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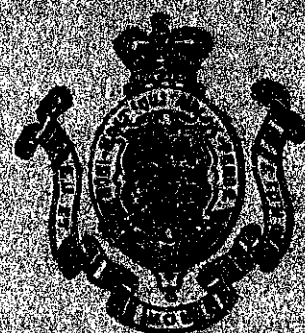
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The Tech.

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IT has been decided to adopt the suggestion of one of our professors, and reserve a column in the paper for the publication of the titles of articles in prominent periodicals which may be especially interesting to our students in connection with their work. There are certainly many such articles in the monthly magazines and scientific journals which, if brought to the notice of the students, would be gladly sought for and read. The great number of these magazines and the limited time of the student make it impossible for him to examine the contents of each of these and read that which is most useful or interesting to himself. Many of our professors, however, are constant readers of these journals, and with their assistance much may be done. We have therefore ventured to ask these gentlemen, especially those at the heads of departments, to send us regularly, if possible, the titles of articles which, in their opinion, will most interest our readers, giving also the name and date of magazine, and a short note or comment if they desire. The professors who have been consulted have expressed themselves in favor of the plan, and are willing to assist

by contributing as invited. We therefore wish to call attention to the matter, and express our readiness to receive contributions and carry on the column.

THE opening days of December find the Institute once more in possession of a gymnasium, and the building, with its long, sloping roof of slate and new brick walks, presents on the exterior quite a marked contrast to the rusty sides of its predecessor.

In the interior a great improvement is also readily noticeable. At the north end, enclosed by a lead-colored partition, is placed the janitor's apartments, Institute armory, and a large storeroom. At the south end, arranged in a similar manner, are the washrooms, sanitariums, dressing-room, bath-room, with shower and fixed baths, and the Chauncy Hall School armory; while beneath our feet we find, to our disappointment (happy, however), a *new floor*.

The apparatus, which is arranged essentially the same as it was in the other gymnasium, is materially the old, though a number of new pieces will soon be added.

The management of the gymnasium has been changed. The Gymnasium Committee, which, since 1879, has been a committee only in name, seems to have awakened to the fact of the heretofore slack management of the gymnasium and, through a petition, obtained permission from the Faculty to have complete control of the building, with the exception of the few hours when the Institute, Chauncy Hall, and city use it for drilling purposes. By this move they have already been enabled to make many improvements in the building, and will hereafter have the power to look after the interests of the students more closely than they have been looked after before. In this and many other of its arrangements the new gymnasium

is a decided improvement over the old, though as a drill shed it can never be what a gymnasium should be.

WE find it necessary to call the attention of our readers to one of the new departments of the paper, — the "Alumni Column." It would appear that our graduates, having been through the same courses and trained for the same definite professions, should be more interested in each other's career in after-life than are the graduates of the general college, and that a rightly conducted "personal" department in our paper should be well received. A large number of college publications sustain departments of this kind, which have proved entirely successful, increasing considerably the circulation of the paper and adding to its value.

There seems to be no lack of appreciation of the utility of our own department, for many of our correspondents and others have expressed themselves in its favor. We find, however, that it will be impossible to continue the column unless contributions be more frequent, for only by contributions from graduates themselves can these personal notes be made interesting to former classmates and friends. Should each alumnus send us some account of his present situation, his occupation and success therein, he would, we think, be well repaid by the increased information which would be given him in the column; and we earnestly invite contributions from every graduate.

THE progress of the Y. M. C. A. building, now in process of building at the corner of Berkeley and Boylston Streets, is watched with much interest by the students. Last year there was a report current that the Institute was to have the use of their new gymnasium, and that it would be ready for use at the beginning of the present term; consequently, when the students returned and found that it would not be ready at least for another year, much disappointment was felt; however, the lower classes of the Institute ought to congratulate themselves that they will have a good gymnasium, where

they will be better able to compete with the records of other colleges.

It seems as though we might obtain another benefit from this association, for instance, societies which have regular meetings ought to obtain room in the new building at reasonable rates; still the building does not look very inviting at present for society meetings, so we must wait and see what arrangements can be made in the future.

Lacrosse.

AS this game has lately been introduced at the Institute, a few words on the subject may not be out of place.

Lacrosse is more properly the national game of America than any other athletic game, as base-ball, which originated in the game of rounders, and foot-ball have both been introduced from England. Lacrosse was played here by the Indians before the time of Columbus, and was employed in Indian strategy as a means of surprising forts during the early frontier wars.

Its introduction into the United States is of comparatively recent date, and consequently all clubs are on a more nearly even footing than had the game been played here for a considerable time.

Lacrosse has been the national game of Canada for years, and the contests attract as large a number of spectators as our league ball games, while ladies attend in greater numbers than they do at any athletic sports here, with perhaps, the exception of the Harvard-Yale base-ball games. The Canada clubs are the champions of the world.

The game was introduced into England in 1867, where it attracted considerable attention. The Lacrosse Association of London was formed, and a set of laws differing slightly from those in force in Canada adopted.

In 1879 the U. S. National Amateur Lacrosse Association was organized, which adopted in general the Canada laws.

Last year, I believe, there existed an Inter-

collegiate Association, composed of Harvard, Princeton, University of New York, and Columbia. This year, in addition, Yale and Amherst have organized teams, and also Andover and Exeter Academies. With these, together with the second union and the Harvard Freshman teams, there will be no lack of worthy adversaries if the Institute can put a strong team in the field.

To become a fair player in lacrosse does not require a life's practice, as is now the case in base-ball; nor need the risk of broken bones be taken into account as in foot-ball. It necessarily renders a good player agile and quick of eye, as well as a graceful runner, and requires of him considerable endurance. A game of lacrosse is generally more interesting to a spectator than one of base-ball, — where often the ball is the only thing moving on the field, — or rough-and-tumble foot-ball.

Now that an association has been formed at the Institute, there seems to be no good reason why a strong representative team should not be organized, as there ought to be plenty of good material here, and, judging from what has already been accomplished, and the numbers that have taken hold, there is no lack of interest.

