MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

ANNUAL REPORT

OF THE

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To The Corporation of the Massachusetts Institute of Technology:

The school year upon which I have now the honor to report has been one of mingled good and ill. There has been a large increase in the number of students, carrying the aggregate up to 1,157; a new course of instruction, that in naval architecture, has been successfully launched; the reputation and influence of the Institute have steadily widened, and there is reason to believe that every part of its work has been well done. On the other hand, no year in the history of the Institute has brought more distressing losses from the corps of instructors; and never, or not for many years at least, has the pressure of financial restriction been so hard and painful. The last-named feature of the situation is one which deserves the serious consideration of the members of the Corporation. It will soon be necessary, if indeed the time has not already come, for the friends of the Institute and the people of Boston and Massachusetts to decide whether this great school of industrial science, with its honorable record and its vast possibilities of future usefulness, shall be allowed to suffer serious and enduring injury and possibly irreparable disaster, from lack of pecuniary means. When it is remembered that the small and poor Republic of Switzerland, with its wide wastes of barren mountain, each year contributes $175,000 — a sum at least twice as large for all effective purposes as would be the same sum here in the United States — for the maintenance of the Polytechnicum at Zürich, can we believe that the Commonwealth and people of Massachusetts will permit an institution which has so completely proved its usefulness in the scientific and technical education of her sons, to languish from want of funds properly to sustain and progressively to enlarge its activities? The poverty of the Institute, it should be remembered, is due solely to its overwhelming success as an institution of learning. Enough has been bestowed upon it to have fairly

endowed a small institution of the second class, an ordinary college. The reason why its needs are so pressing is because it has become one of the largest institutions of the first class. Its needs are so great because it is itself so much needed.

The Graduating Class.

The school year of 1892–93 closed fortunately, on the 30th of May. Of the 129 graduating members of the class of '93, 25 graduated in Civil Engineering, 30 in Mechanical Engineering, 5 in Mining Engineering, 2 in Architecture, 8 in Chemistry, 41 in Electrical Engineering, 2 in Biology, 8 in Chemical Engineering, 2 in Geology, while 6 graduated from the department of General Studies.

The Entering Class.

The new year has witnessed a large increase in the numbers of the students in the school. The registration of this year, as by the catalogue now in press, amounts to 1,157, against 1,060 twelve months ago, a gain of 97. The following table exhibits the number of students in the school each year, from the opening of the Institute to the present time: —

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

Students by Classes.

The aggregate number of students for 1893–94 is divided among the several classes as follows:—

Graduate students, candidates for advanced degrees	2
Regular students, Fourth Year	146
" " Third "	158
" " Second "	207
" " First "	310
Special students	334
Total	1,157

Comparison with the corresponding figures of last year shows that there has been an increase among the regular students in the fourth year of 8, in the third year of 14, in the second year of 32, and among the special students of 48. There has been a decrease of 1 among the graduate students, candidates for advanced degrees, and of 4 in the regular students of the first year.

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

Class.	Regular.	Special.	Total.
Graduates of the M. I. T., candidates for advanced degrees	2		2
Fourth Year	146	49	195
Third Year	158	81	239
Second Year	207	168	375
First Year	310	36	346
Total	823	334	1,157

Statistics of Examinations.

Of the 1,157 students of the present year, 456 were not connected with the school in 1892–93; 25 had been connected with the Institute at some previous time, and returned to

resume their places in the school; 42 were admitted provisionally without examination; 25 were admitted by examination as special students; 80 were admitted on the presentation of diplomas or certificates from other institutions.

Excluding from consideration those who were admitted but have not in fact entered the school, 68 in number, the following was the final result of the examinations held in June and September: —

Admitted clear	191	
" on one condition	53	
" on two conditions	29	
" on three conditions	11	
		284
Rejected		44
		328

Examinations at Distant Points.

In addition to the entrance examinations held at Boston in June and September, examinations were also conducted in June at Belmont (Cal.), Chicago, Cincinnati, Cleveland, Denver, Detroit, Easthampton (Mass.), Exeter (N. H.), Montreal, New York, Philadelphia, Pittsburgh, Poughkeepsie, St. Louis, St. Paul, Toronto, and Washington.

Residence of Students.

Forty States of the Union, besides the District of Columbia and the Territories of Utah and New Mexico, are represented on our list of students. Of the total number of 1,157, 665 are from Massachusetts, or 57.5% of the whole; 136 are from other New England States; 356 are from outside New England, of whom 31 are from foreign countries.

The following table shows the number of students of each specified class, from each State or foreign country :—

States.	Candidates for Advanced Degrees.	Fourth Year.	Third Year.	Second Year.	First Year.	All Regular Students.	Special Students.	Total.
Alabama				1		1	1	2
Arkansas		1				1		1
California		2	4	2		8	7	15
Colorado		1	2			4	1	5
Connecticut		6	4	5	9	24	6	30
Delaware		1		1	2	4		4
Dist. Columbia		2		2	1	5	2	7
Florida			1	1		2	1	3
Georgia							3	3
Idaho		1						1
Illinois		5	3	12	8	28	11	39
Indiana		3	1		1	5	1	6
Iowa		2	4	1	1	8	5	13
Kansas							1	1
Kentucky		2	1	1	3	7	4	11
Louisiana							3	3
Maine		3	5	6	10	24	12	36
Maryland				1		1	3	4
Massachusetts	2	80	91	123	199	495	170	665
Michigan			1	1	2	4	3	7
Minnesota		4	3	1	2	10	1	11
Missouri		1	1	3	4	9	8	17
Montana					2	2		2
Nebraska			2	1		3		3
Nevada		1				1	1	2
N. Hampshire		5	5	8	10	28	4	32
New Jersey		1				1	5	6
New Mexico			1	1		2		2
New York		6	6	11	15	38	14	52
Ohio		3	5	7	9	24	21	45
Oregon							1	1
Pennsylvania		4	7	5	10	26	5	31
Rhode Island		4	7	3	9	23	10	33
South Carolina		1		1		2	1	3
Tennessee							1	1
Texas					3	3	3	6
Utah							2	2
Vermont					2	2	3	5
Virginia							3	3
Washington							1	1
West Virginia		1				1		1
Wisconsin		1		3	2	6	5	11
Foreign Countries.								
Belgium				1		1		1
Bulgaria		1				1		1
Cent'l America		1				1		1
Cuba					1	1		1
England		1				1		1
France							1	1
Germany				1		1	1	2
Hawaiian Isl'ds							2	2
Holland			2			2		2
Ireland			1			1		1
Japan					1	1		1
Mexico							1	1
N. Brunswick			1			1		1
New So. Wales							1	1
Ontario					3	3	1	4
Porto Rico							1	1
Quebec		1		1	3	5		5
Scotland		1				1	1	2
Spain							1	1
Venezuela							1	1
Total	2	146	158	207	310	823	334	1,157

A table showing the number of students in each year from and including 1887, coming from each State or Territory and from each foreign country, may not be without interest and instruction: —

States.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
Alabama	..	..	1	..	2	4	2
Arkansas	3	2	2	3	3	2	1
California	9	13	10	14	19	14	15
Colorado	2	2	6	4	7	7	5
Connecticut	29	28	36	31	30	27	30
Delaware	..	..	..	1	..	2	4
Dist. of Columbia	4	9	9	7	4	4	7
Florida	..	..	2	3	3	4	3
Georgia	2	1	1	2	2	3	3
Idaho	..	..	..	..	1	1	1
Illinois	29	37	33	34	32	40	39
Indiana	..	1	3	6	3	5	6
Iowa	3	6	4	9	10	10	13
Kansas	..	..	..	2	2	1	1
Kentucky	2	3	4	4	8	7	11
Louisiana	..	2	4	8	5	2	3
Maine	24	26	30	29	27	39	36
Maryland	2	4	4	7	7	6	4
Massachusetts	429	494	533	517	565	603	665
Michigan	10	12	13	16	13	10	7
Minnesota	6	8	10	12	13	13	11
Missouri	5	7	8	8	12	13	17
Montana	..	..	..	1	..	..	2
Nebraska	4	2	1	1	1	4	3
Nevada	..	..	..	1	3	3	2
New Hampshire	19	24	21	23	24	29	32
New Jersey	11	8	13	11	16	11	6
New Mexico	..	2	..	..	1	2	2
New York	35	31	25	40	40	50	52
North Carolina	..	1	2	1	1	1	..
Ohio	21	23	35	33	33	39	45
Oregon	..	1	2	1	1	2	1
Pennsylvania	18	18	23	22	26	25	31
Rhode Island	19	22	22	21	26	24	33
South Carolina	1	1	1	2	4	1	3
South Dakota	1	1	1	..	..	..	..
Tennessee	2	3	5	3	4	1	1
Texas	1	2	..	1	2	5	6
Utah	..	..	..	..	..	1	2
Vermont	7	5	4	4	5	4	5
Virginia	5	4	6	5	6	4	3
Washington	1	..	2	2	3	3	1
West Virginia	..	..	2	2	2	2	1
Wisconsin	5	7	9	10	7	9	11
Wyoming	..	1	..	..	..	..	..
Foreign Countries.							
Argentine Rep.	..	..	..	2	..	..	..
Belgium	..	..	..	..	..	1	1
Brazil	1	2	2	2	4	..	..
Bulgaria	..	..	1	1	1	1	1
Central America	..	..	..	..	1	1	1
Colombia	..	..	1	..	2	..	..
Cuba	..	..	..	..	..	..	1
England	..	..	..	2	1	1	1
France	..	..	1	1	1	1	1
Germany	..	..	..	..	..	..	2
Greece	..	1	..	..	..	..	..
Guatemala	1	1	1	..	..	1	..
Hawaiian Islands	..	1	1	4	4	2	2
Holland	..	..	..	..	2	2	2
Ireland	1	1	1	1	..	..	1
Japan	1	..	1	4	3	1	1
Mexico	..	..	1	1	1	1	1
New Brunswick	..	1	1	1	2	1	1
New South Wales	..	..	..	..	1	1	1
Nova Scotia	..	..	2	2	1	..	..
Ontario	1	2	1	1	2	2	4
Peru	1	2	1	3	1	..	..
Porto Rico	1	2	2	2	1	..	1
Quebec	2	1	1	4	4	5	5
Scotland	..	1	1	3	2	1	2
Spain	..	..	..	..	..	1	1
Trinidad	1	1	1	1	1	..	..
Turkey	1	1	2	1	2	1	..
Venezuela	..	..	..	..	1	..	1
Total	720	827	909	937	1,011	1,060	1,157

Residence of Massachusetts Students.

It has been said that 57.5 per cent of our students are from Massachusetts. All the counties of the State, except the small counties of Dukes and Nantucket, send students to the Institute. One hundred and fifteen cities and towns are borne on the lists, one more than last year. The first

column of the following table shows the number of cities and towns in each county sending pupils to the Institute; the second column gives the aggregate number from each county. It appears that Suffolk sends 201 and Middlesex 192 pupils; Essex comes third, with 81; Norfolk fourth, with 78.

County.	No. of Towns.	No. of Students.	County.	No. of Towns.	No. of Students.
Barnstable . . .	4	7	Hampshire . . .	3	3
Berkshire . . .	5	13	Middlesex . . .	30	192
Bristol	6	21	Norfolk	17	78
Essex	17	81	Plymouth . . .	12	35
Franklin	4	6	Suffolk	4	201
Hampden . . .	5	14	Worcester . . .	8	14
Total	41	142	Total	115	665

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

Boston	186	Springfield . .	9	Gloucester . . .	5
Newton	30	Watertown . .	8	Medford . . .	5
Cambridge . .	29	Brockton . . .	7	Rockland . . .	5
Brookline . . .	25	Melrose . . .	7	Weymouth . .	5
Newburyport . .	19	Pittsfield . . .	7	Arlington . . .	4
Lynn	16	Plymouth . . .	7	Barnstable . . .	4
Somerville . . .	14	Reading . . .	7	Concord . . .	4
Hyde Park . .	13	Salem	7	Danvers . . .	4
Lowell	13	Taunton . . .	7	Dedham . . .	4
Chelsea	12	Wakefield . . .	7	Fitchburg . . .	4
Waltham . . .	12	Andover . . .	6	Mansfield . . .	4
Framingham . .	11	Natick	6	Marlboro' . . .	4
Lawrence . . .	10	New Bedford . .	6	Wellesley . . .	4
Malden	9	Quincy	6		

The following table exhibits, for ten years, the distribution of the total number of students among two classes: first, those students whose names are found upon the catalogue of the year preceding; and secondly, those students whose names appear as new names 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.
1884–85	579	311	268	186	82
1885–86	609	369	240	177	63
1886–87	637	379	258	190	68
1887–88	720	396	324	229	95
1888–89	827	465	362	245	117
1889–90	909	557	352	255	97
1890–91	937	572	365	234	131
1891–92	1,011	624	387	258	129
1892–93	1,060	618	442	303	139
1893–94	1,157	701	456	301 *	155

It appears from the foregoing that the number of students remaining over from last year to this has been increased by eighty-three, while the number registered for the first time is larger by fourteen, making the total increase, as stated, ninety-seven. The effect of the hard times has therefore been, not to decrease, but rather largely to increase, the attendance at the Institute. This is all the more remarkable in view of the large number of technical schools springing up all over the land, and of technical departments newly added to many of the old-fashioned colleges and universities.

Ages of Students on Entrance.

The next table exhibits the ages of our students upon entrance, after taking out those who are repeating the first year, and seventeen of unusual ages. These deductions leave two hundred and eighty-four as the number of students whose ages have been made the subject of computation. The results appear in the following table, in comparison with the corresponding results of 1892–93.

* In addition nine students are repeating the first year.

