890–91	937
1877–78	194	1891–92	1,011
1878–79	188	1892–93	1,060
1879–80	203	1893–94	1,157
1880–81	253	1894–95	1,183
1881–82	302	1895–96	1,187
1882–83	368	1896–97	1,198
1883–84	443	1897–98	1,198
1884–85	579	1898–99	1,171
1885–86	609	1899–1900	1,178
1886–87	637	1900–1901	1,277
1887–88	720	1901–1902	1,415
1888–89	827	1902–1903	1,608

Students by Classes.

The aggregate number of students for 1902–03 is divided among the several classes, as follows: —

Fellows	5
Graduate students, candidates for advanced degrees	12
Regular students, Fourth Year	195
" " Third "	230
" " Second "	278
" " First "	433
Special students	455
Total	1,608

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

Class.	Regular.	Special.	Total.
Fellows and Graduates of the M.I.T.	17	—	17
Fourth Year	195	95	290
Third Year	230	130	360
Second Year	278	184	462
First Year	433	46	479
Total	1,153	455	1,608

The Courses of Instruction.

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

Year.	Civil Engineering.	Mechanical Engineering.	Mining Engineering and Metallurgy.	Architecture.	Chemistry.	Electrical Engineering.	Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
4th Year Class .	31	34	28	13	14	38	1	3	1	10	7	1	14	195
3d " "	42	43	28	17	14	37	—	13	4	6	1	—	25	230
2d " "	56	56	27	13	30	43	1	4	4	14	4	—	26	278
Total	129	133	83	43	58	118	2	20	9	30	12	1	65	703

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

Year.	Civil Engineering.	Mechanical Engineering.	Mining Engineering and Metallurgy.	Architecture.	Chemistry.	Electrical Engineering.	Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
1891	81	104	17	33	23	108	11	5	19	28	9	3	—	441
1892	76	106	19	37	35	112	9	5	16	34	5	3	1	457
1893	78	97	22	50	39	141	4	10	19	31	10	2	8	511
1894	88	111	19	48	50	137	5	9	19	35	13	1	20	556
1895	88	118	25	67	59	126	7	11	14	25	10	3	22	575*
1896	99	117	24	65	66	106	7	11	11	34	8	—	25	573*
1897	109	119	38	71	60	90	8	9	10	36	7	1	26	578
1898	93	108	52	64	64	94	6	8	12	38	7	1	33	574
1899	99	113	60	53	58	84	8	7	11	30	14	1	38	575*
1900	89	127	69	53	50	87	6	4	8	34	17	1	38	582
1901	102	129	76	40	35	96	6	13	9	30	14	1	39	590
1902	129	133	83	43	58	118	2	20	9	30	12	1	65	703

*Deducting those counted twice.

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

Year.	Total.	Course.												
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
1st . . .	5	–	–	–	–	–	–	–	–	–	–	–	–	–
2d . . .	23	4	10	4	1	–	1	–	1	–	–	–	–	2
3d . . .	14	4	4	–	1	–	3	1	–	–	1	–	–	–
4th . . .	23	4	2	4	–	2	5	–	–	–	1	3	–	2
5th . . .	5	–	1	2	–	1	–	–	–	–	–	1	–	–
	70	12	17	10	2	3	9	1	1	–	2	4	–	4

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

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.
Mathematics	474	386	175	2	1,037
Chemistry	503	76	117	56	752
English	437	350	24	28	839
French	195	136	55	0	386
Physics	—	397	323	126	846
German	130	269	212	4	615
Mechanic Arts . . .	—	182	84	86	352

The total registration in the Summer School was 214 students; the registration in the various subjects is shown in the following table: —

Mathematics.	
(*a*) Analytic Geometry	14
(*b*) Integral Calculus	5
Applied Mechanics	15
Mechanical Drawing and Descriptive Geometry	42
Mechanic Arts (Shopwork).	
(*a*) Woodwork	8
(*b*) Forging	11
(*c*) Chipping and Filing	5
(*d*) Machine-Tool Work	23
Modern Languages.	
(*a*) French	13
(*b*) German	14
Chemistry.	
(*a*) Inorganic and Analytical Chemistry	46
(*b*) Air, Water, and Food Analysis	3
Physics.	
(*a*) Mechanics, Light, and Electricity	30
(*b*) Heat	5
(*c*) Physical Laboratory	8
Civil Engineering.	
(*a*) Surveying	8
Mechanical Engineering.	
(*a*) Mechanism	8
(*b*) Mechanical Engineering Drawing	8

Residence of Students.

States.	Candidates for Advanced Degrees.	Fourth Year.	Third Year.	Second Year.	First Year.	All Regular Students.	Special Students.	Total.
Alabama	–	–	–	–	–	–	1	1
Arkansas	–	–	–	–	–	–	1	1
California	–	2	4	1	3	10	5	15
Colorado	–	1	–	1	3	5	5	10
Connecticut	–	4	10	8	6	28	15	43
Delaware	–	–	–	1	2	3	1	4
Dist. of Columbia,	–	3	3	4	4	14	3	17
Florida	–	–	–	–	1	1	1	2
Georgia	–	1	–	–	2	3	3	6
Illinois	–	14	12	7	10	43	6	49
Indiana	–	4	1	2	4	11	3	14
Iowa	–	1	2	1	–	4	4	8
Kansas	–	–	–	–	–	–	1	1
Kentucky	–	–	1	5	2	8	3	11
Louisiana	–	1	1	–	–	2	–	2
Maine	–	6		5	11	25	10	35
Maryland	–	2	6	3	5	16	11	27
Massachusetts	15	104	128	167	282	696	239	935
Michigan	–	1	1	–	3	5	5	10
Minnesota	–	2	1	1	2	6	4	10
Missouri	–	1	1	5	4	11	9	20
Montana	–	1	1	–	–	2	1	3
Nebraska	–	1	2	1	1	5	–	5
New Hampshire	–	5	5	7	9	26	8	34
New Jersey	–	2	–	–	6	8	–	8
New Mexico	–	–	–	–	–	–	1	1
New York	1	8	17	20	19	65	31	96
North Carolina	–	1	–	2	–	3	3	6
North Dakota	–	–	–	–	–	–	1	1
Ohio	–	3	6	8	9	26	17	43
Oregon	–	–	–	1	2	3	1	4
Pennsylvania	–	–	–	–	1	1	1	2
Porto Rico	–	9	3	4	14	30	14	44
Rhode Island	–	9	4	5	10	28	12	40
South Carolina	–	–	–	–	1	1	–	1
South Dakota	–	–	–	–	–	–	1	1
Tennessee	–	–	–	–	1	1	2	3
Texas	–	–	–	–	1	2	3	5
Utah	–	–	–	1	–	1	2	3
Vermont	–	–	–	1	3	4	2	6
Virginia	–	–	–	–	1	1	2	3
Washington	–	–	–	–	2	2	1	3
Wisconsin	–	1	1	2	–	3	3	6
Wyoming	–	–	–	–	1	1	–	1
Foreign Countries.								
Australia	–	–	–	–	–	–	2	2
Bermuda	–	–	–	–	–	–	–	–
Brazil	–	–	–	–	1	1	2	3
Chili	–	–	–	–	–	–	2	2
China	–	–	–	–	–	–	1	1
Cuba	–	–	–	–	–	–	1	1
Denmark	–	–	–	–	–	–	1	1
England	–	–	–	–	–	–	1	1
Germany	–	–	–	–	1	1	–	1
Ireland	–	–	–	–	–	–	1	1
Japan	–	–	–	–	–	–	1	1
Manitoba	–	–	–	–	–	–	1	1
Mexico	–	–	–	1	1	2	–	2
New Brunswick	–	–	1	–	–	1	–	1
Nova Scotia	–	2	2	–	–	4	2	6
Ontario	–	–	–	1	–	1	1	2
Scotland	–	–	–	–	–	–	1	1
Turkey	–	1	–	1	1	3	1	4
Total	17	195	230	278	433	1,153	455	1,608