On Wednesday, Nov. 22, a meeting was held for the purpose of forming a lacrosse association, and a committee appointed to draw up a constitution. On the following Friday this constitution was adopted, and the following officers elected: Mr. H. F. Otis, president; Mr. F. L. Smith, manager; Mr. W. F. Carr, secretary and treasurer; Mr. H. D. Bennett, captain.

It is to be hoped, and we feel assured, that the popularity of lacrosse will increase at the M. I. T., as it has wherever it has been introduced.

C. B. A.

Are We Competent?

EDITOR TECH, — This question may well be asked, seeing that it was a matter of comment that the Institute, which pretends to turn out practical architects, should not have seen fit to intrust the erection of its new build-

ing to one of its graduates, some of whom are practising in this city.

This being the case it is not strange that the students should really feel little confidence in their own power, and therefore should think of giving the design for the proposed Rogers Memorial Tablet to an outside artist. This action, however, would not only be inappropriate, as this Memorial is set forth in the resolutions to be erected by the students alone, but it would also be extravagant, as the cost must necessarily be kept as low as possible, which would probably be the case if designed by an Institute man. Undoubtedly, there are now among the architects those competent and willing to undertake the work.

Will you therefore publish this suggestion, which will attract more attention in the widely circulated TECH than if made at the scantily attended Memorial meetings? Let the Tablet be opened to competition, and let the selection of the best design be left to competent judges. Probably the successful man would feel sufficiently rewarded in having his design adopted without asking further remuneration, but, if not, a prize could be offered, as was the case in the competition for the design of the cover of THE TECH.

A. L. R.

"The Education of Engineers."

THE following is abridged from an editorial published in the *Railroad Gazette* of Nov. 10, in reply to a letter asking advice to aid a young man in educating himself for the profession of a civil engineer. The article is written from the point of view of a "practical man," and we hope some of our professors will see fit to give us the other side of the question: —

The term "civil engineer" has about it what Edward Everett would have called a "sonorous amplitude" of sound and meaning. It seems to mean more than it does, and experience soon teaches that the occupations it includes, instead of having about them a sort of super-exalted character, are usually very commonplace indeed. It sounds well for a young man to say that he intends to be a "civil engineer." Fond mothers like to tell their intimate friends that Ed-

mund intends to adopt that "profession." There is a rhythm about the name of it that makes it agreeable to tell to Angeline in soft and confidential tones, and she is apt to think that it produces a good impression to speak of the favored one as a "civil engineer" when the diamond or plain gold ring first makes its appearance in public. The word "engineer" carries with it many illusions, which, under such circumstances, it is rather pleasant to entertain, but which, if dispelled, would make the occupation much less attractive than it now is to many young men.

On the card of a firm engaged in practical engineering work is announced that they do railroad and other grading, difficult foundations, heavy masonry, and steam pile-driving. Now, assuming that our aspirant is aiming to qualify himself for doing the kind of work that this firm is engaged in, and that his aim is to get such an education as will best qualify him to become a railroad grader, to build foundations, to become a stonemason, or a pile-driver, would not the question of the kind of education he ought to seek assume a very different aspect from what it does when he is aiming to become a "civil engineer"?

But it may be said that the kinds of work named are only some of the branches of civil engineering; that there is other work in which a thorough knowledge of mathematics and other science is required, and for which a person cannot be qualified who has not had a very complete theoretical training. Unfortunately for some of the theories regarding technical education, this statement is not true. There is not a branch of civil or mechanical engineering now practised in this country in which the men who have achieved either the greatest distinction or pecuniary success have had a liberal education, either classical or technical. This shows in an indubitable way that such training is not *essential* to success or to the attainment of distinction in these occupations.

The truth is, that, in comparison with other qualifications, the value of any high degree of mathematical or scientific training is very slight. If the relative usefulness of different amounts of education were laid out graphically, so that its value would be represented by the height of vertical ordinates, a curve drawn through the different points laid down would probably assume the form of a semi-ellipse, with the conjugate axis for a base. The beginning of education would be seen to be of prime importance, and the curve would ascend almost vertically. When the elements are mastered, the curve would begin to incline from a perpendicular, and, as the common school period is passed, the inclination would probably be about 45° , and, with the beginning of the course in a technical school, the curve would approximate more and more towards a horizontal line, and the rate of vertical increase would be less and less, until it would begin to descend, slowly at first, but, after a certain amount of scholastic training has been

attained, the rate of descent would be certain, and, after a while, rapid. What we want to make clear here is, that, so far as an aid to success is concerned, it is the beginning of education that is the most important. So far as the achievement of success — that is, making money by honorable means — is concerned, the higher technical education is of little or no help. But there is something else in life worth having besides money and the power which it gives.

It will be well, though, if our young friend should at the outset make a distinction, and determine exactly what he wants most to get. If he has such a love for science and of knowledge as would make the possession of it a source of great pleasure to him during his whole after-life, then we would by all means advise him to take as thorough a course in one of the schools as he can afford time and money for. If, on the other hand, it is important or desirable for him to earn the most money in the least time, and if he has a fair elementary education, can use his own language with reasonable correctness, knows algebra, geometry, and trigonometry, with more or less natural philosophy or "physics," as it is now the fashion to call it, and some knowledge of mechanical drawing, our advice would be to plunge into practice at once.