Period of Life.	1892–93.		1893–94.	
	Half-year Groups.	Yearly Groups.	Half-year Groups.	Yearly Groups.
16 to 16½ years	3	–	1	–
16½ to 17 "	5	8	2	3
17 to 17½ "	18	–	23	–
17½ to 18 "	36	54	56	79
18 to 18½ "	49	–	48	–
18½ to 19 "	55	104	47	95
19 to 19½ "	58	–	51	–
19½ to 20 "	32	90	30	81
20 to 20½ "	25	–	9	–
20½ to 21 "	7	32	9	18
21 to 22 "	9	9	8	8
	297	297	284	284

From the foregoing tables it appears that the average age of the two hundred and eighty-four students taken for this comparison is eighteen years, nine months, or one month less than last year.

In this connection it may be interesting to note the ages at graduation of the class leaving us in May. The one hundred and twenty-nine members of the class were distributed among the several periods of life as follows: —

Under 20	1
Between 20 and 20½	3
" 20½ and 21	8
" 21 and 21½	14
" 21½ and 22	34
" 22 and 23	38
" 23 and 24	14
24 and over	17
	129

Proportion of Regular and of Special Students.

The following table exhibits both the absolute number of regular and of special students, as by the catalogue of each

successive year since 1882, and the proportion existing between these two classes:—

Year.	No. of Regular Students.	No. of Special Students.	Total No. of Students.	Percentage.	
				Regular.	Special.
1882-83 . . .	219	149	368	60	40
1883-84 . . .	272	171	443	61	39
1884-85 . . .	368	211	579	64	36
1885-86 . . .	415	194	609	68	32
1886-87 . . .	442	195	637	69	31
1887-88 . . .	520	200	720	72	28
1888-89 . . .	590	237	827	71	29
1889-90 . . .	652	257	909	72	28
1890-91 . . .	658	279	937	70	30
1891-92 . . .	706	305	1,011	70	30
1892-93 . . .	774	286	1,060	73	27
1893-94 . . .	823	334	1,157	71	29

Women as Students at the Institute.

The number of women pursuing courses with us is forty-six as against forty-one last year. Of this number, eight are graduates of colleges. Of the total number, two are regular students of the fourth year; three of the third year; four of the second year. Thirty-seven are special students. Of the nine regular students of the upper classes, five take Course IV., Architecture; one, Course VII., Natural History; two, Course VIII., Physics; one, Course XII., Geology. Of the special students, two devote themselves to Architecture; six to Chemistry; four to Physics; nineteen chiefly to Biology and allied subjects; and six to English, History, or Political Science.

Graduates of Other Colleges.

The number of students who are graduates from this and other institutions shows a very marked and gratifying increase over last year. Seventy-nine graduates of institutions conferring degrees are now included in our list of students. Of these, eleven are our own graduates, of whom two are pursuing studies as candidates for advanced degrees; sixty-nine are

graduates of other institutions, pursuing courses of study with us, either as regular or as special students. One of these is also a graduate of the Institute. Nineteen are graduates of Harvard University; four of Yale University; and three each of Williams and Smith Colleges; two each of Johns Hopkins University, the University of Minnesota, and Iowa Agricultural College; while the following institutions, universities or colleges, are represented on our list by a single graduate each, — Trinity College (Dublin), Drake University, Vassar, Brown, Dartmouth, Georgetown, Göttingen, Kenyon, Holy Cross, Pennsylvania State College, Smith, Charleston, Caracas, Cornell, Delaware, Michigan State Agricultural College, Chicago, Havana, Straight, Iowa State College, Harvard Annex, University of the city of New York, North Western University, Bowdoin, Centre, Lafayette, Marietta, Oberlin, Ogden, Robert, Wellesley, The Michigan Mining School, The National Institute, and Worcester Polytechnic.

The candidates for advanced degrees are Messrs. J. A. Meyer, Jr., of the class of 1891, in Architecture, and F. H. Fay of the class of 1893, in Civil Engineering. Messrs. W. W. Carter and H. L. Clapp of the last graduating class, in Chemical Engineering, and Mr. N. R. Craighill of the same class, in Mechanical Engineering, have returned to take an additional year of study as candidates for the bachelor's degree in Electrical Engineering. Mr. G. W. Stose of the class of 1893, in Civil Engineering, is a candidate for the degree in Geology. Messrs. C. H. Alden, Jr., of the class of 1890, H. B. Clement of the class of 1891, P. A. Hopkins and G. H. Ingraham of the class of 1892, have returned for special advanced work in Architecture. Mr. R. Selfridge, of the class of 1892, in General Studies, is also a special student in Architecture.

Of the seventy-seven, not candidates for advanced degrees, thirty-eight are regular students, — namely, thirteen in the fourth year; thirteen in the third year; nine in the second year; three in the first year; the remaining thirty-nine are special students. Of the thirty-five graduates who

are regular students in the three upper classes, five take Civil Engineering; one, Mining Engineering; three, Mechanical Engineering; eleven, Architecture; two, Chemistry; thirteen, Electrical Engineering.

The Courses of Instruction.

The following table presents the numbers of the regular students in the third and fourth 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.
4th Year Class .	23	31	4	16	12	35	1	3	5	13	3	..	..	146
3d " " .	22	37	6	14	13	38	1	3	5	10	3	2	4	158
2d " " .	33	29	12	20	14	68	2	4	9	8	4	..	4	207
Total . . .	78	97	22	50	39	141	4	10	19	31	10	2	8	511

The following table shows the figures of the total line in the foregoing table, in comparison with the corresponding figures for the next nine 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.
1884	29	54	28	9	20	30	1	1	3	..	..	..	..	175
1885	44	74	26	10	23	41	4	1	8	..	..	..	..	228
1886	45	75	19	13	24	52	4	2	5	..	..	..	..	242
1887	50	89	16	18	23	61	5	6	14	..	..	..	..	282
1888	71	100	12	21	28	74	4	5	12	11	..	..	..	338
1889	79	99	14	30	29	91	9	5	12	14	6	..	..	388
1890	79	95	18	27	27	105	11	4	13	18	7	3	..	407
1891	81	104	17	33	23	108	11	5	19	28	9	3	..	441
1892	76	106	19	37	35	112	9	5	16	34	5	3	..	457
1893	78	97	22	50	39	141	4	10	19	31	10	2	8	511

It will appear from the foregoing table that the course in Electrical Engineering remains the largest of the courses of the school. The courses in Mechanical and Civil Engineering follow in the order in which I name them. These three courses together embrace three hundred and sixteen of the five hundred and eleven regular students candidates for the degree in the three upper classes. In the case of Course IV., Architecture, the number of regular students fails to measure the importance of the department to the school, inasmuch as that course embraces a considerable number of college graduates and of young men who have had experience as draughtsmen and assistants in architects' offices, who are allowed to enter the department as special students, to get as nearly as possible what they require without passing through the full course. Thus, the number of special students in Architecture in the three upper classes the present year is sixty-nine, which, added to the fifty regular students, makes the total number one hundred and nineteen. The Chemical and Biological courses also contain considerable numbers of special students, often of advanced grade, some of them teachers or persons who have been engaged in professional practice. I repeat my remark of last year, that in regard to the courses having a very small number of students, the figures above do not fairly represent the real importance of these courses to the Institute. Thus, the Physics course, being a pure science course, has never had, and is not expected to have, a large number of students. Yet that course has always been a power for good in the Institute; some of our strongest men have graduated from it; and the influence of the instruction given in it has always had a great effect upon the technical courses of the school.

The following table exhibits the number of persons who have graduated within each of the several courses at each succeeding year since the first diplomas were conferred: —

Year.	Civil Engineering.	Mechanical Engineering.	Mining Engineering.	Architecture.	Chemistry.	Metallurgy.	Electrical Engineering.	Natural History or Biology.	Physics.	General Course.	Chemical Engineering.	Sanitary Engineering.	Geology.	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	6	6	1	1	..	..	..	1	2	..	..	..	27
1876	12	9	7	..	5	1	..	2	3	4	..	..	..	43
1877	12	6	8	4	2	..	..	..	..	..	..	..	..	32
1878	8	2	2	3	3	..	..	..	..	1	..	..	..	19
1879	6	8	3	1	3	..	..	1	1	..	..	..	..	23
1880	3	..	3	..	1	..	..	..	..	1	..	..	..	8
1881	3	5	6	3	8	..	..	1	..	2	..	..	..	28
1882	2	5	5	3	6	..	..	1	1	1	..	..	..	24
1883	3	7	5	1	3	..	..	..	..	..	..	..	..	19
1884	5	6	13	..	12	..	..	..	..	..	..	..	..	36
1885	4	6	8	2	4	..	2	..	..	1	..	..	..	27
1886	9	23	7	1	7	..	10	1	..	1	..	..	..	59
1887	10	17	8	1	9	..	8	1	1	3	..	..	..	58
1888	11	25	4	5	10	..	17	3	1	1	..	..	..	77
1889	15	23	5	3	8	..	17	1	1	2	..	..	..	75
1890	25	27	3	5	13	..	18	3	2	6	..	..	..	102
1891	17	26	4	6	11	..	23	3	3	1	7	..	1	102
1892	22	26	4	12	7	..	36	6	1	7	4	6	1	132
1893	25	30	5	2	8	..	41	2	..	6	8	..	2	129
Total	247	271	128	55	135	1	172	25	15	44	19	6	4	1,122
Deduct names counted twice														5
Net total														1,117

The Earlier Choice of Courses.

I spoke in my last Annual Report of a very important change in the policy of the school, by which the students were to make choice of their courses at the opening of the first term of the first year, instead of at the opening of the second year; and I there gave the grounds upon which it was anticipated that benefit would result to the students and to the school from this new departure. I am now able to report,

after the trial of a single year, that the system is beyond doubt successful, although greater benefit will probably be realized from it the coming year than during the year in which it was first put into operation, and that with comparatively little preparation.

Classification of Special Students.

Our special students, of course, cannot be classified systematically, but the following table exhibits the number of such students pursuing each particular branch of study: —

Applied Mechanics	56	History	94
Architecture	69	Language	164
Biology	35	Mathematics	191
Chemistry	118	Mechanical Engineering	83
Civil Engineering	39	Mining Engineering	15
Drawing	171	Physics	174
Electrical Engineering	36	Political Science	54
English	120	Shopwork	75
Geology	34		

It may be of interest to note the number of students, either regular or special, pursuing certain leading branches of study, in each of the four years, as follows: —

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.
Mathematics	345	289	168	55	857
Chemistry	381	77	57	36	551
English	331	266	17	17	631
French	240	76	38	16	370
Physics	..	316	216	77	609
German	65	213	125	7	410
Shopwork	14	142	50	46	252

Classes from the Boston Normal School of Gymnastics.

Toward the close of the last school year, as the result of negotiations between the Executive Committee of the Institute and Mrs. Mary Hemenway, whose large philanthropic

plans have embraced the maintenance of a normal school in Boston for the training of teachers to have charge of instruction in physical culture, an agreement was entered into by which the pupils in both years of the school referred to are to receive their instruction in Physics, Chemistry, and Biology, as special students in the Institute of Technology. These students, who number in all fifty-two, are, however, not embraced in the catalogue of the Institute; nor are they included in the statistics of attendance, etc., which I have already given. The instruction of these classes in Physics has been committed to Mr. Derr; Mr. Bardwell conducts the classes in Chemistry; while Professor Sedgwick and Dr. Hough have charge of their work in the Biological Laboratory. It is believed that by this arrangement, which is necessarily of a temporary character, the Institute will both confer and receive benefit.

Five-Year Courses.

The number of students in the five-year courses is shown in the following table, with their distribution by years and by courses: —

Year.	Total.	Course.										
		I.	II.	III.	IV.	VI.	VII.	IX.	X.	XI.	XII.	Course. Undetermined.
First . . .	9	..	..	..	..	..	..	..	..	..	..	9
Second . . .	14	4	2	1	..	4	..	2	..	1	..	..
Third . . .	10	..	3	1	1	3	1	..	..	..	1	..
Fourth . . .	9	1	2	..	3	..	..	..	2	1	..	..
Fifth . . .	7	..	2	..	4	1	..	..	..	..	..	..
	49	5	9	2	8	8	1	2	2	2	1	9

Changes in the Faculty and in the Corps of Instructors.

Last year I announced the loss of two members of the Faculty,— one, Professor Létang, by death; the other, Professor Luquiens, by resignation. This year it is my painful duty to report the loss of three members of the Faculty, — one by death and two by resignation.

On the 26th of April, 1893, Prof. Lewis M. Norton, in charge of the department of Industrial Chemistry and of the course in Chemical Engineering, died, after a brief illness, of pneumonia, at his home in Auburndale. Professor Norton's death constitutes one of the severest blows which the Institute has ever sustained. A chemist of reputation and experience, he was pre-eminently a teacher; and research and practice had for him their chief value as they enabled him to build up new courses of technical instruction in the school.

Dr. Norton was an assistant at the Institute from 1875 to 1877; during the two following years he studied abroad, taking his doctor's degree in Göttingen in 1879. For the three years next succeeding he was chief chemist in one of the largest manufacturing works of New England, but gladly availed himself of a call to the Institute as an instructor, in 1882. The following year he became Assistant Professor, and in 1885, Associate Professor, having charge of the laboratories both of organic and of industrial chemistry. Of the latter charge he was relieved in 1891, being thus enabled to concentrate his energies upon his chosen field of industrial chemistry, in which he soon gained a degree of success which has only been surpassed in a few of the older institutions of Europe. Between 1886 and 1888, Professor Norton rendered an inexpressible service to the Institute of Technology and to the general cause of technical instruction in the United States by proposing and arranging a new course of instruction, appropriately termed Chemical Engineering, which was, after long discussion and deliberation, adopted by the Faculty and opened to students in 1888. To the development of this

course Professor Norton applied himself with unwearying attention, so that at the time of his lamented death he had brought it to rank with the most highly organized, best integrated and most efficient courses of instruction in our school.