Forty-one states of the Union and one territory, besides the District of Columbia and Porto Rico, are represented on our list of students. Of the total number of 1,608, 935 are from Massachusetts, or 58 per cent. of the whole; 164 are from other New England states; 509 are from outside New England. Of these, 47 are from foreign countries.

A table showing the number of students in each year, from 1896, coming from each state or territory, and from each foreign country, may be not without interest and instruction: —

States.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
Alabama	1	1	1	–	1	2	1
Arkansas	1	1	–	–	1	1	1
California	9	9	11	9	10	9	15
Colorado	7	8	8	7	8	6	10
Connecticut	24	30	26	29	35	42	43
Delaware	5	6	3	4	4	3	4
Dist. of Columbia	17	13	8	7	13	14	17
Florida	–	1	–	1	1	1	2
Georgia	3	4	4	3	3	4	6
Hawaiian Islands	–	–	1	–	1	–	–
Idaho	1	1	–	–	–	1	–
Illinois	45	40	51	36	39	44	49
Indiana	3	7	3	5	7	11	14
Iowa	14	12	7	6	10	8	8
Kansas	3	3	–	–	–	1	1
Kentucky	12	10	10	4	5	9	11
Louisiana	–	1	1	1	2	1	2
Maine	27	24	19	25	22	30	35
Maryland	9	8	8	8	13	16	27
Massachusetts	739	739	719	731	770	837	935
Michigan	6	5	9	10	8	12	10
Minnesota	7	8	11	10	7	10	10
Missouri	11	6	10	11	13	19	20
Montana	3	5	2	3	5	4	3
Nebraska	2	2	2	3	4	3	5
Nevada	–	–	–	1	1	–	–
New Hampshire	26	25	25	29	26	31	34
New Jersey	13	15	13	12	8	6	8
New Mexico	–	–	–	–	–	–	1
New York	69	62	68	61	68	79	96
North Carolina	1	1	2	2	2	6	6
North Dakota	–	–	–	–	–	–	1
Ohio	28	30	23	27	27	27	43
Oregon	4	3	3	2	1	2	4
Pennsylvania	42	41	34	33	37	36	44
Porto Rico	–	–	–	–	–	1	2
Rhode Island	20	19	23	32	35	38	40
South Carolina	6	4	1	1	1	2	4
South Dakota	–	–	–	1	1	2	1
Tennessee	1	3	3	4	6	4	3
Texas	2	2	1	2	4	7	9
Utah	2	3	5	6	7	7	2
Vermont	7	11	12	12	15	15	12
Virginia	3	4	3	2	3	5	7
Washington	5	4	7	4	2	4	3
West Virginia	2	1	–	1	1	1	–
Wisconsin	6	6	8	7	8	11	11
Wyoming	1	–	–	–	–	–	1
Foreign Countries.							
Australia	–	–	–	–	–	–	2
Austria	–	–	–	–	–	1	–
Bermuda	–	–	–	–	1	2	1
Brazil	–	–	–	–	–	4	5
Cape Breton	–	–	1	–	–	–	–
Chili	1	–	–	–	–	1	1
China	–	–	–	–	–	1	1
Cuba	2	1	1	–	–	1	2
Denmark	–	2	1	1	1	1	1
Dutch Guiana	–	–	1	1	–	–	–
England	2	2	4	1	3	3	3
France	1	1	1	2	4	1	–
Germany	–	–	1	1	2	3	1
Ireland	–	–	–	–	–	–	1
Jamaica	–	–	–	1	1	1	–
Japan	2	–	1	2	2	2	1
Manitoba	–	–	–	–	–	–	1
Mexico	3	6	7	7	7	7	10
New Brunswick	2	2	3	3	2	2	2
Nova Scotia	1	1	2	–	2	6	8
Ontario	2	–	–	–	–	3	2
Quebec	2	2	1	3	4	2	–
Russia	–	–	–	1	1	1	–
Scotland	–	–	–	–	–	–	1
Turkey	1	3	3	3	3	1	4
Total	1,198	1,198	1,171	1,178	1,277	1,415	1,608

Residence of Massachusetts Students.

It has been said that 58 per cent. of our students are from Massachusetts. All the counties of the State except Dukes send students to the Institute. One hundred and forty-six cities and towns are on the lists. The first column

of the following table shows the number of cities and towns in each county sending pupils: the second column gives the aggregate number from each county. It appears that Suffolk sends two hundred and seventy-eight, and Middlesex two hundred and seventy-three pupils; Essex comes third, with one hundred and thirty-five; Norfolk, fourth, with ninety-seven.

County.	No. of Towns.	No. of Students.	County.	No. of Towns.	No. of Students.
Barnstable	5	9	Middlesex	32	273
Berkshire	4	9	Nantucket	1	1
Bristol	11	33	Norfolk	21	97
Essex	24	135	Plymouth	19	42
Franklin	3	5	Suffolk	4	218
Hampden	5	16	Worcester	15	32
Hampshire	3	5			
			Total	146	935

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

Boston	261	Haverhill	12	Beverly	7
Newton	49	Melrose	12	Springfield	7
Cambridge	33	Brockton	11	Wenham	7
Somerville	22	Taunton	11	Concord	6
Newburyport	21	Fitchburg	10	Marlboro	6
Brookline	20	Quincy	10	Natick	6
Salem	19	Canton	9	Reading	6
Lawrence	18	Chelsea	9	Stoneham	6
Lowell	18	New Bedford	9	Woburn	6
Lynn	16	Winchester	9	Andover	5
Framingham	14	Gloucester	8	Holyoke	5
Malden	14	Weymouth	8	Middleboro	5
Hyde Park	13	Arlington	7	Peabody	5
Medford	13	Belmont	7	Plymouth	5
Waltham	13				

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

appear first upon the Catalogue of the year to which the statement relates.