In taking the last census in Great Britain, those in charge of the work would not accept, as an answer to the question of what a man's occupation was, that he was an "engineer." They decided that the term does not indicate what a person's occupation is with the degree of definiteness demanded by the census. Our correspondent speaks of his "making a specialty of railway construction and management." It is to be feared that the British census-takers would not regard that as sufficiently definite. "Railway construction" involves a number of distinct occupations. Does he intend to locate lines where none are built? If so, he had better attach himself to some party, or "corps" — as they love to call themselves — of men in the field who are doing that kind of work. If he wants to learn about the grading of a line, and doing the masonry work for its bridges, tunnels, etc., then he had better join a contractor, and study the geometry of earthwork and the characteristics of the mule, gunpowder, nitro-glycerine and Hibernian, Italian, and African laborers, with more or less of the literature of strikes. If he aims at a knowledge of bridge-building, he can learn to design and build bridges very much better if he enter the employ of some firm in that line of business than he can in a technical school. If he means to turn his attention to rail-manufacturing, then chemistry would help him; but he could pick up more knowledge which would be useful in a good rail-mill than he could in all the laboratories in the world. Besides, the mill has the advantage that the young rail-maker can in odd hours learn as much chemistry as he will need; whereas the laboratory has the disadvantage

that it is impossible, in it, to get the knowledge which the mill alone can teach. If he means to learn how to take care of a railroad track, let him join himself to a section foreman—if he has the physical strength for it—as a track laborer for a time; it will develop his muscles, and he will learn how much work a man ought to do in a day, and he will get a glimpse of life from a day laborer's point of view, and thus be able to deal more justly with class thereafter than he could without such experience.

But it may be said that the young inquirer does not want to be a railroad locator, a railroad grader and builder, a bridge-builder, a rail manufacturer, a track master, a switch or signal maker, a telegraph operator or superintendent, a locomotive superintendent, master car builder, or traffic manager. It may be that he wants to get a general knowledge of railroad construction and operation, and educate himself for a general manager or a president. Now, if this is the case, there are some rather awkward questions which ought to be considered. Supposing that after he has completed such an education no one should happen to want him for a general manager or general superintendent, what would he do? It is true that competent men are always wanted for such positions, but those whose services are sought are men who have shown by what they have done that they are competent and have the ability to manage affairs. Our student would have no such reputation, after he had laid up a stock of "general information," and he might find himself unable to get employment on the top shelf. Now general information would not help him to get employment lower down. What is wanted there is special knowledge. If he wants to be employed to locate a railroad or design a locomotive, he must be able to show that he knows how to do these things as well or better than other people.

The writer remembers, soon after emerging from the chrysalis state of his apprenticeship, gravely asking his former employer what position the latter would advise the emancipated apprentice to take. The old man hesitated a moment, and then, with an expression on his face like that which Gen. Butler probably assumed on hearing the news of the late election in Massachusetts, advised the writer "to take whatever position he could get."

During the same apprenticeship there was a philosopher workman who "run" a drill press next to the writer. He was given to saying that, "in order to get on in the world, a man must conceive himself to be a wedge, and when he sees an opportunity he must insert himself." We will finish this article by advising our friend in search of an education first to abandon the use of the term "civil engineer": it will clear away some things that are foggy now; next, to learn to do some one thing, like locating railroads, building bridges, or

making signals, or repairing cars, as well or better than any one else; then "take whatever position you can get," and, after that, conceive yourself "a wedge," and look out for opportunities.

A MODERN JONAH,

— OR —

The New Twenty Thousand Leagues Under the Sea.

(CONCLUDED.)

CHAPTER VI.



ON reaching the plesiosaurus we learned the cause of the curious appearance he presented. It seemed that in our absence the cabin-boy had gained admission to the saloon, and, with the recklessness of childhood, had begun to play with the wires which Sir John had carelessly left exposed. Fortunately for us, however, instead of starting the animal off at full speed he had merely produced the effect we noticed, and which Sir John was able to set right by a few movements of the knobs.

Several days later, as we were sailing along the shores of Newfoundland, Sir John said to me, while I was looking out through the panel in the saloon upon the shoals of fish attracted by our lamp,—

"Professor, are you at all acquainted with the language of ancient Egypt?"

"Very slightly," I replied. "I have deciphered a few inscriptions, nothing more."

"I think, then, that you are enough of an Egyptologist to be interested in what I have to show you, if you will follow me," he said, as he led the way to the library adjoining the saloon. When I had joined him there he pointed to a table on which was lying an oblong slab of stone with irregular edges, and bearing, besides numerous hieroglyphics, a rude drawing of a face, which seemed strangely familiar.

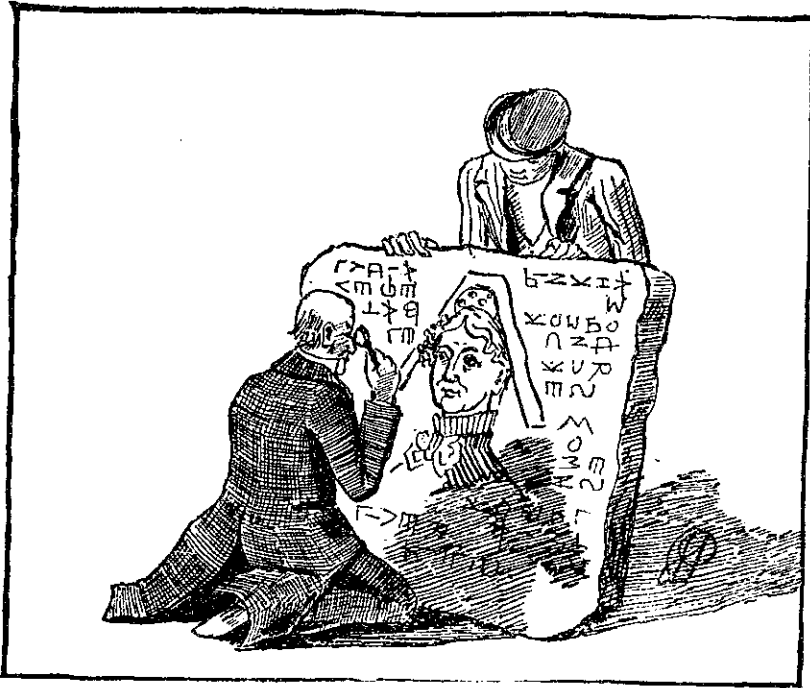
"What do you make of that?" he asked.

I examined it closely for a few moments, and then said, "It evidently dates back to the time of the Pharaohs."

"It does, indeed," replied Sir John, "and it is that Pharaoh now buried under the waters of the Red Sea."