For the work of conducting the two courses with which he was thus strongly associated, — namely, Industrial Chemistry (the application of chemistry to manufactures), and Chemical Engineering (the application of mechanical engineering to the problems of the chemical manufactures), — Professor Norton had pre-eminent qualifications, so much so that since his death the name of no single person in this country has suggested itself to the Faculty as that of a full and competent successor. As a chemist conducting investigations of a purely scientific character, he had his superiors; but in the qualifications for building up and conducting the two courses referred to, he was without a peer.

I should do injustice to the subject if I did not add a brief tribute to the sincerity, purity, earnestness, and kindliness of Professor Norton's character, his deep devotion to the Institute, and his unflagging interest in the welfare of all the students under his charge. Indeed, his interest in our students was not limited by the bounds of his own courses. For several years he had practically the entire charge of the subject of free scholarships at the Institute; and in the discharge of this difficult duty he took the greatest care and pains. He personally knew every student in the school who was an applicant for a scholarship, and entered deeply into the needs and feelings of every man who came to him for such a purpose. As a member of the Faculty Dr. Norton was earnest and zealous, punctilious without being narrow, progressive while yet holding strongly to all the best traditions of the Institute.

During the past summer Prof. Charles H. Levermore resigned the chair of History to accept the principalship of the Adelphi Academy in Brooklyn; and Prof. George R. Carpenter, in charge of the department of English, left us to

accept a professorship of Literature in Columbia College, New York. Professor Levermore came to us in 1888, from the University of California, and during the five years of his connection with the Institute has had a most distinguished career. A ripe historical scholar, a profound thinker, a teacher of rare powers and of great command over his pupils, his loss must be deeply felt in the immediate future of the school. Professor Carpenter came to us in 1890 from Harvard University, and during the three years of his stay here, built up an admirable system of instruction in English. Broad, liberal, and tolerant, a graceful scholar wholly devoid of intellectual snobbishness, deeply interested in the work he had undertaken, the results of his labors here will not be lost, though we may lament that he is no longer personally to carry out the excellent system he had inaugurated.

No attempt has as yet been made to fill Dr. Norton's place in the Faculty. Professor Drown has for the year assumed the charge of the instruction before given by Professor Norton; Dr. Frank H. Thorp has been appointed instructor in Industrial Chemistry, and will enter upon the discharge of his duties at the beginning of the second term; and a considerable number of highly experienced lecturers have been secured to give courses in their respective specialties.

Professor Levermore's chair has also been left vacant for the year, owing to the lateness of the time at which his resignation was received. Assistant Professor Currier assumed the charge of the instruction in History at the opening of the year, and has shown excellent capacity in the emergency thus created. An additional instructor, Dr. Edson L. Whitney, of Harvard University, has been appointed; and it has been sought by means of distinguished lecturers, called in from the outside, to prevent the instruction in this important department from suffering through the departure of Professor Levermore. Mr. John Fiske is now delivering an inspiring course of lectures upon Early American History to the students of the second year; Mr. A. Lawrence Lowell, of Boston, is to

give in the second term a course on the Political Institutions of Europe to the students of the first year; and Prof. John F. Jameson, of Brown University, is in the same term to conduct a course on Advanced Constitutional History, for the benefit of the classes in Course IX. I esteem the Institute fortunate in that, through the arrangements thus described, we shall be able the present year to keep our instruction in History on a high plane.

There has been less delay in filling the chair left vacant by Professor Carpenter's resignation, Mr. Arlo Bates having, to our great satisfaction, accepted the position of Professor of English. Professor Bates entered upon his new duties in September. The Faculty are to be congratulated upon the accession of a colleague so widely and variously accomplished. The Corporation may feel assured that his high abilities, his long and thorough training in journalism and in literary work, and his earnest devotion to the task he has undertaken will command complete success.

The Corps of Instructors.

The catalogue of 1893–94 shows the number of instructors of all grades to be one hundred and seventeen, 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 one hundred and forty-four. The following table shows the distribution among the several classes of instructors, with the gain or loss since last year:—

	1892–93.	1893–94.
Professors	16	19
Associate Professors	11	6
Assistant Professors	11	14
Instructors	41	52
Assistants	30	26
Lecturers	16	27
Total	125	144

The instructing staff for the year 1893–94 is distributed as follows among the several departments of the school:—

	Civil Engineering.	Mechanical Eng. and App. Mechanics.	Mining Engineering and Metallurgy.	Naval Architecture.	Architecture.	Chemistry.	Physics and Electrical Engineering.	Biology, Zoölogy, Etc.	Mineralogy, Geology, and Geography.	English History and Political Science.	Language.	Mathematics.	Drawing and Descriptive Geometry.	Mechanic Arts.	Military Tactics.
Professors . . . . (19)	1	1	1	1	1	2	2	1	1	2	1	4	..	..	1
Associate Professors . (6)	3	1	1	..	1	..	..	..	..	..	..	..	..	..	..
Assistant Professors . (14)	..	3	..	..	1	2	1	..	1	1	2	2	1	..	..
Instructors . . . . . (52)	2	3	1	1	1	12	8	2	1	4	4	7	3	3	..
Assistants . . . . . (26)	4	8	..	..	1	4	1	1	1	..	..	..	3	3	..
Total . . . . (117)	10	16	3	2	5	20	12	4	4	7	7	13	7	6	1
Lecturers . . . . . (27)	1	..	1	..	4	8	5	3	..	5	..	..	..	..	..
Total . . . . (144)	11	16	4	2	9	28	17	7	4	12	7	13	7	6	1

The accession of Mr. Meyer to the Modern Language Department has allowed a certain reduction to be effected in the size of the class-sections and a certain increase of optional advanced work. The sections of this department are, however, too large, and it is greatly to be desired that the instructing staff should be still further increased. Assistant Professor Vogel is this year on a leave of absence pursuing studies at the University of Heidelberg. If, on his return, it should be found practicable to retain the present body of teachers entire, we shall be able to add greatly to the usefulness of our Modern Language Department, especially on the German side.

The library of the department has been increased during the year by some accessions, notably that of the great German Encyclopædia of Ersch and Gruber, which numbers

one hundred and forty volumes already published, and that of the Century Dictionary; but many more works are needed to furnish both teachers and students with the best books of reference in French, German, Italian, and Spanish; and it is hoped that the financial means of the Institute may soon allow a considerable increase of the sum assigned to this object.

A gratifying sign of the increased interest of the students in the study of modern languages the present year has been the formation of a French society, which has already taken a strong hold upon its large membership, and promises to be very useful in giving opportunities for practice in speaking. So successful has been this society that a similar organization is now forming among the students of German. In the regular school exercises in the French language an effort has been made during the year on which I am now reporting to give the students, besides facility in translation, a better foundation in grammar and larger opportunities for hearing the spoken language. Questions have been asked and answered in French to a greater extent than ever before; and these efforts on the part of the teachers have generally received a cordial response from the pupils. This procedure calls for much more activity on the part of the teacher, and makes it increasingly desirable to obtain a further subdivision of the sections. In German the progress of the work of instruction has been even more satisfactory, by reason of the fact that the students of this language — that is, with the exception of four out of eighteen sections — begin this study at the Institute; and therefore all are from the outset taught in the same way, and well taught, whereas in French all the students, with the exception of the four sections referred to, have had their preliminary French training in a great variety of schools, according to a great variety of methods, and not infrequently with teachers not of the highest accomplishments.

It is gratifying to feel assured that within the immediate future we may look for a marked improvement of our modern

language instruction at the Institute, not merely through our own efforts, but also through marked advances to be made in the preparatory schools. The movement for the improvement of the secondary schools of the United States, the high schools and endowed academies, which was inaugurated a few years ago by the National Association of School Superintendents, and to which President Eliot of Harvard University has largely contributed, seems destined to produce early results of high value, bringing pupils to the colleges and technical schools much more fully and more thoroughly prepared. Professor van Daell has been a member of the Committee on Modern Languages dealing with this subject.

Perhaps the most interesting thing in connection with the English Department is the success of the experiment of co-operation, whereby the technical essays and memoirs of the scientific courses come to the instructors in English for criticism of diction and form. This method of work is found to have many advantages. It leaves the heads of the several departments free to lay all their stress upon the technical criticism which they alone are qualified to give; it enforces the absolute necessity of correct language and clearness of style for exact scientific statement; while it gives to the student an opportunity of testing practically his command of accuracy of expression in the line of his especial branch, and keeps distinct in his mind the difference between criticism of his scientific knowledge and of his manner of expressing it. Under this system, students take more pains in preparing their technical papers, with the obvious result that they gain not only facility and clearness of expression, but accuracy and sharpness of thought as well.

The most important change in the Mathematical Department has been the rearrangement of the general courses consequent upon the advance in entrance requirements referred to in the last Annual Report. The time assigned to first-year Mathematics has heretofore included in the first term sixty hours of recitations and one hundred and twenty of preparation, equally divided between Algebra

and Geometry, while in the second term seventy hours of exercise and one hundred and forty of preparation have been devoted to Plane and Spherical Trigonometry. By the new requirements, either Algebra or Solid Geometry must be presented for admission. In utilizing the time thus left free, the department has been able to effect a long-desired rearrangement of the general mathematical work, which has heretofore extended to the middle of the third year in all engineering courses. The time gained, with the omission (except from Course I.) of Spherical Trigonometry, renders it possible to transfer Analytic Geometry from the second year to the first, and, so far as can now be anticipated, Integral Calculus from the third year to the second. The engineering students will thus acquire by the end of the second year all the mathematical preparation essential for their work in Applied Mechanics and the various technical subjects dependent upon Calculus.

It is probable also that a part of the time set free in the third year may in several of the departments be devoted to a course in Solid Analytic Geometry, — a subject of obvious importance, which has heretofore been offered only to students in the course in Physics. The changes outlined above permit an increase in the time heretofore available for the brief course in Analytic Geometry taken by students in Biology and in General Studies, and also an important differentiation of the mathematical instruction offered to students in Chemistry, enabling them to finish by the middle of their second year briefer courses in Analytic Geometry and Calculus, in preparation for the study of Theoretical Chemistry. The department has been enabled, by a special appropriation, to place in its library a considerable number of the admirable models manufactured by Brill of Darmstadt.

Military Science and Tactics.

The greatest relative change in any department of the Institute is doubtless to be found in that of military science and tactics. Heretofore the time allotted has been employed almost exclusively in drill. Lieutenant Hawthorne has taken an enlarged view of his duties under the Act of Congress, July 2, 1862, which requires this class of instruction to be given in all colleges receiving aid from the general government. He believes that the time should not be used wholly in a continuation of high-school drill, but that a portion should be employed in giving the students a clear conception of the simple principles of the art of war and a knowledge of the military history of our own country; above all, a thorough acquaintance with the duties of company officers, regarding recruiting and the care of men, responsibility for stores, equipments, and supplies, the routine of camp, marches, and the necessary discipline of military life. In this view taken by Lieutenant Hawthorne, I heartily concur. If the graduates of the Institute of Technology should ever be called upon to put to use in their country's service the information and training which they have acquired in this department, it will be almost wholly as officers, called upon in an emergency to assist in bringing troops into the field, and providing for their early organization and discipline. This was the work for which the resources of the nation were most painfully inadequate in 1861; and the same difficulty would instantly recur should any international complications arise which required a general arming of our people. The theoretical part of Lieutenant Hawthorne's instruction also includes the nature and effect of the modern tactics, and a consideration of the steps in the development of the art of war which have led to them. It embraces a systematic study of the elements of minor tactics, the ballistics of the infantry weapon, and the influence of topography upon the movements of troops.

The military department has enjoyed a great advantage

through the courtesy of the Commonwealth in allowing the use of the South Armory for our drills. This transfer of the battalion from a small gymnasium to a hall having a length of several hundred feet has enabled our young men to accomplish far more, especially with the increased intervals required by the new tactics, than would otherwise have been possible. Our thanks are due to His Excellency Governor Russell, to Gen. Samuel Dalton, Adjutant and Inspector General of the Commonwealth, and to Colonel Matthews and the officers of the First Massachusetts Regiment.

With a carefully and judiciously administered system of excuses for students physically disqualified, the drill exercises of the first year become an excellent means of physical development and training. The arms in use are no longer the heavy, old-fashioned musket, but the cadet-rifle, as used at West Point. Lieutenant Hawthorne has all that appreciation of the physical development of the soldier which characterizes the modern officer, as compared with the officer of fifty or even twenty years ago. Gymnastics are now a regular part of the technical training of the soldier in every army; and personal "setting up" is quite as carefully looked after as perfection in the movement of the mass. Indeed, it may almost be said that there is no "mass" in modern war, and that the work of the individual is acquiring every year greater and greater importance. Lieutenant Hawthorne is carrying out his work in this spirit; and Mr. Boos, in the gymnasium proper, is cordially co-operating to give every student a chance for straightening himself and bringing out the possibilities of his form. Under such a regimen, I believe that drill at the Institute will have a constantly increasing value in the physical development of the first-year students. It is, however, essential, as was stated, that the system of excuses from military drill should be well conceived and judiciously administered. "One man's meat is another man's poison;" and exercises which are of profit to nineteen students might do harm to the twentieth. In this view the Faculty have appointed a standing committee on excuses

from military drill, to consider carefully every application for excuse, with a view to prevent any shirking on the one hand, and to avoid the danger of physical injury on the other.

The Libraries.

The problem of promoting the utmost use of books of reference, of scientific journals, manuals, and encyclopædias, has long received the attention of the Faculty of the Institute. It is believed that the result here reached represents the highest possible success in this particular. The Institute contains ten regular libraries, in addition to the collection of books in the Margaret Cheney room. Each of these libraries is in immediate connection with the department whose wants it is intended to supply. Each has its own card-catalogue, while a duplicate of every card is found in the office of the general librarian. Five of the libraries have their own special librarians; Mr. Andrews, the librarian in chief, takes personal charge of the chemical library; the remaining four are looked after by the professors of the departments concerned or by their assistants.