Year.	(1) Total No. of Students.	(2) No. of Students in the catalogue of the previous year who remain in the Institute.	(3) No. of New Students entering before issue of catalogue.	(4) Of those in column (3) the following number are regular First-year Students.	(5) No. of New Students not of the regular First-year Class.
1892–93	1,060	618	442	303	139
1893–94	1,157	701	456	301	155
1894–95	1,183	768	415	271	144
1895–96	1,187	778	409	266	143
1896–97	1,198	758	440	263	177
1897–98	1,198	757	441	277	164
1898–99	1,171	769	402	278	124
1899–1900	1,178	764	414	275	139
1900–1901	1,277	789	488	312	176
1901–1902	1,415	844	571	396	175
1902–1903	1,608	949	659	432	226

Ages of Students.

The next table exhibits the ages of our students upon entrance, after taking out one who is repeating the first year, and fifteen persons of unusual ages. These deductions leave four hundred and seventeen as the number of students whose ages have been made the subject of computation.

Period of Life.	1901–1902.		1902–1903.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
16 to 16½ years	—	—	3	—
16½ to 17 "	4	4	12	15
17 to 17½ "	28	—	30	—
17½ to 18 "	48	76	49	79
18 to 18½ "	47	—	85	—
18½ to 19 "	66	113	65	150
19 to 19½ "	73	—	65	—
19½ to 20 "	41	114	47	112
20 to 20½ "	31	—	28	—
20½ to 21 "	24	55	10	38
21 to 22 "	15	15	23	23
	377	377	417	417

The results appear in the table above in comparison with the corresponding results of 1901–1902.

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

In this connection are presented the ages, at graduation, of the class which left us in June. The one hundred and ninety-three members of the class were distributed among the different periods of life as follows: —

Under 20½	2
Between 20½ and 21	8
" 21 " 21½	16
" 21½ " 22	32
" 22 " 23	54
" 23 " 24	42
" 24 and over	39
Total	193

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

Graduate Students.

The number of students who are graduates of this and other institutions is one hundred and sixty-one. Of these twelve are candidates for advanced degrees, ten being our own graduates.

One hundred and fifty-one are graduates of the following institutions, and are pursuing courses of study with us either as regular or as special students.

Universities.

Acadia	1	Leland Stanford, Jr.	2
Baylor	1	Maine	1
Boston	2	Miami	1
Brown	4	Northwestern	3
Catholic University of America	1	Pennsylvania	2
Chicago	4	Princeton	3
Colgate	1	Rochester	1
Cornell	3	Tulane	1
Hamline	1	University of the South	1
Harvard	12	Vermont	2
Illinois	2	Virginia	2
Johns Hopkins	4	Washington	1
Kansas State	1	Yale	12
Lake Forest	1		70

Colleges.

Acadia	1	Pennsylvania Military	1
Adelbert	1	Pomona	1
Amherst	4	Radcliffe	1
Bates	1	Randolph-Macon	1
Beloit	3	Rhode Island Agricultural	1
Boston	3	Robert	1
Butler	1	Rock Hill	1
Canisius	1	St. Francis Xavier	1
Central	1	St. Ignatius	1
Christian Brothers	1	St. Joseph	1
City of New York	2	St. Xavier	1
Colby	2	Smith	1
Colorado	1	Southwest Baptist	1
Connecticut Agricultural	1	Southwestern Presbyterian	2
Davidson	2	Syrian Protestant	1
Delaware	1	Texas Agricultural	2
Detroit	1	Throop Polytechnic Institute	1
Earlham	1	Trinity	3
Gallaudet	1	Tufts	2
Georgetown	1	U.S. Naval Academy	6
Grove City	1	Vassar	1
Haverford	1	Villanova	1
Iowa	1	Virginia Medical	1
Kalamazoo	1	Virginia Military	1
Kenyon	1	Wellesley	3
Mass. College of Pharmacy	1	Westminster	1
Mass. Inst. of Technology	10	Williams	1
Milton	1	Winchester Normal	1
Mt. Allison	1	Wittenberg	1
Mt. St. Joseph	1		94
Munich Technical Institute	1		
North Dakota Agricultural	1	Total	164
Neuchâtel Académie	1	Deduct names counted twice	3
Oberlin	1		161

Women Students.

The number of women pursuing courses with us is sixty-three. Of these four are graduates of colleges. Of the total number seven are regular students of the fourth year, five of the third year, five of the first year. Forty-six are special students. Of the twelve regular students of the upper classes, five take Course IV., Architecture; three, Course V., Chemistry; one, Course VII., Biology; two, Course VIII., Physics; and one, Course IX., General Studies. Of the special students, thirty devote themselves to biology, three to chemistry, three to physics, two to architecture, one to general studies, one to naval architecture, and one to mechanical engineering, while five are first-year specials.

Statistics of Admission.

Of the 1,608 students of the present year, 659 were not connected with the school in 1901–1902. Of these 408 were admitted as regular students of the first year upon the basis of their entrance examinations. The 251 remaining comprise (1) those who had previously been connected with the Institute, and have resumed their places in the school; (2) those who were admitted provisionally without examination; (3) those who were admitted by examination as regular second-year or as special students; (4) those who were admitted on the presentation of diplomas or certificates from other institutions of college grade or from the College Examination Board. In addition to the 408 who were thus admitted to the first year on examination, and have taken their place in the school, 70 were admitted on examination, but have not entered the school.

In the case of the 408 persons who were admitted on examination, and have joined the school, the results of the examinations, embracing both those of June and those of September, were as follows: —

Admitted clear	316
" on one condition	75
" on two conditions	17
	408

One hundred and four applicants were rejected.

Entrance Examinations at Distant Points.

In addition to the entrance examinations held at Boston in July and September, examinations were conducted in July at Austin (Tex.), Belmont (Cal.), Chicago, Denver, Detroit, Kansas City (Mo.)., New York, North Adams, Philadelphia, Pittsburg, Portland (Me.), St. Louis, St. Paul, Springfield (Mass.), Syracuse, and Washington.

Graduates by Courses.