"Why! what do you mean," I cried, while Sir John went on:—

"Several years ago it occurred to me that, if possible to any man, I could find some trace of that vast host which the Red Sea doubtless overwhelmed. After careful study I set my men to digging at what is, without doubt, the exact locality of the disaster. Nothing



but a few heaps of sand beneath the water marked the spot, and at these my men worked patiently for many days. Complete as was our search, however, we only succeeded in finding a portion of a broken chariot wheel, which immediately fell to pieces, and the tablet you see before you. It remains for you to read its secret."

The words of Sir John wrought my curiosity to the highest pitch, and the strangely familiar lines of the face upon the stone haunted me night and day. At night, as though under the influence of some spell, I would leave my bed to study the tablet, to twist the letters about in every possible way, until at last, by the aid of frequent references to a copy of the Rosetta stone which I found on board, I thus, and I have every reason to think, correctly translated the markings upon it:—

O King, live forever. Know, O King, that to me, L—dia E. P—nkham, born in the third year of the reign of thy predecessor, has been given to add another and greater one to the plagues which have been sent upon thee! Waking or sleeping, my face shall haunt thee, thou or thy people shall have no rest from me, nor thy descendants to the last generation. Selah!

CHAPTER VII.

All this time the plesiosaurus had been slowly but steadily moving toward the north. This and the fact that it was early summer made me think that Sir John was falling a prey for a third time to his old passion for Arctic exploration. I said nothing, but watched him closely. He seemed moody and abstracted. One day he would spend in carefully measuring with the *sine* galvanometer the amount of electricity stored up in the battery, or else in examining with the same care the condition of the stores on board; the next he would arrange his collections with a feverish activity,

as though trying to drive something from his mind. After a few days of this mental struggle he said to me one morning, as we were passing Cape Chudleigh on our way into Davis Strait:—

"It is useless, Professor, for me to try to deceive either you or myself any longer. We are on our way to the pole."

The sudden announcement neither surprised nor disturbed me. I had been prepared for it for several days, and I was quite aware of the futility of escape. I therefore merely said, —

"Is the plesiosaurus in a condition to enter upon so serious a journey?"

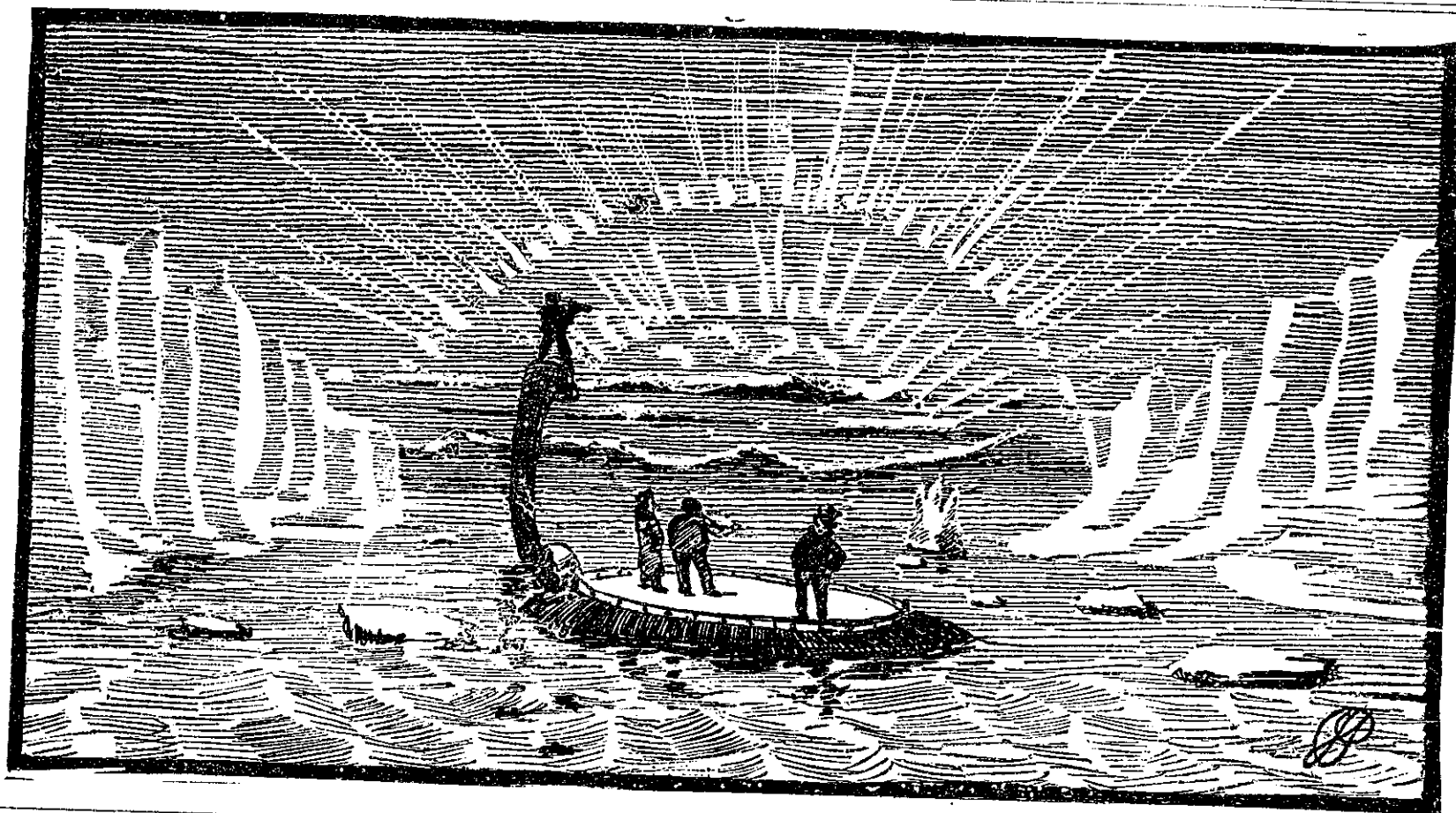
"Everything is ready and in perfect condition," replied Sir John. "I have had this plan in mind for years, and have only been deterred from entering upon it by the want of a companion to make life bearable through the long Arctic nights. Such a companion I have found in you."