Such a disposition of our very valuable collections of course involves a certain amount of duplication, since the same book may be required for frequent use by more than one department. The amount of this duplication, however, is not large, being estimated by Mr. Andrews not to exceed two per cent. This system also involves a certain increase of labor and expense in the administration; but both these disadvantages are many times outweighed by the enormous advantage which comes from having the books subject to immediate consultation by the students. I do not think it would be an exaggeration to say that the use of books by our students is fourfold what it would be if the students were required to go to a large general library and take out the desired volumes with the formalities usual in such cases. With us, books are tools for handy use; just as much so as the apparatus of the chemical or physical laboratories. The

student steps from his desk into a room but a few feet away, looks through the shelves for the volume he requires, consults this for the, perhaps, single, small point concerned, and leaves it on the table to be returned to its place by the librarian in charge. Under such a system the students learn to use books with freedom; and I need not say to the Corporation that this is of itself no inconsiderable part of the education of a scholar.

But I should not do justice to the subject if I did not allude to what is, perhaps, the most striking result of our system, which is the loyalty and integrity of the students in the use of the privileges thus afforded them. Professor Cross has recently told me that during the ten years since his library was set up in the Walker Building, though during all that time until the beginning of the present year there was no one in charge of the shelves or the room, not a single highly valuable book has disappeared, while the losses of books of ordinary value have been so small as to come within the normal limits of accident or thoughtlessness, the aggregate losses of ten years being hardly worth considering. Moreover, during this long term, Professor Cross assures me he has never once had occasion to complain of boisterousness or disorder on the part of students who, in the main entirely unwatched, have used the room occupied as a library and reading-room. Another very noticeable instance of the care and fidelity of our students in the use of books has just come to light through the completion of the catalogue of the Geological Library. This library has, from and including 1889, received several large additions of rare and valuable books, chiefly through the generosity of Mrs. Rogers; but the onerous duties of the librarian have not allowed these collections to be catalogued until the last summer. Upon comparing the card-catalogue with the lists of books received during five years, there has been discovered only the most inconsiderable loss from all sources.

I have before adverted in other reports to the exception-

ally large periodical literature, in the sciences and in technology, received at the Institute. In 1887 a list of periodicals was prepared by the librarian. In connection with our exhibit at Chicago, a second edition of this list was printed. The new edition shows that the Institute is regularly receiving four hundred periodicals, exclusive of annuals or serials, and of official reports. Thirteen copies received are duplicates, leaving the total number of separate periodicals 387. Our list also contains 51 complete, and 42 incomplete sets of periodicals not now received, and also 78 annuals or serials, exclusive of official reports. The total number of separate publications appearing on the list is therefore 558.

The total accessions to the library for the year have been 5,150, of which 2,072 have been received as gifts or in exchange, 2,440 obtained by purchase, and 638 by binding periodicals and pamphlets. The net accessions have been 5,009, of which 3,607 are volumes, and 1,402 pamphlets. The distribution and cost, including binding, of these accessions, and the total number of volumes in each departmental library are shown in the following table: —

Library.	Vols. added.	Pphs. added.	Cost.	Pamphlets (bound and unbound) already catalogued.	Total No. of volumes.
General	474	293	$510.53	2,092	3,093
Engineering	764	435	1,325.35	2,106	4,547
Mining	111	36	216.57	183	1,276
Architectural	71	50	291.81	91	1,202
Chemical	362	144	643.23	1,114	5,423
Biological	164	23	233.75	206	1,423
Physical	541	82	842.30	334	3,845
Political Science	861	191	792.73	2,021	6,012
English	154	..	165.22	31	1,650
Geological	88	145	124.92	287	1,388
Margaret Cheney Room	17	3	..	11	560
Total	3,607	1,402	$5,146 41	8,476	30,419

The total number of pamphlets in the Institute is not less than twelve thousand.

Four thousand five hundred and seventy-five cards have been added during the year to the main catalogue, which now contains 27,682 cards, covering 30,350 volumes and 8,476 pamphlets. During the summer the Geological and Architectural Libraries have been catalogued. Nineteen hundred and thirty separate orders for books were given, and 182 were returned to the departments, because the books were already in the Institute or had been ordered for it. The saving of unnecessary duplication is shown by the fact that only twenty-six of these orders were repeated. Eight hundred and twenty-one orders for binding were given, covering 1,464 volumes, at a cost of $1,062.88. Besides an increased number of gifts of single books, the Institute has received from the Royal Institute of British Architects seventeen volumes of their Transactions, as far as possible completing our set; from the United States Coast and Geodetic Survey, one hundred and sixty maps; and from Professor Wells of the Institute, a set of his works.

Changes in Buildings and Grounds.

Although the Architectural Building is but a little more than a year old, the school again feels pressure for room at many points. We could to excellent effect use another building for additional recitation-rooms, library and reading-rooms, faculty-rooms, etc. We need not only a large room to be used as a faculty-room exclusively, but also several rooms in which groups of teachers giving instruction in the same lines might have opportunities for conference, for comparing marks, for keeping their records, and for consulting personally with students. We need, also, at least ten additional recitation-rooms for moderate-sized classes, both to avoid inconvenience through conflict of appointments, and to secure better ventilation. We also need one or two more large rooms in which the students may pass the intervals between recitations or lectures, studying their lessons, reading up their notes, etc.

But while our buildings have not been increased, the grounds of the Institute have been very greatly extended, if not in actual area, at least in the value which the new land represents. We should have been glad if the issue, whether certain parcels adjoining the Engineering and Architectural Buildings should be purchased by us or be allowed to become the property of others, could have been postponed for a few years, when peradventure our funds might have become more ample; but, unfortunately, this issue could not be postponed. During the past year it became evident that the Institute of Technology must either buy the skating-rink property, on Clarendon St., and the Jordan land lying between our property on Trinity Place and the Providence Railroad, or else be prepared to see both these pieces of real estate hopelessly lost. Such an issue having been fairly made, it became impossible that the government of the Institute should take more than one view of the question. It was not to be thought of that this great and growing school should be left without a square foot of land upon which it could build in future. It was in such a situation, and with such a sentiment, that the tracts in question, aggregating 50,000 square feet, were purchased, at a cost of about $277,000.

To an institution already so heavily loaded with burdens, almost beyond its strength to bear, the accession of such a body of indebtedness constitutes a painful and almost dangerous strain; yet the Institute of Technology ten years ago took up an even larger burden of debt, though then with a far smaller number of students, fewer graduates, and a much narrower sphere of influence and reputation. Nor has the treasury been left to bear this year's new burden altogether unrelieved. Two considerable sums have come to us by bequests from well-proved friends of the school, which, in their aggregate amount, when fully paid over, will provide a part of the cost of the new land. Had it been possible for us to avail ourselves of these benefactions for current expenses, our financial condition would have been greatly

improved. As it is, the school is poorer than ever before in its history, if we compare current receipts with necessary current expenditures.

Summer Schools.

The summer school in Topography, Geodesy, and Geology was held during the month of June near Keeseville, N. Y., in the northern part of the Adirondack region. This location was specially favorable for almost all branches of the work undertaken, and the school was in every respect the most successful that has been held. Twenty-two students were in attendance, — twenty being from the junior class, or more than one half the total number of students in the class in this course. The work was under the supervision of Professors Burton, Porter, and Niles, assisted by Mr. Robbins, and by Mr. G. A. Campbell of the class of 1891.

The topographical work consisted of a plane-table survey of about two square miles, including a complete hydrographic survey of Auger Lake. The contours were put in at vertical intervals of ten feet. The bottom of the lake was contoured at six feet intervals from the soundings. The geodetic work consisted in the measurement of a base-line one kilometer long, with triangulation to known coast-survey stations, by means of which latitude, longitude, and the elevations in the area surveyed were very accurately determined. The measurement of the base-line was made with the steel tape, with a probable error, in three measurements, of one part in 1,700,000. In this work the temperature of the tape was determined by a method never before successfully used; namely, by measurements of its electrical resistance. This part of the work was under the direction of Mr. Campbell, who devised a light and portable apparatus for measuring the resistance in the field. The hydraulic work consisted in measuring by various methods the discharge of the Au Sable River. Weir measurements of the discharge of Auger Lake were also made, as well as measurements in mill flumes.

Moreover, the lake afforded opportunity for rating the current meters. The work, therefore, was of an extremely varied character. The geological work consisted in making a geological profile, two miles long, and in studying the geology of the neighboring region, the field instruction being supplemented by lectures in the evening.

The Summer School of Metallurgy, last June, was arranged in connection with the World's Fair. The various metallurgical works in Chicago and the Exposition were visited on alternate days. The School is particularly indebted to the following gentlemen: —

A. Eilers and F. B. F. Rhodes, of the National Smelting & Refining Co. of Chicago;

R. Forsyth, E. A. S. Clark, and Jasper Whiting, of the Illinois Steel Co.;

Otis T. Stantial, of the Illinois Malleable Iron Co.;

E. F. Eurich and R. H. Colby, of the Chicago and Aurora Smelting & Refining Co.;

H. L. Bridgman, of the Chicago Copper Refining Co.;

John L. Shortall, Frank Wells, Solomon Sturges, and F. W. Clark, of the Northwestern Association.

Courses I. and XI. Civil and Sanitary Engineering. — The permanent staff of instruction in the Civil Engineering Department of the Institute is the same as last year, except that Mr. A. G. Robbins, for several years Instructor in Civil Engineering, has been appointed Instructor in Highway Engineering, in place of Mr. F. E. Foss, who has been called to the chair of Civil Engineering in the State College of Pennsylvania.

No important changes have been made in the course of study during the year; but increased attention is being given to certain branches. A room has been engaged on Myrtle Street (Beacon Hill) especially for geodetic work, consisting of magnetic and astronomical observations, pendulum observations, etc. This location, besides being on natural ground, is but slightly affected by electric currents. A great need, in this branch of instruction, is a separate building in some

suitable locality, devoted to geodetic observations, which would enable the department to increase still further the efficiency of the instruction in this branch.

Special lectures in the department of Civil Engineering were given during the past year by Mr. Eliot Holbrook, on Railway Maintenance; by Mr. J. R. Freeman, on the Hydraulics of Fire Protection; by Col. C. W. Folsom, on Sewer Construction; and by Mr. Desmond Fitzgerald, on the Boston Water Works. The lectures on Railway Signals, by Mr. Blodgett, were given as usual.

A new edition of Professor Swain's Notes on the Theory of Structures was issued last year. Professor Allen has also published his Tables for Earthwork Computation. The equipment of the department has been materially increased during the past year. The larger number of students in Surveying has rendered necessary the acquisition of two new plain transits, a light mountain transit for reconnoissance work, one of Buff and Berger's precise levels of a new pattern, and a German instrument, known as the "tachy-graphometer," which is used in connection with the plane-table, for plotting stadia measurements directly. Various smaller instruments have also been added, including a sextant, a pantagraph, and the electrical apparatus elsewhere referred to for use in steel tape measurements.

The apparatus in the Hydraulic Laboratory has been increased by a Venturimeter, a new set of gates for the large tank, a Crosby gauge-tester, and various smaller pieces of apparatus and fittings. The most important addition, however, and one which was much needed, is a large Blake duplex steam-pump. A Davis plunger power-pump was loaned to the laboratory last spring, so that nearly all the different kinds of pumps are now represented. A current meter, of a recent type (the Ritchie-Haskell), has also been added to the equipment for field hydraulic work. The number of students in this branch of instruction has steadily increased, and further equipment will be needed the present year.

Col. James Francis, of Lowell, has presented to the Institute a large number of beautifully made brass orifices and other apparatus used by the late James B. Francis and the late Uriah Boyden, in experiments made many years ago. Mr. John R. Freeman has loaned a delicate Pitot-tube apparatus for measuring the distribution of velocity in pipes. The Tuerk Hydraulic Power Co. have loaned the school one of their motors for use in the laboratory. Acknowledgment is due in this place to Col. James Francis, for allowing the students to make use of the flumes at Lowell for hydraulic measurements; to President Bliss and General Manager Barnes, of the Boston and Albany R. R., and to General Manager J. W. Sanborn, of the Boston and Maine R. R., for courtesies extended to students; also to Mr. McClure, the city engineer of Worcester, and Mr. Page, of Concord, for assistance in connection with excursions made to works under their charge.

It may not be out of place here to refer to some statistics recently collected with reference to summer work done by students in Civil Engineering. The question is frequently asked, To what extent are students able to obtain work during the summer, and in this way help work their way through the school? Notwithstanding the business depression during the present year, it has been found that, of twenty-nine students in the fourth year in Civil and Sanitary Engineering, twenty-one, or 72.5%, were at work during the greater part of the summer; while of thirty-four students in the third year, twenty-one, or 62%, were so employed. All but two of the forty-two were engaged in engineering work. The earnings of the fourth-year men averaged $54.50 per month; while those of the third-year men averaged $51.00. Of those who did not work during the vacation, many preferred to rest.

The library is well equipped with books and periodicals relating to highways, and new publications are procured as soon as issued. The department is also provided with apparatus for making tests of the physical qualities of road-materials, such as specific gravity, porosity, wearing qualities, etc. It also possesses a collection of samples of materials

used in road construction; and a special room has recently been set apart as a road museum. The development of the course described above, the engagement of a special instructor and of lecturers in Highway Engineering, and the enlargement of the library, are mainly due to the contribution of Col. Albert A. Pope, who has furnished funds to meet the increased expenses involved.

No material changes have been made in the plan of instruction in Course XI., and no special remarks are called for here. There are at present several students in this course in each of the three upper years.