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

Year.	Civil Engineering.	Mechanical Engineering.	Mining Engineering.	Architecture.	Chemistry.	Metallurgy.	Electrical Engineering.	Natural History or Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	Naval Architecture.	Total.
1868	6	1	6	—	—	—	—	—	—	1	—	—	—	—	14
1869	2	2	—	—	1	—	—	—	—	—	—	—	—	—	5
1870	4	2	2	—	1	—	—	—	—	1	—	—	—	—	10
1871	8	2	5	—	2	—	—	—	—	—	—	—	—	—	17
1872	3	1	5	—	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	7	—	5	1	—	2	3	4	—	—	—	—	42
1877	12	6	8	4	2	—	—	—	—	—	—	—	—	—	32
1878	8	2	2	3	3	—	—	—	—	1	—	—	—	—	19
1879	6	8	3	1	3	—	—	1	1	—	—	—	—	—	23
1880	3	—	3	—	1	—	—	—	—	1	—	—	—	—	8
1881	3	5	6	3	8	—	—	1	—	2	—	—	—	—	28
1882	2	5	5	3	6	—	—	1	1	1	—	—	—	—	24
1883	3	7	5	1	3	—	—	—	—	—	—	—	—	—	19
1884	5	6	13	—	12	—	—	—	—	—	—	—	—	—	36
1885	4	7	8	2	4	—	2	—	—	1	—	—	—	—	28
1886	9	23	7	1	7	—	10	1	—	1	—	—	—	—	59
1887	10	17	8	1	9	—	8	1	1	3	—	—	—	—	58
1888	11	25	4	5	10	—	17	3	1	1	—	—	—	—	77
1889	14	24	5	3	8	—	17	1	1	2	—	—	—	—	75
1890	25	28	3	5	13	—	18	3	2	6	—	—	—	—	103
1891	18	26	4	6	11	—	23	3	3	1	7	—	1	—	103
1892	22	26	4	13	7	—	36	6	1	7	4	6	1	—	133
1893	25	30	5	2	8	—	41	2	—	6	8	—	2	—	129
1894	21	31	4	14	11	—	33	1	3	5	12	3	—	—	138
1895	25	30	3	15	14	—	33	—	2	4	11	4	—	5	144*
1896	25	34	10	24	17	—	48	3	3	7	7	4	3	5	189*
1897	25	40	7	16	20	—	33	2	3	7	12	4	1	9	179
1898	32	41	7	29	25	—	33	3	4	6	9	3	—	7	199
1899	30	37	9	22	21	—	32	2	2	1	10	1	—	8	173*
1900	32	34	21	21	19	—	23	3	3	5	11	4	—	9	185
1901	37	39	17	21	17	—	25	1	1	6	14	4	1	16	199
1902	24	46	15	18	14	—	35	5	3	3	9	7	—	14	193
Totals	498	606	221	236	293	1	467	45	39	88	114	40	9	73	2,725*
Deduct names counted twice															15
Net total															2,710

* Deducting names counted twice.

THE SOCIETY OF ARTS.

Report of the Secretary.

To the President of the Institute:

Sir: — On behalf of the Executive Committee I have the honor to present the annual report of the Society of Arts for the year May 16, 1901, to May 8, 1902.

The first meeting of the Society for the present year was held on October 10, 1901. Fourteen meetings have been held with an average attendance of 216. During the last three years there has been a steady gain in the attendance, which has reached this year three times that of any corresponding period since 1875. Another feature, most gratifying to the Executive Committee, is the increased interest manifested by the students of the Institute in these meetings.

The following papers have been read: —

"The Olympia: A general Description of this famous Ship, and a Discussion of the Development of Cruisers during the Past and the Tendency to Future Progress." NAVAL CONSTRUCTOR WILLIAM J. BAXTER, U.S.N.

"Present Condition of American Railroads as Compared with the Period of Depression 1893–1897." PROFESSOR WILLIAM Z. RIPLEY, Expert Agent on Transportation, U.S. Industrial Commission.

"The Importance of Catalytic Agents in Chemical Processes." PROFESSOR ARTHUR A. NOYES.

"The Development of the Nernst Lamp in America." MR. ALEXANDER J. WURTS, Manager, Nernst Lamp Company.

"The Development of Locomotive Boilers with Particular Reference to the Vanderbilt Boilers." MR. CORNELIUS VANDERBILT.

"The New Star in Perseus." PROFESSOR GEORGE E. HALE, Director, Yerkes Observatory.

"The Utilization of Electricity in Mines" MR. CALVIN W. RICE, Electrician, New York Edison Company.

"Some Features of the Isthmian Canal Question." PROFESSOR W. H. BURR, Member of the U.S. Commission on the Isthmian Canal.

"Engineering in China." MR. WILLIAM BARCLAY PARSONS, Chief Engineer, New York Subway.

"Aluminum as a Reducing and a Heat-Producing Agent." PROFESSOR HEINRICH O. HOFMAN.

"India Rubber: A Description of the Crude Gum and its Manufacture." MR. WALTER E. PIPER, Assistant Superintendent, Boston Rubber Shoe Company.

"Smoke and its Abatement in Large Cities." PROFESSOR C. H. BENJAMIN, Supervising Engineer, City of Cleveland, Ohio.

"A Trip through Siberia." HON. E. J. HILL, Member of U.S. House of Representatives.

"Success in Long Distance Power Transmissions." DR. F. A. C. PERRINE, President of the Stanley Electric Manufacturing Company.

At the beginning of the year, the Associate Membership was three hundred and fifty-four. Of these members one has died, five have resigned, one has been cancelled, and twenty-two have been elected, making the present membership three hundred and sixty-nine. There are thirty-eight Associate Life Members.

The publication of the Technology Quarterly has been continued, as before, under the auspices of the Society of Arts. There has been a regrettable difficulty in obtaining manuscripts of papers read before the Society. Nevertheless, the Quarterly has not lacked material, and has published contributions from a considerable number of the Departments of the School. One of the most notable of these contributions is "The Report of the Massachusetts Institute of Technology Eclipse Expedition to Sumatra in 1901" by Professor Burton and Messrs. H. M. Smith, G. L. Hosmer, and G. H. Matthes Another important contribution from the Civil Engineering Department is "Tests of the Massachusetts Institute of Technology Tape Apparatus," by Professors Burton and Mr. John F. Hayford of the U.S. Coast and Geod ic Survey. The Mechanical Engineering Department contributed the usual quota of "Results of Tests," during the summer, and also a paper by Mr. J. C. Riley on the "Pulsometer Steam Pump." From the Physical Department there was a paper by Professor Laws on "An Apparatus for Recording Alternating Current Waves," and one by him and Dr. Coolidge on "An Apparatus for the Rapid Comparison of Voltmeters." The Chemical Department has furnished three: — "Contributions from the Laboratory of Sanitary Chemistry" by Mrs.

Richards, Mr. Woodman, and Miss Hyams; a paper by Professor Gill and Mr. Healey on "Some Thermal Properties of Naphthas and Kerosenes"; and the "Review of American Chemical Research," edited by Professor Noyes, to December. It was found impracticable for the Chemical Department to continue the preparation of the Review and its publication was discontinued with the issue of the December number of the Quarterly. Mr. Winslow has contributed from the Biological Department a report on "Typhoid Fever at Newport, R.I., in 1900 and its relation to Defective Sanitation," and we have had from Mr. Prescott a paper "On the Application of Bacteriology to certain Arts and Industries." The contributions from the Geological Department are two papers by Professor Crosby, one on "Tripolite Deposits of FitzGerald Lake" and the other on the "Geological History of the Hematite Iron Ores of the Anthwerp and Fowler Belt in New York;" and Mr. F. G. Clapp's thesis on the "Geological History of the Charles River." Messrs. Whipple and Jackson have continued their important series of papers on methods of water examination, and Mr. William Lincoln Smith has furnished a second part of his valuable "Study of Certain Shades and Globes for Electric Lights as used in Interior Illumination."