"I am in your power, Sir John, and must of necessity accompany you. With the chances for success which we have, however, I can truly say that I do it with all my heart."

Sir John became enthusiastic and communicated his high spirits to all on board. Every preparation possible was made. The electrical apparatus was everywhere examined, and the large platinum sponges, which, by their resistance to the electrical current, warmed the interior of our craft, were so arranged as to give the greatest possible amount of heating surface. Nothing seemed lacking for success. The speed of the plesiosaurus was increased and each day found us from two and a half to three degrees nearer the Pole. Our advance would have been much greater had it not been for the circuitous nature of our path, which the numerous ice floes rendered necessary. The cold was nowhere very great, on account of the season of the year, and our suits of sealskin would have defied any temperature.

We passed with little difficulty up through Baffin's Bay and entered Jones Sound, intending to pass to the north of Parry Islands. As our main object was to reach the Pole, we stopped for little else; but each night found us on deck admiring and taking measurements of the beautiful aurora which, at times, half covered the sky. Light played strange antics in this lonely region. The effect of refraction was particularly noticeable; mirages and mock suns were of everyday appearance.

At the head of Jones Sound our course was stopped by an enormous ice-field, which stretched far away to the north. It was vain to attempt to go around it, or to wait for its breaking up; so after much hesitation Sir John decided to endeavor to pass beneath the floe. Then the advantages of our strange boat became strikingly apparent. Hardly a movement of the knobs and



wires was necessary to cause it to dive below the ice and then to swim along with the same rapidity and steadiness which it would have shown in the open sea. The electrical apparatus was made to furnish oxygen from the decomposition of sea-water, and a few pans of caustic potash, placed here and there, absorbed the carbonic acid we exhaled. Nothing was simpler, and things went on thus without incident for ten days or more, when I noticed that the water, which had been very cold, became much warmer and apparently more transparent. I called Sir John's attention to the fact, and he at once surmised, as I did, that we had passed beyond the floe and were moving in open water. The plesiosaurus, which had been swimming about one hundred and thirty fathoms deep, was soon brought to the surface, and we found our surmise to be correct. All rushed on deck, where, stretching all around us, we saw the open Polar Sea. The climate was sensibly warmer; sea birds of all kinds were flying overhead or swimming in its wonderfully transparent water. Whales and narwhals were sporting about in numbers which would have driven a New Bedford skipper wild.

Sir John lost no time in taking an observation to determine our latitude, and to the great delight of all on board found it to be $86^{\circ} 47'$ —less than four degrees from the Pole. The Hebrew ancestors of our sailors could not have felt more joy on beholding the promised land, than these, their descendants, showed on receipt of the news. The whole day was given up on board to merry-making, and my last recollection was of seeing Sir John and Sam locked in each other's arms asleep.

Our course now lay directly to the north, and, except a few icebergs, we passed nothing of importance. Two days after Sir John had taken the first observation we were within about forty-five miles of the Pole, when shouts from him called all of us on deck. The cause of his excitement was plainly visible on the northern horizon, where a broad mountain or plateau loomed plainly up. Toward the western part a small pass or rift was visible through the powerful telescope on board. That pass was doubtless the gate to the Mecca toward which so many ill-fated pilgrims have started out.

Night came on, and Sir John and myself went below to continue our observations in the mirror in his cabin. On attempting to use it, however, we found to our surprise that it refused to work. Sir John called one of his Se-mitic companions and sent him out on the head of our animal to see if the difficulty was not with the mirror there. He had been gone hardly fifteen minutes before the motion of the plesiosaurus suddenly changed. Instead of being straight ahead, it was circular, as though the creature were chasing its tail. Sir John and myself were appalled at the change, and were wholly at a loss to account for it. He shifted the wires in every possible way, but all to no purpose; still the animal went round and round, while having at the same time an onward movement, which greatly puzzled me. After an hour or two of fruitless endeavor on our part, the rotary motion still continued the same, although we seemed to be moving forward with a constantly increasing speed, as though we were irresistibly carried toward our goal. The movement at last became so rapid as to excite the concern of all on board, when Sir

John and myself rushed from his cabin, intending to go on deck. We had hardly reached the stairway when we seemed in the midst of a rush and roar of waters, so terrible that I fell senseless to the floor.

CHAPTER VIII.

How long I remained in that condition I have no means of knowing. When I came to myself I found Sir John still unconscious by my side. I carried him to the saloon, where I revived him, with considerable difficulty. The stillness on board was frightful, and everything seemed most curiously out of its normal position. We were utterly at a loss to account for what had happened, and after much hesitation concluded to go on deck. What was our surprise on finding ourselves in the middle of a vast tunnel, black as night, save for the rays of our electric lamps, which only made the gloom more visible. A few leaves torn from Sir John's note-book and thrown into the air quickly disappeared above our heads, showing that we ourselves were falling with an enormous velocity—none other than that obtained by the formula:—

$$P. D. Q. \times g.$$

(g =acceleration produced by gravity).

Then the truth flashed upon me; Siemms's theory was correct. The mountain we had seen had been merely a sort of bulwark around the opening of that vast tunnel, which he claimed must pass through the centre of the earth from pole to pole.

The sailor sent to right the mirror upon the head of the plesiosaurus had in some way injured the cerebellum of the animal, and so caused the rotary movement it exhibited. While in this condition our disabled craft had been drawn along by the water rushing through the pass, and had been precipitated into the tunnel, from which we now saw no escape. All the time it was evident that the rapidity of our descent was increasing, although, as we all fell together, our relative positions remained about the same. The temperature, which had been rising, remained stationary, for some unexplained reason, after reaching about 98° F.

How long we remained on deck I do not know. All the clocks on board had stopped, and each minute seemed an age. At last a faint point of light became visible far above our heads. Our speed gradually slackened. We had evidently passed the centre of the earth, and were nearing the end of our first vibration. The point of light broadened to a wide opening,—the southern end of the great well,—and we saw the blue sky far above our heads with a despair deeper than any I had ever dreamed before.