Highway Engineering. — In view of the increased interest which the subject of Highways is attracting throughout the country, attention may here be called somewhat in detail to the work of the department in this direction. The instruction in Highway Engineering comprises a detailed consideration of the location, construction, and maintenance of roads, as well as of city streets and pavements. This instruction is given in several courses, only one of which bears the name of Highway Engineering. In the course in Railroad Engineering, the alignment and location of common roads, including questions of grades and curves, are considered at great length, and a large amount of time is given to the computation and measurement of earthwork, and the staking out of work in the field. The structures which occur on highways, such as bridges, retaining walls, etc., are studied in the course on the Theory of Structures.

Leaving the study of structures out of account, it may be said that the greater part of the work of the third year which is classed as Railroad and Highway Engineering has a direct and immediate application to the subject of highway construction. This work extends throughout the year, and consists of seventy-five lectures, together with a large amount of work in the field and drawing-room. In the second term, a special course is given (included in the above), on Highway Engineering in its restricted sense, involving a study of those matters pertaining specifically to roads; that is to say, it includes a study

of the methods of constructing and maintaining the road foundation and surface, of the materials used in road construction, of city streets and pavements, and of specifications for road and street work. The special course is given by the Instructor in Highway Engineering, while the remainder of the course is given by the Professor of Railroad Engineering. In addition to these, lectures are given each year by prominent highway engineers. During the past year two lectures were given on road construction by Mr. E. P. North, of New York, and two by Mr. James Owen, of Newark, N. J., both gentlemen having a national reputation in their specialty. The attention of students is also directed to streets and roads under construction, and excursions are made to points of special interest. The work of the fourth year is optional, except so far as the drainage and cleansing of streets and roads are studied in the course in Sanitary Engineering. Students who desire have the opportunity to direct their fourth-year work in design, as well as their thesis-work, toward the subject of highways.

Course II. Mechanical Engineering. — The Emery testing-machine, of three hundred thousand pounds capacity, obtained through the bequest of the late T. O. H. P. Burnham of Boston, arrived about the middle of the last school year, and has already proved itself of great value. It has been in use ever since it was set up, both in giving instruction to the students and in making investigations; and although its late arrival, and the unavoidable delays which always accompany the erection and adjustment of so large a machine, have not left a great deal of time for investigations, nevertheless, a considerable amount of work has already been accomplished by way of determining the compressive strength, per square-inch, of timber across the grain, under different proportions of thickness, and of compressed surface, using both spruce and yellow pine. The machine is capable of testing, in compression, a specimen eighteen feet long, or one twelve feet long in tension. The two large screws which resist all the load that is put upon the specimen are each seven inches in diameter

at the outside of the thread, and the whole construction is one of great solidity. The travel of the piston is forty-two inches. Although the Burnham Machine weighs seventy-nine thousand pounds, it is amply supported by the floor of the laboratory. The Laboratory of Applied Mechanics is to be congratulated on the possession of this machine, not only because it has so great a capacity, but also because of its extreme delicacy. A crane, with two travellers, has been erected over the machine, with a capacity of two tons, by means of which the specimens, the tension-holders, the compression-platforms, and other heavy pieces can be handled. In addition, a set of tension-grips has been made for the machine, and also some measuring apparatus.

The work of the laboratory upon transverse strength, having outgrown the capacity of the machine for testing beams, of fifty thousand pounds capacity, erected in 1881, a new machine has during the year been substituted, which has a capacity of one hundred thousand pounds, and can test a beam up to twenty-six feet span. Not only is the capacity of this new machine double that of the former, but it is much superior in workmanship and in general adaptability for its purpose. It will enable the department to carry on all the work of investigation in transverse strength which is at present in contemplation. The four jackscrews of the machine are provided with ball-bearings.

For testing beams up to fourteen feet span, a machine of eighteen thousand pounds capacity has been added, thus leaving the large machine free for the heavier work. Another important addition is a machine for making torsional tests. It is capable of testing, in torsion, a shaft three inches in diameter, and of a length limited only by the distance between the walls of the room in which it is placed. It was designed by Prof. E. F. Miller, and is capable of performing a much better piece of work than the ordinary torsion-machines in the market. All the apparatus mentioned has been added to the Laboratory of Applied Mechanics. To the other portions of the Engineering Laboratories have been added the following apparatus: —

1st. The large duplex steam-pump, for the joint use of the Steam and the Hydraulic Laboratory, which I have before referred to in speaking of Course I.

2d. An indicator-tester; that is, apparatus for determining the corrections of steam-engine indicators under steam pressure by direct comparison with mercury columns, the indicator being under conditions similar to those of practice. This enables us to do far more accurate work in this line than has ever before been done.

3d. A machine for determining the coefficient of friction of lubricating oils.

4th. A portable orifice tank for measuring moderate quantities of water, when it is not convenient to weigh them.

5th. A machine for testing the transmission of power by ropes.

6th. A plunger-pump, loaned to the laboratory.

7th. A three-inch brass water-meter, presented by the Worthington Pump Company.

8th. An ejector, presented by the Hancock Inspirator Company.

It will thus be seen that the laboratory is constantly developing in equipment and in the work which it accomplishes.

A number of investigations were, as usual, carried on in connection with the thesis work of the students, and some of these will be published. A new and enlarged edition of the notes on the "Action of the Reciprocating Parts of the Steam-Engine," by Professor Lanza, has been printed, containing considerable new material. A paper on the "Measurement of Steam by the Flow through an Orifice" has been presented to the Society of Arts by Professor Miller and Mr. Read.

Course III. Mining Engineering and Metallurgy. — The work of the Mining Department is steadily advancing. It is the opinion of Professor Richards that each year the classes in blow-pipe, in mining engineering, in metallurgy, in assaying and metallurgical laboratory work are a little better taught than the previous classes. The appropriation made to the department is, after the necessary repairs and running ex-

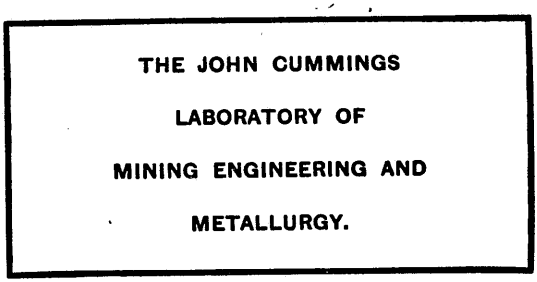
penses are paid, put into permanent and substantial improvements in apparatus, and into standard books and periodicals. The mining and metallurgical summer schools are each year better managed and more highly appreciated by the students. That the present depression in mining business does not deter men from taking the mining course is shown by the numbers included in the second, third, and fourth year classes, which are respectively eighteen, sixteen, and six, — a larger total number than ever before. A new series of lantern-slides have been obtained for illustrating Professor Hofman's lectures on the Metallurgy of Lead and Silver. A new balance has been purchased for the assaying class. The concentrating plant has been improved by the readjustment of the slime-table, which now does a very high grade of work.

Professor Richards is engaged in an ore-dressing investigation which bids fair to explain certain parts of the jigging operation which have never been understood, and which have, therefore, never been applied with the intelligence they deserved. The apparatus is novel, and the results so far obtained are very interesting. The plant for the study of the fusibilities of fire-clays has come into existence within a year, and is now about to receive a new Deville furnace for extremely high heats. The zeal and care bestowed by Mr. Lodge are making the mining laboratory work more effective than ever before. The edition of lithographic notes on Metallurgy of Iron has been exhausted; and these notes will this year be revised and brought up to date.

Professor Richards found no simple and effective stadia for his summer-school work in geological surveying. He has accordingly designed and perfected a new instrument for the use of the students. This instrument does so much more accurate work than those previously designed that its usefulness will probably not be confined to the school. The surveying equipment has also been strengthened by the addition of two alidades. The library is steadily growing, the plan followed being to purchase only standard works and to complete the various sets of periodicals in which all the latest and best pro-

fessional information and experience is to be found. This year the files of "Thonindustrie Zeitung" and "Stahl und Eisen" have been completed, and two new annuals have been added; namely, Freiberger Jahrbuch and Kärnthner Jahrbuch. The subject-catalogue, the preparation of which is in Professor Hofman's hands, is proving more valuable than ever, as is shown by the high class of professional memoirs prepared by the mining students.

The walls of the laboratory have received tablets, —



which tell the students of the invaluable services Mr. Cummings has rendered to the school.

Course IV. Architecture. — The Department of Architecture opened the year with the largest number of students in its history, notwithstanding the recent marked increase in the requirements for special students. Among the new students there are not less than twenty-three college graduates. Seven of the students in Architecture are taking a purely graduate course. Professor Despradelle has begun his work at the Institute under the most flattering auspices. The students have met him with enthusiasm; and his lectures and individual instruction in the drawing-room have given an inspiration to the work of the department which it has never before enjoyed in equal measure. Professor Chandler is thoroughly in earnest in trying not only to maintain unimpaired the traditional standard in this department, but to build up a class of students who, having completed all the undergraduate work, can give at least an

entire additional year to design. The library of the department and its collections of photographs have been largely increased during the year, both by gifts and by purchase. A large and admirable series of lantern-slides, two hundred and fifty in number, for illustrating the lectures in Renaissance Architecture, has been made by Mr. Lawrence. The instruction given in water-color, by Mr. Ross Turner; in the history of ornament, by Mr. Howard Walker; in pen and ink, by Mr. Gregg; in modelling, by Mr. T. H. Bartlett, — is of the highest order. Mr. Adams has been very successful during the past year in his conduct of the life-class. The changes of the year in the course schedule, giving more time to professional work, has allowed the course in Architectural History to be extended.

The Architectural Building, which seemed so large a year ago, is now completely filled, almost every desk which can be put into the drawing-rooms being occupied. The main drawing-room at the top of the building, where instruction is given in water-color, free-hand drawing, sketching, life-class, etc., has proved wonderfully useful. Its arrangements for the control of the light are unique. During the year the room has been crossed in several directions by rods, over which curtains with rings can be drawn at pleasure, dividing the room into a considerable number of smaller drawing-rooms. Notes on Shades and Shadows have been prepared by Mr. Lawrence, and printed for the use of the classes. By the generosity of many manufacturers the Museum of Building Appliances has been very greatly enriched. From the executors of the will of the late George Snell, Esq., the Institute has received his sketches in four large volumes, and also a collection of Gothic casts, originally given to Mr. Snell by Sir Charles Barry.

Courses V. and X. Chemistry and Chemical Engineering. — I have already referred to the great loss sustained by the Chemical Department in the death of Professor Norton, and, in a general way, to the provisional arrangements made for carrying on the work of instruction relinquished by him. It

is appropriate at this point to name the special lecturers who have consented to assist us in this emergency, together with the subjects they have severally taken for discussion before our classes. These are, — Mr. Frank G. Stantial, S. B., on mineral acids and ammonia; Mr. Arthur D. Little, on paper; Mr. George R. Underwood, S. B., on glue; Mr. Charles W. Hinman, S. B., on illuminating gas; Mr. Walter S. Allen, S. B., on fertilizers; Mr. Charles D. Jenkins, S. B., on pottery and tiles; Mr. Webster Norris, S. B., on rubber; Mr. C. S. Doggett, on acetic acid and pigments; Mr. Louis J. Schiller, on sugar and sugar refining.

Nearly all these gentlemen received their training at the Institute, and are actively engaged as superintendents or chemists in leading works. In addition to these lecturers on special topics, Mr. Henry J. Williams, formerly assistant of Professor Norton, and later of Professor Potter of Washington University, St. Louis, and of large independent experience in many lines of chemical industry, is giving an extended course of lectures in various branches of Industrial Chemistry. Dr. Thorp, whom I have already named as a regularly appointed instructor in Industrial Chemistry, graduated from the Institute in 1889, and was for the two years following assistant in Industrial Chemistry with us. He has since obtained his doctorate at the University of Heidelberg, and has for some months been engaged in studying Industrial Chemistry, and particularly the art of dyeing, in the Yorkshire district of England. He will enter on his duties at the beginning of the second term.

To the great gratification of the Faculty of the Institute, Professor Crafts has consented to take charge of the instruction in Organic Chemistry. The accession of a chemist of Professor Crafts's reputation, a teacher of his experience and exceptional powers of inspiring interest and enthusiasm on the part of the students, marks an era in the history of the Institute. If only the means at our disposal were sufficient to provide him further facilities and opportunities and to give full scope to his powers, we might well feel that our

Chemical Department was far on its way to the highest success. The increasing demand for young chemists throughout the country is producing its legitimate effect in the larger number of students entering our course in Chemistry.

Courses VI. and VIII. Electrical Engineering and Physics. — During the past year the work in the class-rooms and laboratories has been steadily improving in its various details, and has been carried on with increased efficiency. I know of nothing which would give a more striking view of the results of steady, progressive growth in building up a great department of instruction, and of the hopelessness of attempting to extemporize a technical school, no matter with what wealth of resources and endowments, than would a careful study of the development of the courses under Professor Cross's administration. There has not been a year since my accession to the Presidency in which the Department of Physics has not made a distinct and marked advance; not a year in which the instruction has not been appreciably better than that in the year preceding. Much, doubtless, of what has been thus attained here might be imitated and repeated elsewhere under judicious management; but much of it also has arisen from the continually nicer adaptation of means to ends, the con nually widening horizon of teachers, and the progressively better preparation of the students for their work.

Large accessions of apparatus have been made during the year, especially of heat and electrical measuring instruments. The new special laboratories of acoustics and optics have proved of great value. In only one particular has the department suffered; namely, through the crowding of its lecture and recitation rooms, due partly to the large increase of the second-year class, and partly to the introduction of additional class exercises. During the year the usual number of original papers have been published from the Rogers Laboratory; and there is still a large amount of material suitable for publication which is only waiting for some of the instructors to find time to put it into proper

form. Toward the close of the year, a circular was issued, descriptive of the courses in Electrical Engineering and Physics, and illustrated by pictures of laboratories and apparatus.