At the last meeting of the year, the fortieth annual meeting, Messrs. George W. Blodgett, Desmond FitzGerald, Edmund H. Hewins, Charles T. Main, and James P. Munroe were re-elected members of the Executive Committee, and Mr. George V. Wendell was re-elected Secretary for the year 1902–1903.

At the October meeting, 1902, the resignation of Mr. Wendell was received and Mr. James F. Norris was elected Secretary.

Respectfully submitted,

JAMES F. NORRIS,
Secretary.

JANUARY 26, 1903.

GENERAL STATEMENT

OF THE

RECEIPTS AND DISBURSEMENTS BY THE TREASURER

FOR THE YEAR ENDING SEPT. 30, 1902

STATEMENT OF THE TREASURER.

The Treasurer submits the annual statement of the financial affairs of the Institute for the year ending Sept. 30, 1902.

This year there has again been a large increase in the amount received from students' fees, the total being more than $31,000 greater than a year ago; but with the increase in the number of students has come a corresponding growth in the expenses, so that the excess of current expenses over receipts is $5,892.14. A year ago such excess was $9,590.26. In other words, the total increase in receipts for current expenses has been somewhat over $35,000, and the increase in expenses between $31,000 and $32,000 over those of a year ago, making the annual deficit nearly $4,000 less.

A triangular piece of land containing about forty-six hundred square feet and adjoining that previously owned on Stanhope Street, has been purchased in order to bring the front of our land to the future line of Clarendon Street extended.

The new Augustus Lowell Laboratory of Electrical Engineering, covering nearly an acre of ground, was begun July 1. All the work included in the original contract was completed September 17, so that the laboratory was ready for use at the beginning of the new term. The portion of the cost of this new building paid during the financial year was $69,705.12. The very large increase in the number of students has made this building an absolute necessity.

A valuable tract of land in Brookline, near Jamaica Pond, and comprising between eleven and twelve acres, has been bought, the total cost being about $113,000. This purchase makes possible certain much needed extensions of the Institute's work as soon as the necessary funds can be secured.

The following legacies and gifts have been received: —

From Samuel Cabot, Esq., $20,000 to be applied toward the purchase of the above Brookline land.

From A. Lawrence Lowell, Esq., and Percival Lowell, Esq., from each $10,000 toward the erection of the Augustus Lowell Laboratory of Electrical Engineering, and from Mrs. W. Scott Fitz $2,000 for the same object.

From the Robert C. Billings estate an additional sum of $7,500, being the amount of the United States inheritance tax returned by the government.

From G. W. Armstrong, Esq., in memory of his son George Robert Armstrong, $5,000, to be known as the George Robert Armstrong Fund.

From an unnamed donor, through President Pritchett, $5,000 to be used "in experiments with a view of finding out the cheapest and most efficacious way of purifying sewage before it is poured into the rivers and harbors of our country." The giver of this promises an equal amount yearly for two more years, for similar purposes.

From Arthur T. Lyman, Esq., $5,000 for general purposes.

From a friend, through Francis H. Williams, M.D., $1,000 for experiments in the use of the Roentgen-rays.

From the estate of the late Henry L. Pierce, an additional sum of $3,000.

From the estate of the late Susan E. Dorr, an additional sum of $1,956.63.

From the estate of the late Matilda Goddard, $500.

From the Saturday Club, for the purchase of books, $500.

From a friend, for salary account, $500.

From Mrs. William B. Rogers, for the purchase of periodicals, $200.

From Samuel Cabot, Esq., for prizes for designs for medal to be given for improvement in physical development, $25.

The gifts and bequests during the past year to be added to the funds for special purposes amount to $46,951.05, and to the funds for general purposes to $21,000 (page 4). These figures do not include the money given for sewage experiments and for Roentgen-ray investigation, nor $1,225 given to be used during the past year.

The total increase in the funds of the Institute for this year has been $96,524.18, including $26,558.97 cash belonging to the Walker Memorial Fund.

The investments of the Walker Memorial Fund have not been included in the general account of the Institute, but the total amount actually paid into that fund up to the close of the financial year was $68,960, which, together with accumulated interest thereon, makes a total of $71,347.30.

Securities Sold or Paid, General Account.

$2,000	Bur. & Mo. River (Neb.) R.R. 6s	1918	2,000.00
19,000	Walter Baker Co. Lt'd. 4½s	1903	19,000.00
3,000	Ozark Equipment Co. 5s.	1910	3,000.00
10 Shares	Lowell Bleachery		260.00
55 "	Old Boston National Bank		6,160.00
15 "	Merchants " "		2,926.50
25 "	New England " "		4,000.00
25 "	Atlantic " "		3,325.00
37 "	Nat. Mechanics Bank, Baltimore		1,147.00
			$41,818.50

Securities Bought, General Account.

$50,000	N. Pac. Great Northern R.R. Joint 4s	1921	$48,500.00

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

Dr.

Cash balance, Sept. 30, 1901		28,638.07
From A. Lawrence Lowell for Lowell Institute Courses		5,757.15
RECEIPTS FOR CURRENT EXPENSES.		
Income of funds for salaries	4,324.00	
" " " " scholarships (students' fees),	10,175.00	
" " " " Joy "	200.00	
" " " " Swett "	400.00	
" " " " Savage "	400.00	
" " " " W. B. Rogers	600.00	
" " " " Library	480.00	
" " " " general purposes	27,976.52	
" " Rogers Memorial Fund	10,838.00	
" " Charlotte B. Richardson Fund	1,495.15	
" " Rotch Prize Funds	400.00	
" " Rotch Architectural Fund	1,000.00	
" " Edward Austin Fund, Scholarships	7,500.00	
" " " " " Awards	5,385.00	
" " Teachers' Fund	3,800.00	
Letter Box Fund	50.00	
Students' fees	252,987.75	
State Scholarships	4,000.00	
United States Act of 1862	5,501.68	
United States Act of 1890	8,333.34	
Gift of State of Massachusetts	25,000.00	
Laboratory supplies and breakages	11,794.01	
Rents, per Table (page 12)	5,982.80	
Gifts	1,225.00	
Interest	8,920.91	
Boston University	1,150.00	
Sale Printed Lecture Notes	3,218.10	403,137.26
GIFTS AND BEQUESTS FOR SPECIAL PURPOSES.		
Increase Scholarship Funds	1,279.42	
" Teachers' Fund	200.00	
" Edward Austin Fund	1,515.00	
" Susan E. Dorr Fund, additional	1,956.63	
Aug. Lowell Lab. Electrical Eng. Fund, add'l,	22,000.00	
Samuel Cabot, toward Brookline land purchase	20,000.00	46,951.05
GIFTS AND BEQUESTS FOR GENERAL PURPOSES.		
Henry L. Pierce Legacy, additional	3,000.00	
Matilda Goddard Legacy	500.00	
R. C. Billings Legacy, tax refunded	7,500.00	
George Robert Armstrong Fund	5,000.00	
Arthur T. Lyman Fund	5,000.00	21,000.00
SECURITIES SOLD OR PAID.		
General Fund, page 3		41,818.50
SUNDRIES.		
Income credited to Bond Premium Acc't	4,622.25	
" " " Rogers Bond Premium Acc't,	825.00	
Boston Art Students' Association, on acc't	666.67	
Notes receivable paid	100,000.00	
Students' Deposits	250.00	
Walker Memorial Fund	40,747.30	
Roentgen-Ray Experiment Fund	1,000.00	
Sewage Experiment Fund	5,000.00	153,111.22
		$700,413.25