Soon all motion of the plesiosaurus ceased, but only for a moment before the horrible downward movement toward the other pole began. Once more we left the light of day, and then in despair sought our cabins for



the rest we so much needed. I must have slept many hours before I was awakened by Sam, who with a horrified expression, begged me to come on deck. I did so, and found all on board assembled there. Imagine my amazement on following their eyes to see Sir John some thirty feet above our heads falling through the air after us with hair and coat-tails streaming to the wind. A spring-board rigged up on the deck gave me a clew to his strange position, and I correctly surmised that when the plesiosaurus had last reached the highest point of its ascending movement, it had approached quite near to the walls of the tunnel, and that Sir John, encouraged by the fact, had in vain endeavored to make his escape by jumping to the sides.

His position was one of no immediate danger, as the fall would not injure him, provided he did not jar himself by stopping suddenly. His voice was lost to us in the rapid motion, but from his gestures I surmised that he wished for something to eat, and sent the cook below, who returned with a large bun. I took the best aim I could and threw the bun at Sir John, quite forgetting that, by the distribution of matter on all sides of us, the force of gravity upon it was balanced on every side except toward the earth's centre. As a result of my oversight the bun, instead of reaching Sir John, passed into an elliptical orbit, having Sir John for a focus, and with an eccentricity of about .789. The bun of course had the common tendency of us all to fall toward the centre of the earth, but, all sidewise pulls being balanced, it was as I should have remembered, free to move under the influence of the impulse I had given it, and Sir John's own attractive force.

Sir John's anxiety regarding the bun was apparent, even from our point of view, and he soon took out his note-book to calculate its period and perihelion distance. My own calculations gave period, = 127.9 min., perihelion distance, = 3.981 feet, which, taking account of the atmosphere as a resisting medium, would be shortened to 26.7 inches, the length of Sir John's arm in ninety-four revolutions.

Meantime, Sir John's example had given me a hope of escape, which, as neither Sam nor myself were under any obligation to either crew or captain, I lost no time in acting upon. Evidently Sir John had waited until the downward movement of the plesiosaurus had recommenced before jumping, and so had lost much of the effect of his effort. Besides he was an old man, of whom no great agility could be expected.

I therefore sent the crew below while Sam and I rearranged the spring-board. I then explained my plan to him and patiently waited until we again neared, through the effect of our oscillation, the opening to the tunnel through which we entered. Nearer and nearer we came; the sky was again visible above our heads, and, as I had reasoned from the manner in which we had entered the tunnel, the side was hardly twenty feet away. Then Sam and myself mounted the spring-board, and at a sign from me we both jumped, not upwards, as Sir John had done, but directly for the side. We began, of course, to fall immediately; but the resultant of our falling and lateral motion soon brought us to the side, where I grasped a jutting piece of rock, and, drawing myself up, fell fainting upon it. When I regained consciousness I found Sam bending over me, and firing signals of distress with his almost empty pocket pistol. * * * * *

Much to our regret Prof. Bolton's manuscript ends here. We, ourselves, are curious to know by what means he and Sam were again brought within the limits of civilization. We can think of none ourselves; we have called on the Professor several times, but found him out each time; and we leave the whole matter to the judgment of our readers. If they choose to decide that he could n't get back at all, we will immediately strike them from the list of our acquaintances. We have, however, heard on good authority that he is at present busy organizing a relief expedition to rescue Sir John, and we will gladly receive any subscriptions, whether in aid of the project or not, at the office of THE TECH. Don't ring. A. D. L.

Work in the Physical Laboratory.

THROUGH the kindness of Prof. Cross we are enabled to give below a brief statement of the original work done in the physical laboratory during the past year.

As a result of numerous experiments on induction in telephonic circuits, Prof. Cross has found that the induction operating to produce telephonic disturbances is almost entirely electro-dynamic.

The effect of thin sheets of tin-foil surrounding an insulated conducting wire is very slight. The diminution of inductive effect produced when a plate of metal or a spare wire is placed between the wires carrying the inducing and induced currents was found to be much

greater than with the foil, and also greater with the overtones of the sounds transmitted than with the fundamental. That electrostatic induction is almost ineffective, so far as producing sounds in the receiving telephone is concerned, is shown by the fact that if a small secondary coil with a large and deep primary is held at right angles to its plane, the sound disappears; also, if the metal plate between the coils is slit radially, its effect in diminishing induction disappears.

If intermittent or variable currents are passed through a coil of wire forming a closed circuit, within which a second closed parallel coil is placed, the secondary current induced in the latter can be investigated to a certain extent by inserting a receiving telephone in the secondary circuit. If a closed wire coil is placed near to the other coils there is a current induced in it, which, as Henry first showed, diminishes the strength of the current in the secondary coil. A heavy sheet of metal, as of brass, placed between the primary and secondary coils, also diminishes the current in the secondary for the same reason. Hence, in both of these cases, the sound produced in the telephone by induction is considerably reduced.

The effect of brass, copper, and iron is very marked. Lead, also, contrary to an opinion that has been advanced, exerts a very decided effect. Thin foil, even if it completely envelops the secondary, produces but slight effect. The application of these important results to telephonic cables is obvious.

If, instead of being placed in a simple secondary coil, the telephone is placed in a double circuit of twisted wires, so arranged that the current induced in these will be in opposite directions, complete neutralization of currents is produced, and consequently cessation of sound.

Various other experiments have been performed to test the value of different "anti-induction" devices.

Prof. Cross has also found that a Hughes microphone and a Blake transmitter were capable of transmitting the sound of a high pitch bar giving 12,000 double vibrations per second, thus showing the excessive sensitiveness of the ordinary hand receiving telephone. If the capacity of the line were increased, it was found that its ability to transmit high vibrations was diminished. These experiments also showed that change in quality in the sounds transmitted is not due, as has been stated, to an inability of the microphone or any part of this circuit to respond rapidly enough to their higher overtones.