The instruction in Course VIII. has been much enlarged by the introduction of new courses in mathematics. Through a judicious condensation in the earlier years, the Department of Physics is now able to present in the fourth year an extended course on Fourier's Series and La Place's Coefficients,—branches of mathematics essential to any complete course in physics, but which in most institutions are offered only to graduate students, or are not given at all.

Another change in the course of instruction, which is of even greater importance because affecting a vastly greater number of students, has been effected by the introduction of recitations, supplementing the physics lectures of the second year. Two hours a week are given to these by each student, the class of about three hundred and twenty-five being divided for this purpose into ten sections. These recitations, which are conducted by Mr. Wendell, have already proved of great benefit to all grades of students, although they were introduced rather with reference to the weaker than to the stronger men. Not only do these "quizzes" result in more thoroughly grounding the whole body of students in the fundamental principles of the subject, but they also serve as a means of communication and better understanding between the instructing staff and the individual pupils. The instruction given by Mr. Derr to students of the Boston Normal School of Gymnastics will be mentioned elsewhere.

At present the Department of Physics is specially striving to secure a greater concentration of the preliminary and general work of Course VI. in the first three years, in order that there may be room for greater specialization in the fourth year. Of necessity, in a field so wide as electrical engineering, and with the large amount of training in theory and in exact measurement which is imperative, progress cannot be made rapidly. But each year sees a distinct advance

in this direction. One important special course introduced during the last year should be particularly mentioned, — that, namely, on the design of Dynamo Machinery, by Mr. H. F. Parshall, of the General Electric Company. Mr. Parshall designed the great dynamos furnishing the current for the Intramural Railway at the World's Fair in Chicago, and is highly competent to give the instruction referred to. It is expected that other courses of a like advanced character will be given shortly.

Course VII. Biology. — Somewhat, I confess, to the disappointment of my expectations, Course VII. as a course in preparation for medical studies has not grown in popularity. Whether due to the refusal on the part of the medical schools to give adequate recognition to the extremely valuable training in such a course, or to other causes, it remains true that this effort of the Institute of Technology to increase its usefulness to the community has not met with considerable success, On the other hand, the activity of the Biological Department is now greater than ever in the training of bacteriologists; in giving to our young chemists and sanitary engineers much-needed instruction bearing upon their professional studies; in promoting investigations regarding water-supply and the disposal of sewage; and lastly in training teachers of natural science for our secondary and higher schools. The number of the last-named class engaged in the biological laboratories of the Institute is already large, and promises to increase. Moreover, the industrial relations of biology are every year becoming more extended and intimate. The practical importance of the micro-organisms involved in fermentation, putrefaction, and decay; in the waste of food and the destruction of timber; in the purification of sewage and water; in the conversion of manures and in nitrification; in brewing, vinegar-making, and the like, — is fast coming to be recognized as justifying and requiring the most thorough and careful investigation of this subject, so that to-day no study can be more properly called technical than Bacteriology. Our laboratory is admirably organized

and equipped for the pursuit of this branch of research; and under Professor Sedgwick's inspiring leadership, work of the highest value is constantly in progress. The instructing staff has been materially strengthened by the appointment of Dr. Robert P. Bigelow and Dr. Theodore Hough, in Zoölogy and Physiology respectively. These gentlemen have come to us from the Johns Hopkins University, and have already shown excellent quality as teachers. Professor Sedgwick retains his connection with the State Board of Health; and a part of the biological work of the Board is carried on at the Institute. In investigating still further the sanitary aspects of public water-supplies and milk-supplies, Professor Sedgwick has made extended inquiries of much sanitary importance in different cities and towns of the Commonwealth, the results of which will be found embodied in a series of papers lately published by the State Board. The recent introduction of an option in Bacteriology into the last year of the course in Chemistry affords a gratifying recognition of the practical value of the biological work of the Institute.

Course IX. Department of General Studies. — Notwithstanding the severe losses which Course IX. has sustained through the resignation of Professors Carpenter and Levermore, the number of students taking this course is more than maintained; and the character of the work has, it is believed, suffered no impairment. The addition to the teaching staff of Dr. William Z. Ripley has greatly increased the efficiency of the work in Economics and Sociology. Dr. Ripley is the first teacher, in this department, of our own breeding; and I cannot doubt that his intimate knowledge of the history, character, and the present needs of the Institute will be a real addition to his other qualifications as an instructor here. I have already spoken of the special courses of lectures given this year by Professor Jameson and Messrs. Fiske and Lowell.

Course XII. Geology. — During the year instruction has been given in all the studies of the department, and Professor Niles has assisted in the work of the Summer School of Topography and Geodesy.

A party of five, under the leadership of Professor Crosby, spent the first two weeks of June in New York, at localities rich in fossils; and two members of the party continued the work two weeks longer. This gave an excellent opportunity for observations in a region quite different from that in which the Institute is located. The expedition was especially successful in obtaining specimens. A large proportion of these are of species not before fully represented in our collections. The material will be of special service in laboratory work in palæontology.

To the equipment of the department there has been added a machine for slicing, grinding, and polishing sections of rocks, fossils, and other specimens, with independent motor-power. A new and much-needed case has been provided for the increasing collections in Structural Geology. Some very desirable additions have been made by purchase and otherwise to the mineralogical and petrological collections, including a large basalt column from the Rhine district. The collections in Economic Geology have been enriched by a series of polished marbles given by Mr. J. W. Tufts, of Boston, by extensive series of whet-stones and oil-stones contributed by the Pike Manufacturing Company, by ores received in exchange from the Geological Survey of Missouri, and various minor additions. A valuable collection of fossils and fossiliferous rocks, numbering eight hundred and seventy-five, has been received from Professor Niles of the Institute. The specimens have been identified, labelled, and arranged in the collections of the Department. The equipment for work in micro-lithology has been increased by the addition of a new microscope and suitable accessories. Mr. Nichols has classified the numerous maps, charts, and diagrams of the department and arranged them systematically in cases.

Course XIII. Naval Architecture. — The work in Naval Architecture detailed in the Report of last year had reached such a stage that it appeared practicable to establish it as an independent four-year course; and it was believed that such action would promote the further growth of this

branch of instruction. As now arranged, the course in Naval Architecture has a continuous series of lectures under that title twice a week throughout the third and fourth years, thus making it possible to give an adequate treatment of the subject.

The subjects which now receive further attention than was formerly possible are: Rolling of ships in an unresisting medium, in water and among waves; the trochoidal theory of waves, and the theory of waves of translation; waves made by ships and the effect of such waves on the propulsion of ships; resistance of ships due to friction, wave-making, eddy-making, and to the effect of the wind on hull and rigging; experiments on the resistance of ships by towing and otherwise; experiments on models of ships in a tank, results obtained by W. Froude and R. E. Froude; effect of the propeller on the resistance of a ship; propulsion of ships by steam or sails; sail-plans, centre of effort and centre of lateral resistance of a sailing-ship; steering and manœuvring a ship under steam and under sail; methods of procedure for laying out the preliminary design of a ship for a given purpose; methods of carrying out and completing a design.

Accompanying the course of lectures, the students have two or three exercises a week in the drawing-room, in which they make the drawings and calculations necessary for the determination of the displacement, stability, and strength of a ship; also the design of the lines of a ship for a given service, and the preparation of the plans of the decks and midship section and the specifications for the scantlings.

In laying out the course in Naval Architecture, the importance of general construction-engineering, as taught in the course in Mechanical Engineering, was kept in mind; and none of the essentials have been sacrificed. The changes from Course II. are, in brief, — the omission of machine design and hydraulic motors from the fourth year, and the mechanism of cotton machinery from the second year. The time for mechanical engineering drawing has been transferred to naval architectural drawing, and considerable additional time

has been given. The woodwork in the shop has been omitted, and the forging transferred from the third to the second year.

The following material for work in Marine Engineering and Naval Architecture has been received this year: —

(*a*) Drawings of the lines and framing of the U. S. cruiser "Cincinnati," which, with the drawings of the machinery already in the department, make a complete set of great value.

(*b*) Complete drawings of the S.S. "Gloucester," recently built by the Maryland Steel Co.

(*c*) Complete drawings of the engines of the U. S. gunboat "Castine," built at the Bath Iron Works.

(*d*) Plans and specifications of lighthouse tenders, lightships, and revenue steamers, from the Treasury Department.

A nearly complete set of the Transactions of the Association of Naval Architects and many other valuable books have been added to the library. Three additional Amsler-Laeffel integrators have been purchased, making five now belonging to the department. It would be of great advantage to have a separate drawing-room assigned to the department, in which students could be provided with tables at least twice the size now available, so that drawings might be made as large as is customary in the draughting-rooms of ship-yards.

The Residence of Students during Term-Time.

For ten years the President has, in his Annual Report, presented to the Corporation statistics of the home-residence of students, showing the distribution of the total body among the several States of the Union and various foreign countries from which they come to us. In the preparation for the present Report, it has seemed to me that matter both interesting and instructive could be obtained by collating facts regarding the residence of our students while in attendance upon the school; and this has now been done for the first time. The object has been to throw the students into classes

according to the distance which they have daily to travel, coming to and going from the school, and also according to the means of locomotion employed. The figures obtained are not exact, because there are certain cases of districts which have more than one mode of communication with the Institute. The object of the inquiry is to give a general view of the situation as regards the time and strength consumed. For this purpose the students have been divided into five classes. The first class comprises those who reside in Boston proper, and who may easily walk to and from the school, or come and go by short street-car trips. If these students habitually walk, the time occupied is well spent in the exercise obtained. If they ride, the time occupied is comparatively small. The number of these students is 621, or about 54% of the total number. The second class comprises those who reside in suburban Boston or in Brookline or Cambridge, — places reached generally by electric cars, in trips of from twenty to forty minutes. The number of these students is 215. The third class consists of those who reside in towns which as a rule are reached from Boston by railroad only, but which are not more than ten miles from the city, according to the tables of railroad distances. This group of towns comprises, besides many others, Quincy, Hyde Park, Braintree, Newton, Watertown, Dedham, Woburn, and Lynn. The number of students in this group is 181. The fourth group comprises those who reside in towns more than ten, but less than twenty miles from Boston according to the table of railroad distances; among these towns are Hingham and Sharon on the south, Natick on the west, Concord and Billerica on the northwest, and Salem on the northeast. This class comprises 56 students. The fifth class comprises those who reside in towns more than twenty miles from Boston, — towns only to be reached by rail, and that by considerable journeys, in most cases a walk of twenty or twenty-five minutes from the station to the Institute being added. The number of students in this class is 84. To most of these, residence at such a distance means the loss of from

two to three hours a day, the time consumed in some cases rising to four hours. From the city of Newburyport, thirty-eight miles distant from Boston, eleven students regularly attend the Institute; while students also come and go daily who reside in Rhode Island, at a distance of more than forty miles. Nearly fifty towns send students daily to the Institute. Thirty-one students travel over sixty miles a day for the sake of an education. Newburyport's contingent alone travels over 5,000 miles weekly for this purpose. The daily migration of the whole institution is estimated by Dr. Ripley at upwards of 8,700 miles. In the transportation of our students from their homes to school and in return daily, the Boston and Albany Railroad performs the largest service; the Boston and Maine, and the Old Colony come next in order.

The Lunch-Room.

In connection with the foregoing statistics of the residence of our students during term-time, and the distances they have to travel, it seems appropriate to refer to the lunch-room, which has for the last four years been one of the "institutions" of the school. Strongly as the need of such accommodations for students coming from a distance was from the beginning felt, it was not until the Engineering Laboratories were removed from the basement of the Rogers Building, in 1889, that space could be found for this purpose, and even then it was only obtained by a sacrifice painfully felt by the Mining Department. A room extending from the front of Rogers Building along its left side seventy-six feet, toward Newbury Street, was neatly finished and fitted up with the best modern appliances; and in the fall of that year the lunch-room was opened, at first under the direction of the Women's Educational and Industrial Union. Everything that occurred during the first year tended to show that this new feature was a great boon to numerous students of the Institute; but it was not until the following year, when the scientific direction of the work was assumed by Mrs. Richards,

and the practical direction and business management were placed in the hands of Mrs. Ellen A. King, that the success of the lunch-room was complete. At the present time between three and four hundred students take their midday meal here, the average expenditure being about twenty cents. All cooking is done at the rooms of the New England Kitchen, on Pleasant Street. The materials obtained for the purpose are the choicest, not inferior to those used in fashionable restaurants. Whatever excess of receipts over expenses there may be, after paying the salaries of those concerned, is placed at the disposal of the scholarship committee, for the abatement of the tuition fees of needy and deserving students. The Faculty have the highest satisfaction in the success of the lunch-room, as they know how much difference it makes to the present and future health of the student whether he eats a cold lunch in the corner of a laboratory, or takes something warm and palatable, under pleasant surroundings and in company with his fellows. Even those students who bring their own lunches, wholly or in part, are as welcome as those who resort to the lunch-room for the entire meal.

The Gymnasium.

Pursuing still the subjects which specially concern the health of our students, I would say that the gymnasium of the Institute has been used more than ever before for athletic exercises. The appointment of a scientifically trained gymnast, as director, has awakened considerable interest in physical culture. Volunteer classes are formed every afternoon between four and six o'clock, for systematic exercise, under the direction of Mr. Boos; and a considerable number of students have availed themselves of the advantages thus offered. While the gymnasium of the Institute is by no means designed for the training of athletes for competitive sports, and has little adaptation for such a purpose, it is still very useful for simple, manly exercise, having a clear floor space of 150 by 50 feet, with an abundance of lockers and ample facilities for bathing.

The Chicago Exhibit.