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.
FOR THE YEAR ENDING SEPT. 30, 1902.

Cr.

Paid for Lowell Institute Courses		5,757.15

EXPENSES.

Salaries, per Table (page 12)	291,501.29	
" paid from Gifts	500.00	
Fellowship paid from Swett Fund	400.00	
" " " Savage "	400.00	
Edward Austin Fund, Awards	5,385.00	
Teachers' Fund, "	3,800.00	
Prizes, Rotch Funds	400.00	
Prizes, Athletic Medal Designs	25.00	
Repairs, per Table (13)	13,648.76	
General Expenses, per Table (page 13)	17,661.78	
Fire Insurance	2,063 21	
Fuel	10,428.98	
Water	2.866.35	
Gas	2,452.10	
Electricity	1,901.36	
Printing and Advertising	5.909.34	
" Lecture Notes	2,891.19	
" Annual Catalogues and Reports	3,676.65	
Rents paid Boston & Albany R.R. Co.	90.00	
" " Natural History Society	200.00	
" " 71 Newbury Street	1,493.63	
Laboratory Supplies and Libraries, per Table (p. 12)	39,903.27	
Society of Arts	1,408.94	
Pan-American Exposition	22.55	409,029.40

(Expenses more than Income, $5,892.14)

SECURITIES BOUGHT OR RECEIVED AS LEGACIES.

General Account (page 3)		48,500.00
Walker Memorial Fund		13,000.00

SUNDRIES.

Extension Lot, No. 3 Trinity Place	23,210.00	
Aug. Lowell Lab. Electrical Eng. Bldg., 1902	69,705.12	
Brookline Real Estate	112,904.32	205,819.44
Cash balance, Sept. 30, 1902		18,307.26
		$700,413.25

The following account exhibits the property held by the Institute, as per Treasurer's books, Sept. 30, 1902:—

INVESTMENT OF THE W. B. ROGERS MEMORIAL FUND.

30,000.00	Burlington & Mo. River R.R. 4s.	1910	25,787.50
27,000.00	Kansas City Belt R.R. 6s.	1916	27,000.00
6,000.00	New York & New England R.R. 6s.	1905	6,000.00
3,800.00	Republican Valley R.R. 6s.	1919	3,800.00
4,000.00	Cin., Ind., St. Louis & Chicago R.R. 6s.	1920	4,000.00
4,000.00	Kansas City, Fort Scott & Gulf R.R. 7s.	1908	4,000.00
1,000.00	Lincoln & Northwestern R.R. 7s.	1910	1,000.00
1,000.00	Atchison & Nebraska R.R. 7s.	1908	1,000.00
35,000.00	Fort Street Union Depot 4½s.	1941	34,825.00
24,000.00	Rome, Watertown & Ogdensburg R.R. 5s.	1922	24,000.00
37,500.00	Detroit, G. Rapids & Western R.R. 4s.	1946	37,500.00
25,000.00	Atchison, Top. & St. Fé R.R. 4s.	1995	24,470.00
7,000.00	Chesapeake & Ohio R.R. 5s.	1939	7,000.00
38,000 00	Chi. Junc. & Union Stock Yards 5s.	1915	38,000.00
3,000.00	Chi., Mil. & St. Paul R.R. 7s.	1905	3,000.00
	Advances to Bond Premium acc't		9,207.50
			250,590.00

INVESTMENTS, GENERAL ACCOUNT.

8,000.00	Bur. & Mo. River (Neb.) R.R. 6s., non-exempt	1918	8,000.00
2,000.00	Bur. & Mo. River (Neb.) R.R. 6s., exempt	1918	2,000.00
5,000.00	Chicago, Burlington & Quincy R.R 4s.	1922	4,100.00
3,000.00	Hannibal & St. Joseph R.R. 6s.	1911	3,000.00
6,000.00	West End Street Ry. 5s.	1902	6,000.00
35,000.00	Fitchburg R.R. 5s.	1903	35,000.00
65,000.00	Boston & Maine R.R. 4½s.	1944	65,000.00
26,000.00	Am. Dock & Improvement Co. 5s.	1921	26,000.00
3,000.00	Illinois Central R.R. 4s.	1951	3,000.00
26,000.00	New York & New England R.R. 6s.	1905	26,000.00
8,000.00	Chi. Junc. & Union S. Yards 5s.	1915	8,000.00
5,000.00	Dominion Coal Co. 1st. 6s.	1913	5,000.00
2,000.00	New England Tel. & Tel. Co. 6s.	1907	2,000.00
2,000.00	New York & New England R.R. 7s.	1905	2,000.00
100,000.00	West End Street Ry. 4s.	1917	100,000.00
50,000.00	Utah & Northern R.R. 1st 7s.	1908	50,000.00
47,000.00	Walter Baker Co., Ltd., 4½s.	1903	47,000.00
50,000.00	Chi. Terminal & Transfer Co. 1st 4s.	1947	47,507.50
120,000.00	Illinois Steel Co., non-conv. 5s.	1913	119.586.25
43,000.00	Chesapeake & Ohio R.R. 5s.	1939	43,000.00
100,000.00	Long Island R.R. 4s.	1949	96,137.50
7,000.00	K. C., Clinton & Springfield R.R. 5s.	1925	6,289.21
8,500.00	K. C., Mem. & Birmingham R.R. 4s.	1934	8,287.50
13,000.00	K. C., St. Jo. & Council Bluffs R.R. 7s.	1907	13,000.00
50,000.00	Kansas City Stock Yards 5s.	1910	50,000.00
25,000.00	Atchison, Top. & St. Fé R.R. 4s.	1995	25,000.00
50,000.00	Rio Grande & Western R.R. 4s.	1939	49,180.00
50,000.00	Oregon R.R. & Navigation Co. 4s.	1946	50,000.00
50,000.00	Union Pacific R.R. 4s.	1947	50,000.00
100,000.00	Chic. & W. Michigan R.R. 5s.	1921	100,000.00
100,000.00	American Tel. & Tel. Co. 4s.	1929	99,875.00
50,000.00	New England Tel. & Tel. Co. 4s.	1930	50,000.00
50,000.00	Chi. Junc. & Union S. Yards 4s.	1940	49,250.00
50,000.00	K. C., Fort Scott & Memphis R.R. 6s.	1928	50,000.00
25,000.00	Southern Ry., St. Louis Div. 4s.	1951	24,875.00
22,000.00	Ozark Equipment Co. 5s.	1910	22,000.00
50,000.00	Northern Pac. Gt. Northern Joint 4s.	1921	48,500.00
	Advances to Bond Premium acc't		40,210.00
			1,434,797.96
	Amount carried up		$1,685,387.96