Experiments by Prof. Cross and W. O. Miller (M. I. T. '80) upon a Mason & Hamlin organ showed that the equal temperament scale is closely realized in practice, and thus indicates that a common explanation of the alleged differences existing among musical keys is erroneous. Experiments with three pianos, so tuned that a piece was transposed by passing from one instrument to the other without changing the position of the

keys struck, threw doubts upon the explanation of this same difference given by Helmholtz.

Mr. A. C. White, '82, has made a study of the alcohol thermometer at low temperatures. He employed two thermometers constructed with the greatest care by Baudin, of Paris. They agreed with each other at the lowest temperature measured, differing by only about .005 of a degree C., but deviated from the air thermometer by over 9°.

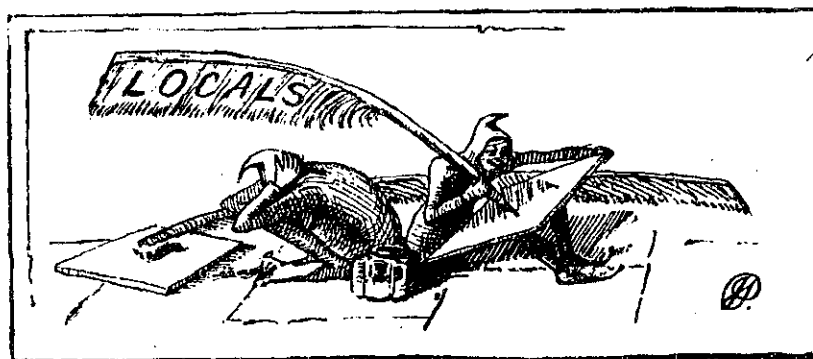
The lowest temperature attained was 88° C., and was reached by the evaporation of liquid nitrous oxide. To avoid using an excessive quantity of this material, Mr. White devised the ingenious method of filling the beaker surrounding the bulb of the air thermometer with copper turnings, the liquid being poured upon them and filling the interstices. Mr. White found a source of considerable error in the adhesion of the alcohol to the sides of the capillary tube.

Mr. F. E. Kidder has made in the laboratory a series of experiments on the fatigue of small spruce beams; and Mr. Silas W. Holman has worked out a simple and admirable method to replace the tedious and somewhat difficult ones in ordinary use for calibrating thermometers. Papers giving the results of the work of both these gentlemen have been published in the proceedings of the American Academy. Mr. Holman has also made numerous experiments to determine the coefficient of friction in leather belting, and in the last number of THE TECH gave a synopsis of his results.

Besides a number of experiments relating to mixtures of colors and certain acoustic effects, a series of observations have been carried on in the laboratory by Mr. Pickering for the past two years on the resistance offered by the air to plane surfaces moving through it at varying angles and rates of speed. Several methods were employed, among others that of propellers of different size and pitch, and revolving from thirty to six thousand times per minute. The results of these latter experiments will soon be in shape for publication.

W. A. Hammett publishes, in the *American Machinist* of Nov. 25, a "New Table of Indicated Horse-power," designed to facilitate calculation when the diameter of the cylinder and the piston speed of the engine are known. This very useful table may also be found in Rigg's "Treatise on the Steam Engine."

Contrary to expectation, Mr. Turner, the new instructor in water-color sketching, did not put in an appearance on Tuesday last; so, unless something unforeseen happens, the first lessons will be given this week.



THE Civils want to know who *Signic* is? L—r is probably the lucky man.

Did you go to the rink Thanksgiving?

Brown, formerly of '83, has entered Harvard this year.

"Laboratory" of '81 will hold a reunion about New Year's.

The Juniors had their first examination in geology Saturday, Nov. 26.

The alumni of '79 will probably hold a dinner in this city about Christmas time.

Now is the time to get your photographs taken at reduced rates. See bulletin board.

'84 has just finished Integral Calculus, but the Seniors say something harder is coming.

Most of the students availed themselves of the vacation and went home to eat their Thanksgiving dinners.

One notices a gratifying decrease in the number of broken instruments since the Gazelles finished their work at Hyde Park.

A large number of photographs of various engineering structures has been placed on the walls of the civil engineer's drawing-rooms.

Would it not be a good plan for the miners of '83 to petition to take the mining lectures over again? They seem to have a special liking for them.

That the Institute has an eye for the beautiful, might have been readily seen by the "Something new in the art line," recently on exhibition in the reading-room.

Four men from the second-year architects are going to pull four from the first-year specials in a tug of war. The latter have the heaviest men and probably will win.

The $\Gamma \Sigma T$ held its first regular meeting on the evening of the 25th at the Parker House.

With the interest now shown, this cannot fail to become one of the best Institute societies.

The *Beverly Citizen* announces the marriage of Mr. Arthur C. Wallis, '85, and Miss Myra B. Greenleaf, both of Beverly.

A ten-mile hare and hounds run was held Nov. 24. Haines and Harriman, the hares, getting in about fifteen minutes ahead of the hounds.

At the last mass meeting held to consider the Rogers Memorial, it was decided to delay the action upon the report of the committee until the next meeting, to be held at the discretion of the committee some time within two weeks. Meanwhile the subscription papers will be circulated and as much money as possible pledged. It was also voted that the committee should select two more men from '85 and two from '86 to help canvass their classes.

The following letter was received too late for publication in a previous issue :—

BOSTON, November, 1882.