Space having been assigned to us in the Liberal Arts Department of the Columbian Exposition, without any urgency on our part, it seemed the duty of the Institute to make an adequate exhibit of the methods and results of its instruction. This was accordingly done at an expense which has been painfully felt during the past year, but which, it is hoped, will bear good fruit in the future. The space assigned us consisted of 1,080 feet, in two courts upon opposite sides of a broad aisle. These courts were handsomely enclosed and neatly and appropriately fitted up with furniture, cases, desks, etc., for the best presentation of what the Institute had to show. The "installation" of our exhibit was universally regarded as artistic and effective.

The exhibit consisted, in a general way, of the following classes of objects: First, enlarged photographs of buildings, interiors of laboratories, machinery and apparatus, oftentimes with the students at work. Second, architectural and engineering drawings, comprising both ordinary and thesis work of the students, blue-prints, etc. Third, certain statistical tables and graphic charts, showing the distribution of students geographically and by classes; also the residence of graduates. Fourth, charts presenting the studies in each of the principal courses leading to the degree of the Institute. Fifth, a collection of chemical products, the work of the students in Course V., also a series of dyed yarns from the Department of Industrial Chemistry. Sixth, a full set of regular shopwork pieces, in iron and wood, required of all students, as well as numerous examples of special pieces made by students taking more than the time ordinarily allotted. All the foregoing objects and classes of objects were seen by the great majority of visitors to the courts of the Institute, and were doubtless all which the time at their command or their interest in the subject would have allowed them to examine; but beyond these were certain things which, to the careful student of education, constituted the chief merit

of our exhibit. These were, — (*a*) A full set of theses of the graduating class of 1892, 132 in number. Here one who had never visited Boston could for himself see the exact result of four years of training at the Institute of Technology. Here was the work of every member of a large class, shown without editing or correcting by the professor, affording an ample and perfectly just measure of the student's capacity for dealing with a scientific problem and undertaking an original investigation. A more complete disclosure of the weakness or the strength of the Institute could not have been offered to the numerous persons who came to its courts for the purpose of studying critically its methods and results. (*b*) Two-score or more of portfolios and albums, exhibiting by type-written letter-press, by photographs, by mounted specimens of students' work, by statistical tables, etc., the actual kind and order of work, year by year, in the different departments of instruction and investigation. These albums have now been returned to us from Chicago, and will constitute a valuable record of what the Institute was in 1893. (*c*) A manuscript volume containing the professional record and present occupation and address (if living) of twelve hundred graduates and former students of the Institute. The compilation of this volume, requiring a vast amount of labor and care, was conducted by Dr. Tyler; and the result constitutes an important addition to the history of the Institute. The list of present occupations and addresses of graduates published in the annual catalogue has always attracted attention, and has served largely to increase the reputation of the Institute; but the work here referred to not only embraces many former students who did not stay long enough to receive diplomas, but gives for each of these, as well as for each of the graduates of the school, the statement, year by year, of the successive positions held by him and the professional or other work in which he has been engaged. (*d*) A full set of the printed or engraved notes or books, specially prepared for the use of students of the Institute, the whole aggregating several

thousands of pages, with multitudinous plates and illustrations, and constituting a collection which it is believed cannot be paralleled within the range of academic literature.

The formation of the Institute Exhibit was provided for and carried on by a Committee of the Faculty, of which Professor Richards was chairman. Mr. J. H. Stanwood, of the Civil Engineering Department, acted as the executive officer of the committee. During the months of May, June, and July, Mr. R. K. Sheppard, of the third-year class in Chemical Engineering, was in charge of the exhibit. During the last three months of the Fair, Mr. Sheppard's place was taken by Mr. W. S. Hutchinson, of the class of 1892, who had during the year served as assistant to the Secretary. In connection with the exhibit at Chicago the President prepared a pamphlet, descriptive of the work and history of the Institute, illustrated by a considerable number of half-tone prints. Mr. Andrews prepared a new edition of the list of periodicals taken at the Institute; Professor Norton and Dr. Gill, of the Chemical Department, brought out a revised and enlarged edition of publications of officers and former students of the school, begun by Professor Nichols, and brought down to 1888 by Professor Norton. The courts of the Institute were visited by vast numbers during the six months of the great Exhibition. The large majority of course simply wandered through, looking about for something curious or striking; but many hundreds of earnest students of science and technology, teachers, superintendents of schools, and others visited our exhibit for the purpose of careful and protracted examination.

In connection with our exhibit at Chicago, cordial acknowledgment should be made of assistance rendered by our alumni. The general Alumni Association raised nearly $2,500 toward the expenses of the exhibit, and also bore the entire expense of completing and publishing the list of publications by officers and students of the Institute, to which I have before alluded. The Northwestern Associa-

tion also raised a considerable sum of money, which was used in maintaining a headquarters for Institute men while in Chicago. A suite of pleasant and commodious rooms, at the corner of Michigan Avenue and Thirteenth Street, was fitted up for this purpose, and contributed much to the pleasure and convenience of our graduates and students visiting the great Exposition.

Since my last Annual Report, two highly esteemed members of the Corporation have died, — Mr. Ames and Mr. Dresser. Mr. Ames was elected to the Corporation in March, 1885. He invariably showed a high appreciation of the work of the Institute, and a cheerful readiness to assist in its development. No appeal was ever made to him in behalf of its finances which was not responded to at once with practical liberality and with cordial expressions of goodwill. Mr. Dresser entered the Corporation only in June, 1891; but from the very foundation of the school he had been one of its most active and zealous friends, and a leading member of the Society of Arts. For many years he was chairman of the Executive Committee of the Society.

TREASURER'S REPORT.

STATEMENT OF THE TREASURER.

The Treasurer submits the annual statement of the financial affairs of the Institute for the year ending Sept. 30, 1893: —

The year has been an unusual one both as regards the amounts received and the amounts expended. Two large and important purchases of real estate have been made, the one on Trinity Place and the other on Clarendon Street. The land thus bought adjoined the land already owned and used by the Institute for its Mechanical and Civil Engineering and its Architectural departments. As a result of these purchases, the Institute has been forced to burden itself with a debt of two hundred thousand dollars.* There has also been an expenditure for current expenses very largely in excess of income, resulting in a deficit of nearly thirty-three thousand dollars. This is due in part to expenses which may fairly be called exceptional and in part to the natural growth in expenses as the Institute grows. The exhibit at the World's Fair involved an outlay of more than eight thousand dollars. Last year the Institute received from the State Endowment Fund the accumulated appropriations of four years, amounting to twenty-two thousand dollars. This year the amount received is only a little more than six thousand dollars. There has been a considerable amount of interest to pay on the money borrowed for the purchase of real estate, and there has been a falling off in income due to the maturing of bonds paying a high rate of interest and the reinvestment of the proceeds at necessarily lower rates.

To offset the discouraging features of the account, there have been unusually large bequests and gifts made to the Institute during the past year, as follows: —

From the estate of the late Mrs. Martha Ann Edwards, property of the value of over ninety-eight thousand dollars.

From the subscription of 1892, the sum of eighty thousand five hundred dollars, leaving about thirty thousand dollars still to be received.

From the estate of the late T. O. H. P. Burnham, twenty thousand dollars, from which, in accordance with Mr. Burnham's wish, about fourteen thousand dollars have been devoted to the purchase of the great Emery testing-machine.

From Mrs. Susan E. Covill, of Springfield, five thousand dollars, to be held as the Wm. F. Huntington Scholarship Fund, the preference being given to students in Civil Engineering.

From Miss Susan Upham, one thousand dollars for scholarship purposes.

From the Alumni of the Institute, two thousand dollars, to be applied towards the expenses of the Institute's exhibit at the World's Fair. The Alumni have also added five hundred dollars to the Wm. B. Rogers Fund.

From Mrs. Wm. B. Rogers, for periodicals, two hundred dollars.

From Samuel Cabot, Esq., for special work in connection with the Chemical Department, one hundred dollars.

From the Civil Engineers' Society, for the purchase of books, seventy-five dollars.

The net result of the year is an increase, amounting to about one hundred and seventy-six thousand dollars, in the property of the Institute.

* A portion of this real estate has now been leased to the Boston Art Student Association.

GEORGE WIGGLESWORTH, Treasurer, *in account with*

General Statement of Receipts and Disbursements

Dr.

Cash balance Sept. 30, 1892		$5,006.95
From Augustus Lowell for Lowell Courses	$4,800.00	
" " " " C. Kastner's salary	2,500.00	
" " " " Lowell School of Design	867.82	8,167.82
Receipts for Current Expenses.		
Income of funds for salaries	$4,380.00	
" " " " scholarships (students' fees)	3,875.00	
" " " " Joy "	200.00	
" " " " Swett "	400.00	
" " " " Library	250.00	
" " " " general purposes	10,389.12	
" " Rogers Memorial Fund	12,975.61	
Students' fees	194,775.00	
State Agricultural Fund	4,785.76	
State Endowment Fund	6,333.34	
Laboratory supplies and breakages	5,470.16	
Rents, per Table (page 12)	8,293.26	
Gifts	3,375.00	
Contributed by former M. I. T. Students for expenses at World's Columbian Exposition	2,000.00	
Interest	1,951.11	
Pope Fund for Highway Engineering, used	868.88	
Letter-Box Fund $162.00, used of 1892, $13.00	175.00	
Boston University	1,150.00	
Sale printed Lecture Notes	2,413.96	
Profit and Loss, expenses more than income	32,816.75	296,877.95
Bequests for Special Purposes, etc.		
Income James Savage Fund, not used	$602.30	
" James H. Mirrlees Fund, " "	7.98	
" William Barton Rogers Fund, " "	30.55	
" Elisha Thacher Loring Fund, " "	63.30	
" Richard Perkins Fund, " "	128.78	
" Charlotte B. Richardson Fund, " "	1,618.31	
" Charles Lewis Flint Fund, " "	59.71	
" Pope Fund, " "	331.12	
William F. Huntington Fund (income " ")	5,208.33	
Susan Upham Fund (" " ")	1,037.50	
W. B. Rogers Fund (additional)	500.00	
Scholarship Fund	500.00	10,087.88
Gifts and Bequests for General Purposes.		
Martha Ann Edwards Legacy	$98,452.89	
Subscriptions of 1892 (additional)	80,500.00	
T. O. H. P. Burnham Legacy	20,000.00	198,952.89
Securities Sold or Paid. General Fund: 15,000 Bur. & Mo. River R. R. L. G. 7s.		15,000.00
Securities Sold or Paid. W. B. Rogers M. F. 20,000 Mo. V. Blair R. & B. Co. 6s.		20,000.00
Sundries.		
Income General Funds credited to Advance Bond Premium Account	$363.19	
Income Wm. B. Rogers Mem. Fund credited to Advance Bond Premium Account	400.00	
Students' Deposits	100.00	
Rent reserved to pay annuity under M. A. Edwards Legacy	250.00	
Students' Notes paid	105.00	
Borrowed on Mortgage Notes	200,000.00	201,218.19
		$755,311.68

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

FOR THE YEAR ENDING SEPTEMBER 30, 1893.

Cr.

Paid for Lowell Courses	$4,800.00	
" " Charles Kastner's salary	2,500.00	
" " Expense Lowell School of Design	867.82	
		$8,167.82
EXPENSES.		
Salaries, per Table (page 12)	$188,373.13	
" paid from the Pope Fund	600.00	
Supplies " " " " "	268.88	
Scholarships paid from Swett Fund	400.00	
Repairs, per Table (page 12)	12,813.70	
General Expense, per Table (page 13)	16,158.89	
Fuel	11,886.10	
Water	1,450.80	
Gas	2,120.84	
Printing and Advertising	4,557.85	
" Lecture Notes	3,074.18	
" Annual Catalogue	1,956.70	
Rents paid Boston & Albany R. R. Co.	180.00	
" " Natural History Society	200.00	
Laboratory Supplies and Libraries, per Table (page 12)	30,513.44	
Society of Arts	946.57	
World's Columbian Exposition	8,231.56	
Interest, 5 per cent on funds not in stocks and bonds	7,384.19	
Interest paid A. Lowell, Trustee	1,000.00	
" " on Mortgage Notes	4.761.12	
		296,877.95

SECURITIES BOUGHT OR RECEIVED AS LEGACIES. GENERAL ACCOUNT.

$2,000	Chi. Bur. & Northern R. R. 5s	$2,040.00	
2,000	Atchison Topeka & Santa Fé 4s	1,605.00	
6,000	West End Street R'w'y 5s 1902	6,240.00	
112	Sh. Morris & Essex R. R.	8,540 00	
83	" Pennsylvania Coal Co.	11,910.50	
65	" Pittsburg, Fort Wayne & C. R.R.	9,880.00	
House No. 34 Commonwealth Ave		30,000.00	
			70,215.50

SECURITIES BOUGHT FOR, OR TRANSFERRED TO, WM. B. ROGERS MEMORIAL FUND.

$2,000	Kansas City Belt R. R. 6s.	$2,160.00	
20,000	Chicago, Burlington & Quincy R. R., Conv. 5s	18,820.00	
			20,980.00

SUNDRIES.

Gymnasium Building (additional)	$225.00	
Architects' Building (additional)	22,925.78	
Annuity under M. A. Edwards Legacy	250.00	
Letter Box Fund 1892, used	13.00	
Emery Testing Machine	13,853.27	
Lot No. 2 Trinity Place	137,241.60	
Clarendon Street Land and Building	139,702.00	
Profit and Loss, per contra. (See page 4)	32,816.75	
		347,027.40
Cash balance, Sept. 30, 1893		12,043.01
		$755,311.68

The following account exhibits the property held by the Institute, as per Treasurer's books, Sept. 30, 1893: —

INVESTMENT OF THE W. B. ROGERS MEMORIAL FUND.