Amount brought up $1,685,387.96

STOCKS.

Shares.					
172	Boston & Albany R.R.	par	100	34,456.50	
50	Chi., Milwaukee & St. Paul R.R. Pf.	"	100	6,775.00	
12	Cocheco Manufacturing Co.	"	500	6,000.00	
56	Hamilton Woollen Co.	"	100	5,390.00	
31	Great Falls Manufacturing Co.	"	100	3,472.00	
2	Dwight Manufacturing Co.	"	500	1,600.00	
17	Pepperell Manufacturing Co.	"	100	2,789.50	
27	Essex Co.	"	50	3,780.00	
25	National Bank of the Republic	"	100	3,625.00	
40	The Molsons Bank, Montreal	"	50	2,930.00	
64	Boston Real Estate Trust	"	1000	68,909.64	
1	Boston Ground Rent Trust	"	1000	900.00	140,627.64

Investment of the Joy Scholarship Fund.

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

Investment Swett Scholarship Fund.

Massachusetts Hospital Life Insurance Co.	10,000.00

Amount carried up $1,845,139.30

Amount brought up			$1,845,139.30

REAL ESTATE.

Rogers Building		200,000.00	
Walker "		150,000.00	
Land on Garrison Street	50,840.00		
Workshops " "	30,000.00	80,840.00	
Land on Trinity Place	76,315.69		
Engineering B'ld'g, A, Trinity Place,	90,000.00	166,315.69	
Gymnasium Building		7,967.85	
Engineering Building, B		57,857.10	
Lot No. 2, Trinity Place		137,241.60	
Lot No. 3, " "		282,260.00	
Henry L. Pierce Building, Trinity Place . . .		154,297.05	
Boiler and Power House, " " . . .		26,916.74	
Clarendon St. Land and Building		142,762.94	
Real Estate, Massachusetts Ave., Cambridge .		16,154.38	
Real Estate, Brookline, Mass.		112,904.32	
Aug. Lowell Lab. Elec. Eng. Bldg., 1902 . . .		69,705.12	1,605,222.79
Equipment, Engineering Building		16,555.24	
" Workshops		20,628.56	37,183.80

SUNDRIES.

Notes Receivable		37,000.00	
Boston Art Students' Association		8,999.99	
Students' Notes		770.50	
Cash Balance, Sept. 30, 1902		18,307.26	65,077.75
			$3,552,623.64

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

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

William Barton Rogers Memorial Fund . . .		250,225.00	
Richard Perkins Fund		50,000.00	
George Bucknam Dorr Fund		49,573.47	
Martha Ann Edwards "		30,000.00	
Nathaniel C. Nash "		10,000.00	
Sidney Bartlett "		10,000.00	
Robert E. Rogers "		7,680.77	
Albion K. P. Welch "		5,000.00	
Stanton Blake "		5,000.00	
McGregor "		2,500.00	
Katharine B. Lowell "		5,000.00	
Samuel E. Sawyer "		4,764.40	
John W. and Belinda Randall Fund		83,452.36	
James Fund		163,654.21	
George Robert Armstrong Fund		5,000.00	
Arthur T. Lyman Fund		5,000.00	686,850.21
Amount carried up			$686,850.21

Amount brought up		$686,850.21
The income of the following is used towards paying salaries: —		
Nathaniel Thayer, for Professorship of Physics .	25,000.00	
Jas. Hayward, for Professorship of Engineering	18,800.00	
William P. Mason, " " Geology . .	18,800.00	
Henry B. Rogers, for general salaries	25,000.00	
George A. Gardner, " "	20,000.00	
Sarah H. Forbes, "	500.00	108,100.00
SCHOLARSHIP TRUSTS.		
Richard Perkins Fund	53,267.74	
James Savage "	14,137.87	
Susan H. Swett "	10,182.95	
William Barton Rogers Fund	10,717.89	
Joy Fund	9,123.70	
Elisha Thatcher Loring Fund	5,356.27	
Charles Lewis Flint "	5,274.65	
Thomas Sherwin "	5,000.00	
Farnsworth "	5,000.00	
James H. Mirrlees "	2,828.30	
William F. Huntington "	5,225.32	
T. Sterry Hunt "	3,229.33	
Elisha Atkins "	5,000.00	
Nichols "	5,000.00	
Ann White Vose "	60,778.15	
Ann White Dickinson "	40,642.92	
Dalton Grad. Chemical "	6,471.44	
Willard B. Perkins "	7,112.75	
Billings Student "	50,000.00	
Henry Saltonstall "	10,000.00	314,349.28
OTHER TRUSTS.		
Charlotte Billings Richardson Ind. Chem. Fund		37,378.78
Susan Upham Fund		1,299.54
Susan E. Dorr "		12,956.63
William Hall Kerr Library Fund		2,000.00
Charles Lewis Flint " "		5,000.00
Rotch Architectural " "		5,000.00
Rotch Architectural Fund		25,000.00
Rotch Prize "		5,200.00
Rotch "Special" Prize Fund		5,200.00
Edward Austin "		366,549.09
Teachers' "		104,000.00
Saltonstall "		40,600.00
Letter Box "		10.50
MISCELLANEOUS.		
Students' Deposits	450.00	
Henry L. Pierce Legacy, 1898	803,000.00	
Robert C. Billings Legacy, 1900	100,000.00	
Rebecca A. Goddard " 1901	1,000.00	
Barthold Schlesinger " 1901	2,000.00	
Matilda Goddard " 1901	500.00	
Aug. Lowell Lab. Electrical Eng. Fund	32,000.00	
Walker Memorial Fund	26,558.97	
Samuel Cabot, Gift Brookline Land Account . .	20,000.00	
Roentgen-Ray Experiment Fund	1,000.00	
Sewage Experiment Fund	5,000.00	
M. I. T. Stock Account	841,620.64	1,833,129.61
		$3,552,623.64

Comparative Statement of Funds, etc.

	Sept. 30, 1901.	Sept. 30, 1902.
Trusts for general purposes	676,850.21	686,850.21
" " Salaries	108,100.00	108,100.00
" " Scholarships	313,482.26	314,349.28
" " Library	7,000.00	7,000.00
Charlotte B. Richardson Ind. Chem. Fund	37,378.78	37,378.78
Susan Upham Fund	1,297.64	1,299.54
Susan E. Dorr "	11,000.00	12,956.63
Rotch Architectural Library Fund	5,000.00	5,000.00
Rotch Architectural Fund	25,000.00	25,000.00
Rotch Prize Fund	5,200.00	5,200.00
Rotch "Special" Prize Fund	5,200.00	5,200.00
Henry L. Pierce Legacy	800,000.00	803,000.00
Robert C. Billings "	92,500.00	100,000.00
Saltonstall Fund	40,200.00	40,600.00
Aug. Lowell Lab. Electrical Eng. Fund	10,000.00	32,000.00
Rebecca A. Goddard Legacy	1,000.00	1,000.00
Matilda Goddard Legacy		500.00
Barthold Schlesinger "	2,000.00	2,000.00
Edward Austin Fund	365,034.09	366,549.09
Teachers' Fund	103,800.00	104,000 00
Letter Box Fund		10.50
Students' Deposits	200.00	450.00
Roentgen-Ray Experiment Fund		1,000.00
Sewage Experiment Fund		5,000.00
Walker Memorial Fund		26,558.97
Samuel Cabot Gift Brookine Land Account		20,000
M. I. T. Stock Account	845,856.48	841,620.64
	$3,456,099.46	$3,552,623.64
Increase,		
Consisting of:		
Bequests for Special Purposes, etc. (See page 4)	46,951.05	
Gifts and Bequests for General Purposes. (See page 4)	21,000.00	
Students' Deposits	250.00	
Roentgen-Ray Experiment Fund	1,000.00	
Sewage Experiment Fund	5,000.00	
Net Gain on Stocks sold	1,656 30	
Walker Memorial Fund, net amount	26.558.97	102,416.32
Less Expenses more than Income		5,892.14
		$96,524.18

INCOME FROM GENERAL INVESTMENTS, AND APPLICATION THEREOF.

Applied to Salaries	4,324.00	From Dividends, Bank Stocks	980.15
" " Scholarships	10,550.00	" State Tax returned on Bank Stocks	242.94
" " " James Savage Fund	400.00	" Bonds	64,906.45
" " Charlotte B. Richardson Fund	1,495.15	" Dividends, Railroad Stocks	1,855.00
" " Teachers' Fund	4,000.00	" " Manufacturing Stocks	1,017.30
" " Edward Austin Fund	14,400.00	" Real Estate Stocks	2,915.00
" " Rotch Prize Funds	400.00		
" " Rotch Architectural Fund	1,000.00		
" " Library	480.00		
" " General Purposes	27,976.52		
" " Samuel Dorr Annuity	1,000.00		
" " Increase of Funds	1,268.92		
" " Advances to Bond Premiums	4,622.25		
	$71,916.84		$71,916.84

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

Paid Massachusetts Institute of Technology	10,838.00	Received Income from Railroad Bonds	11,663.00
Credited to Advances Bond Premiums	825.00		
	$11,663.00		$11,66.300

DETAILS OF SOME ITEMS IN TREASURER'S CASH ACCOUNT.

Rents.

Huntington Hall, for Lowell Lectures	1,750.00	
Land and Building, Clarendon St., on account	2,750.00	
Use of Rooms and Gymnasium	1,044.12	
Cambridge Real Estate	438.68	$5,982.80

Department Supplies.

Chemistry	11,162.89	
Physics	6,903.07	
Mining	4,787.12	
Mechanical Engineering	2,730.17	
Civil Engineering	2,441.35	
Workshops	2,143.70	
Architecture	1,893.52	
Periodicals	1,770.26	
Applied Mechanics	1,399.48	
Geology	1,332.68	
Biology	1,020.87	
English	982.97	
Naval Architecture	750.87	
Mathematics	201.09	
Military	157.21	
Drawing	121.40	
Modern Languages	104.62	$39,903.27

Salaries.

Instruction	228,864.05	
Administration	32,796.04	
Labor	29,841.20	$291,501.29

General Expense.

Furniture		3,263.70	
Stationery and Office Supplies		2,642.04	
Postage		2,626.82	
Electrical Wiring, Lamps, etc.		1,330.89	
Sundries		1,226.90	
Express		1,115.50	
Janitor's Supplies		1,096.38	
Examinations		900.41	
Diplomas and Commissions		619.40	
Washing		599.35	
Telephone Service, Installing Stations, Rentals, Repairs, etc.		486.25	
Engine Room Supplies:			
Oil	259.32		
Waste	68.84		
Sundries	62.40	390.56	
Library		317.45	
Ice		232.30	
Examination Books		217.07	
Graduation Exercises		174.20	
Removing Ashes		138.20	
Glass		137.77	
U. S. Vaults		75.00	
Gymnasium		71.59	$17,661.78

Repairs.

Department Improvements:			
Chemistry		3,890.03	
Mechanical Engineering		437.68	
Architecture		368.53	
Workshops		267.70	
Physics		266.09	
Mining		262.16	
Naval Architecture		150.54	
Geology		53.85	
Biology		47.61	
Civil Engineering		23.64	
English		3.76	
Applied Mechanics		1.25	5,772.84
Rogers Building			2,300.30
Walker "			1,648.39
Sundries			1,451.63
Steam Fitting			746.25
Engineering Building			580.47
Pierce Building			530.06
Boiler and Power House			277.62
Motor for fan for heating Huntington Hall			237.50
Gymnasium			103.70
			$13,648.76

BOSTON, November 14, 1902.

Mr. E. L. Parker, an accountant employed by this committee, has examined the accounts of the Treasurer of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY for the year ending September 30, 1902, and his report is hereto annexed.

We have verified the list of personal property held by the Institute.

CHARLES C. JACKSON,
JAMES P. TOLMAN,
Members of the Auditing Committee.

BOSTON, November 14, 1902.

To the Auditing Committee of the Massachusetts Institute of Technology:

GENTLEMEN,— I have audited the accounts of Mr. George Wigglesworth, Treasurer, for the year ending September 30, 1902.

They are correct, payments duly vouched, and the receipts from students' fees and all other income duly accounted for. The cash at office and in banks, according to the deposit books, is correct. The account of property held by the Institute and the funds and balances, as shown in the Treasurer's report of September 30, 1902, is in accordance with the books.

Respectfully submitted,

EDWARD L. PARKER,
Public Accountant.