$50,000.00	Saginaw & Western R. R. 6s	1913	$50,000.00	
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	
18,000.00	Atchison, Topeka & Santa Fé R. R. 4s (Reg'd)	1989	15,372.30	
16,000.00	Kansas City, Clinton & Springfield R. R. 5s	1925	16,000.00	
7,000.00	Omaha & Southwestern R. R. 8s	1896	7,000.00	
5,400.00	Republican Valley R. R. 6s	1919	5,400.00	
4,000.00	Cin., Ind., St. Louis & Chicago R. R. 6s	1920	4,000.00	
2,000.00	Ottawa, Oswego & Fox River R. R. 8s	1900	2,000.00	
2,000.00	New York & New England R. R. First 6s	1905	2,000.00	
2,000.00	Kansas City, Fort Scott & Gulf R. R. 7s	1908	2,000.00	
2,000.00	Kansas City, Memphis & Birmingham R. R. 5s	1927	1,905.00	
250.00	" " " Coupon Note	1901	250.00	
1,000.00	Lincoln & Northwestern R. R. 7s	1910	1,000.00	
1,000.00	Atchison & Nebraska R. R. 7s	1908	1,000.00	
7,000.00	Chicago, Burlington & Quincy R. R. 7s	1903	7,000.00	
42,000.00	" " " " Conv. 5s	1903	40,820.00	
35,000.00	Fort Street Union Depot 4½s	1941	34,825.00	
	Advances to Bond Premium account		7,293.91	
	Bonds			$250,653.71

INVESTMENT OF THE JOY SCHOLARSHIP FUND.

	Massachusetts Hospital Life Insurance Co	$5,000.00	
	Deposits in Savings Banks	3,555.83	
			8,555.83

INVESTMENT, SWETT SCHOLARSHIP FUND.

	Massachusetts Hospital Life Insurance Co.		10,000.00

INVESTMENTS, GENERAL ACCOUNT.

$50,000.00	Atchison, Topeka & Santa Fé R. R. 6s	1893	$50,000.00	
2,000.00	" " " " 4s	1989	1,605.00	
18,000.00	Bur. & Mo. River (Neb.) R. R. 6s, non-exempt	1918	18,000.00	
6,000.00	Chicago, Burlington & Quincy R. R. 4s	1922	5,100.00	
3,000.00	Milwaukee & St. Paul R. R. 7 3-10	1898	3,000.00	
4,000.00	Chicago, Burlington & Northern R. R. 5s	1926	4,000.00	
2,000.00	Kansas City, Fort Scott & Gulf R. R. 7s	1908	2,000.00	
1,000.00	International & Great Northern R. R. 6s	1919	1,000.00	
1,000.00	Union Pacific R. R. 6s	1898	1,000.00	
13,000.00	New York & New England R. R. First 6s	1905	13,000.00	
3,000.00	Hannibal & St. Joseph R. R. 6s	1911	3,000.00	
25,000.00	Eastern R. R. of Minnesota 5s	1908	25,000.00	
15,000.00	Chicago, Burlington & Quincy R. R. Conv. 5s	1903	15,000.00	
6,000.00	West End Street Ry. 5s	1902	6,000.00	
	Advances to Bond Premium account		2,100.00	
	Bonds			149,805.00
	Amount carried up			$419,014.54

Amount brought up				$419,014.54

STOCKS.

SHARES.				
148 Boston & Albany R. R.	par	100	$29,933.00	
12 Cocheco Manufacturing Co.	"	500	6,000.00	
55 Old Boston National Bank	"	100	5,510.50	
50 Hamilton Woollen Co.	"	100	5,000.00	
194 Morris & Essex R. R.	"	50	14,690.00	
27 Essex Co.	"	50	4,050.00	
158 Pennsylvania Coal Co.	"	50	23,160.50	
35 Everett Mills	"	100	3,150.00	
40 New York & Harlem R. R.	"	50	5,000.00	
85 Pittsburg, Fort Wayne & C. R. R.	"	100	12,880.00	
15 Consolidated Gas Co., New York	"	100	1,447.50	
				110,821.50

REAL ESTATE.

Rogers Building		$315,726.88	
Walker Building		190,492.44	
Land on Garrison Street . . .	$50,840.00		
Workshops " "	52,416.49		
		103,256.49	
Land on Trinity Place	$76,315.69		
Engineering B'ld'g, Trinity Place	106,616.87		
		182,932.56	
Gymnasium Building		7,967.85	
Architects' Building		57,857.10	
Lot No. 2 Trinity Place		137,241.60	
Clarendon St. Land and Building		139,702.00	
House No. 34 Commonwealth Ave. . . .		30,000.00	
			1,165,176.92
Equipment, Engineering Building		$16,555.24	
" Workshops		20,628.56	
			37,183.80

SUNDRIES.

Notes Receivable	$1,500.00	
Emery Testing Machine	13,853.27	
Students' Notes	2,300.00	
Cash Balance, Sept. 30, 1893	12,043.01	
		29,696.28
		$1,761,893.04

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	
General Institute "	36,028.00	
		$456,007.24

The Income of the following is used towards paying salaries: —

Nathaniel Thayer, for Professorship of Physics,	$25,000.00	
Jas. Hayward, for Professorship of Engineering,	18,800.00	
William P. Mason, " Geology	18,800.00	
Henry B. Rogers, for General Salaries	25,000.00	
		87,600.00

SCHOLARSHIP TRUSTS.

Richard Perkins Fund	$52,704.24	
James Savage Fund	12,648.26	
Mrs. Susan H. Swett Fund	10,182.95	
William Barton Rogers Fund	9,388.33	
Joy Fund	8,555.83	
Elisha Thacher Loring Fund	5,329.39	
Charles Lewis Flint Fund	5,253.93	
Thomas Sherwin Fund	5,000.00	
Farnsworth Fund	5,000.00	
James H. Mirrlees Fund	2,667.61	
William F. Huntington Fund	5,208.33	
Susan Upham Fund	1,037.50	
Scholarship Fund	500.00	
		123,476.37

OTHER TRUSTS.

Charlotte Billings Richardson, Industrial Chemistry Fund,	33,984.56
Charles Lewis Flint, Library Fund	5,000.00
Albert A. Pope, Street Building and Highway Engineering Fund, balance	1,046.13
Letter Box Fund, balance	196.37

MISCELLANEOUS.

Notes Payable	$220,000.00	
Students' Deposits	500.00	
Subscription of 1887	123,500.00	
Subscription of 1892	96,750.00	
Martha Ann Edwards Legacy, 1893	98,452.89	
T. O. H. P. Burnham Legacy, 1893	20,000.00	
M. I. T. Stock Account	495,379.48	1,054,582.37
		$1,761,893.04

Comparative Statement of Funds, etc.

	Sept. 30, 1892.	Sept. 30, 1893.
Trusts for general purposes	$456,007.24	$456,007.24
" " Salaries	87,600.00	87,600.00
" " Scholarships	115,337.92	123,476.37
" " Library	5,000.00	5,000.00
Charlotte B. Richardson Ind. Chem. Fund	32,366.25	33,984.56
Albert A. Pope Street Building and Highway Engineering Fund	715.01	1,046.13
Letter Box Fund	209.37	196.37
Notes Payable	20,000.00	220,000.00
Students' Deposits	400.00	500.00
Subscription of 1887	123,500.00	123,500.00
" " 1892	16,250.00	96,750.00
Martha Ann Edwards Legacy		98,452.89
T. O. H. P. Burnham Legacy		20,000.00
M. I. T. Stock Account	528,196.23	495,379.48
	$1,385,582.02	$1,761,893.04
Increase	376,311.02	
Consisting of: —		
Charlotte B. Richardson Fund Income	1,618.31	
Scholarship Funds, not used	1,138.45	
Subscription of 1892, increase	80,500.00	
A. A. Pope Fund, increase	331.12	
Wm. B. Rogers Fund, increase	500.00	
Martha Ann Edwards Legacy	98,452.89	
T. O. H. P. Burnham Legacy	20,000.00	
Wm. F. Huntington Fund	5,000.00	
Susan Upham Fund	1,000.00	
Scholarship Fund	500.00	
Students' Deposits, increase	100.00	
Notes Payable	200,000.00	
		409,140.77
Less Loss. Expenses more than Income	$32,816.75	
Less on Letter Box Fund	13.00	
		32,829.75
		$376,311.02

INCOME FROM GENERAL INVESTMENTS, AND APPLICATION THEREOF.

Applied to Salaries	$4,380.00	From Dividends, Old Boston National Bank	$247.50
" " Scholarships	3,875.00	" State Tax returned, Old Boston National Bank	82.18
" " Library	250.00	" Railroad Bonds	9,568.20
" " General Purposes	10,389.12	" Dividends, Pittsburg, Ft. W. & C. R. R. Stock	140.00
" " Increase of Funds	2,736.76	" Dividends, Pennsylvania Coal Co.	1,382.00
" " Advances to Bond Premiums	363.19	" " Everett Mills	210.00
		" " Essex Co.	162.00
		" " Cocheco Mfg. Co.	240.00
		" " Consolidated Gas Co., N. Y.	105.00
		" " New York and Harlem R. R.	210.00
		" " Hamilton Woollen Mills	300.00
		" " Morris & Essex R. R.	483.00
		" " Boston & Albany R. R.	1,480.00
		" Interest allowed on Funds not in Bonds and Stocks @ 5%	7,384.19
	$21,994.07		$21,994.07

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

Paid Massachusetts Institute of Technology 5%		Received Income from Railroad Bonds . .	$13,375.61
on Amount of Fund ($250,225.00) + 464.36	$12,975.61		
Credited to Advances Bond Premiums . .	400.00		
	$13,375.61		$13,375.61

DETAILS OF SOME ITEMS IN TREASURER'S CASH ACCOUNT.

Rents.

Huntington Hall, for Lowell Lectures	$3,500.00	
Lowell School of Design	1,800.00	
Chauncy Hall School, for Gymnasium	500.00	
State Board of Health, for use of Laboratories	1,087.50	
Boston Water Works, use of Laboratory	200.00	
"Rink" Building, Clarendon Street	657.00	
34 Commonwealth Avenue $550.00 less $250.00 reserved for Annuity under Martha Ann Edwards Legacy	300.00	
Use of Lecture Rooms and Gymnasium	248.76	
		$8,293.26

Department Supplies.

Chemistry	$9,060.48	
Physics	5,345.62	
Mining	1,520.58	
Mechanical Engineering	2,353.04	
Naval Architecture	248.92	
Applied Mechanics	1,579.84	
Civil Engineering	2,761.32	
Biology	1,136.97	
Geology	830.00	
Architecture	963.90	
Drawing	46.03	
Mathematics	352.70	
English	903.17	
Workshops	1,881.08	
Modern Languages	264.48	
Periodicals	1,265.31	
		$30,513.44

Salaries.

Instruction	$155,141.94	
Administration	16,916.66	
Labor	16,314.53	
		$188,373.13

Repairs.

Department Improvements: —		
Physics	$1,348.43	
Chemistry	1,247.34	
Workshops	469.03	
Mechanical Engineering	427.59	
Geology	250.04	
Architecture	138.07	
Drawing	135.50	
Amount carried forward	$4,016.00	

Amount brought forward	$4,016.00		
Modern Language	134.37		
Mining	79.66		
Civil Engineering	63.99		
Applied Mechanics	63.26		
Biology	41.64		
English	38.51		
Mathematics	23.25		
		$4,460.68	
Walker Building		1,499.37	
Rogers "		1,370.46	
Gymnasium Building		600.14	
Engineering "		297.05	
Architects' "		112.17	
Steam Fitting		598.75	
Painting brick walls, columns, etc. *white*, Engineering Building		551.09	
Blackboards		492.83	
Boiler and Boiler-Room Machinery		592.31	
Plumbing		267.64	
Covering Pipes in Mech. Eng. Build'g Lab.		206.25	
Ventilation Huntington Hall (see Gen. Ex.)		204.06	
Lunch Room		156.19	
President's, Secretary's, and Bursar's Offices		93.82	
Lowell School of Design		93.80	
World's Columbian Exposition (labor)		55.67	
Sundries		1,161.51	
			$12,813.70

General Expenses.

Fire Insurance		$2,012.95	
Stationery and Office Supplies		1,565.93	
Postage		1,383.73	
Furniture		1,272.92	
Paints, Varnish, etc		869.04	
Entrance Examinations		766.95	
Gymnasium Supplies, etc.		713.70	
Express Charges, Teaming, etc.		692.08	
Architects' Building		682.85	
Janitor's Supplies: —			
Brushes, Pails, Soap, etc.		630.52	
Diplomas, Commissions, and Expense of Drills		536.37	
Ventilation, Huntington Hall (see Repairs)		523.49	
Legal Fees		509.94	
Examination Books		483.60	
Washing		477.63	
New Engine, ventilation Walker Building		467.59	
Engine Room Supplies: —			
Oil	$312.00		
Cotton Waste	42.57		
Sundries	88.92		
		443.49	
Amount carried forward		$14,032.78	

Amount brought forward		$14,032.78	
Electric Lighting: —			
Power Furnished	$231.40		
Wiring, etc.	163.29		
		394.69	
Books and Supplies for General Library		316.23	
Window Glass		254.10	
Lowell School of Design		250.28	
Telephone and Telegraph Charges		174.17	
Ice		146.77	
Tablets, Mining Department		140.00	
Eco. Magneto Clock Co. (Watchman's)		113.00	
Window Shades		106.50	
Towelling		94.81	
Drafting, Testing, etc.		47.56	
Safe, Chemical Department		38.00	
Union Deposit Vaults		50.00	
			$16,158.89

BOSTON, Dec. 7, 1893.

An examination of the accounts of the Treasurer of the MASSACHUSETTS INSTITUTE OF TECHNOLOGY for the year ending Sept. 30, 1893, has been made, and they are found to be correctly cast, and with proper vouchers. The ledger balances agree with the trial balance. We have verified the evidences of personal property held by the Institute.

FREDERIC W. LINCOLN,
JAMES P. TOLMAN,
CHARLES C. JACKSON,

Auditing Committee.