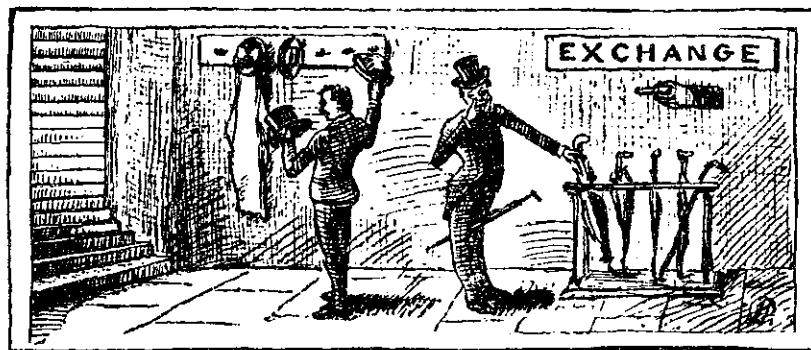
Dear Mr. Editor, — Several gentlemen have come to me for advice about certain machines and mechanisms, and have been so kind and condescending as to recommend their friends. I now express my sincere thanks to these gentlemen, and very much regret not being able to accommodate them, for I am engaged in the following works: namely, draughting and other engineering work for Prof. Whitaker; wood work for Mr. Smith; mathematical calculations for Prof. Runkle, in which the ordinary methods of analytic geometry are used; physical researches in connection with machinery for Prof. Cross; a translation for Prof. Otis of a great work on the subject of engineering called "Elementary German"; and finally a work on the history of science from the time of the ancient Greeks until the present time for Prof. Atkinson. My translation of "L'eau," a work on hydraulics, for Prof. Luquiens, and my triangular work for Prof. Runkle were completed last year. The latter was a difficult task, as it was out of my line. A mechanical engineer's life is a very busy and a very active one; so that I am occupied evenings as well as the rest of the day, and am engaged indefinitely on my present occupations. Notwithstanding all this work, I am not receiving very big pay, but am satisfied with my progress, however slow.

Mr. Small, '85, has my card. He wished me to contribute some articles for THE TECH; and I should be happy to oblige him were my time less occupied.

Respectfully yours,

J. S. BATES, '85.

P. S. I refer any one wishing for work or advice from me to Mr. J. G. Hadley, Third Year Lab'y, M. I. T.



THE *Intercollegiate Press Association*, which is at present occupying so much space in the columns of our exchanges, is the unattained end of a scheme for raising the standard of college journalism. It hopes to do this by bringing the editors of the various papers together at some centrally located college, where they may discuss the aim and best methods of conducting a college journal. The criticism and suggestions which such a meeting would provoke could not fail to be of value to every paper represented, while the personal contact of the editors with each other would tend to produce a mutual respect, alike beneficial to their papers and themselves, and tending to bring their colleges into closer relation. Most of our best exchanges declare themselves strongly in favor of the scheme, a few, notably the *Yale Courant*, oppose it upon various grounds. The objection of the *Courant* is that each paper has a field so distinctively its own that little good would result from an attempt to conduct the paper upon general rules applied to all. This objection, if anywhere, should have weight with THE TECH. The paper is, we are well aware, very different in its aim and matter from all its college contemporaries. We are quite content to have it so; it could hardly be otherwise and still be representative. We think, however, that we have points enough in common with other papers to make the Association of benefit to us, and we will gladly see ourselves among its advocates.

In place of the *Intercollegiate Press Association* the *Courant* proposes an *Intercollegiate Bureau of Correspondence*, in which each paper represented shall agree to furnish, at stated intervals, letters to the others regarding matters

in its own college. This alone would be a great advance on the present precarious method of copying college news; but the idea might be incorporated in the Association.

It is occasionally amusing, but oftener exasperating, to see the same stale items about co-education at Ann Arbor or government at Dartmouth, or something else equally authoritative, making the round of our exchanges in spite of repeated protests from the colleges concerned. Hereafter THE TECH will publish no items of collegiate news which do not come at first hand from the proper authority. We shall also endeavor in all cases to give credit to the paper from which we may take any verses, criticisms, or similar clippings.

A tendency toward the introduction of cartoons is at present noticeable in college papers. As a rule, the cartoons are not of a high order of merit; among others, the *Athenæum* and *Lehigh Burr* would gain by their omission.

We are always glad to see the *Columbia Spectator*. To be sure, its cover is dauby, and often the only respect which its jokes can command is that due to age. We still, however, rank it among the first of our E. C's. and consider it in many respects a model. Its strong points are of course its illustrations, which are the best in any college paper, and its general typographical appearance.

We take the liberty of publishing the following letter, clipped from the *Trinity Tablet*. It may not be generally known that the M. I. T. has already established a thorough course in Electrical Engineering:—

To the Editors of the Tablet,—During a recent trip to Europe I learned that young men and gentlemen were studying Electrical Engineering, which profession has not become overcrowded, and great fortunes have been made in its pursuit. The enormous extension of the telegraph, telephone, electric light, cables, etc., into all parts of the world will create a great demand for skilled electricians. If any of the young readers of your valuable journal are interested in this new field, I will cheerfully give them any information in my power.

Yours very respectfully,

HENRY GREEN.

489 Fifth Ave. and 122 East 26th Street, New York.



SUSPENDERS for college breaches is the janitor's definition of Faculty. — *Collegian*.

The Beacon is to issue a holiday number.

Students of Wesleyan are trying to compile a new song book for the college.

The Harvard Co-operative Society now numbers over seven hundred. — *Crimson*.

There are said to be at least seven thousand American students in German universities.

The annual cremation of mathematics by the Sophomores at Amherst passed off very successfully Nov. 16.

Amherst is soon to have a new library building, gymnasium, and laboratory, while Walker Hall is being rapidly rebuilt.

The trustees of Colby have authorized the president to purchase and distribute among friends of the college a number of copies of each issue of *The Echo*.

The University of Michigan has a Free Trade Club. The students of the University hope to bring out a Greek play and one in German at the next commencement.

The following unique epistle was picked up by an editor of the *Trinity Tablet* in the college yard:—

TRINITY COLLEGE, Wednesday, Nov. 15, 1882.

Dear Father: I like college first rate. Please send me a check for \$50.00. I am growing more liberal minded every day. The girls in town are immense. I took one to the theatre the other night and no one chaperoned us. You can bet your bottom dollar I had a good time. Give my love to Aunt Mary, and tell her I will send her a book to read as soon as I find out where the college library is. The German astronomers are spending a few days here to observe the transit of Venus and Adonis, which, I am told, closes on the fifth of December.

Don't forget the check.

Your af. son,

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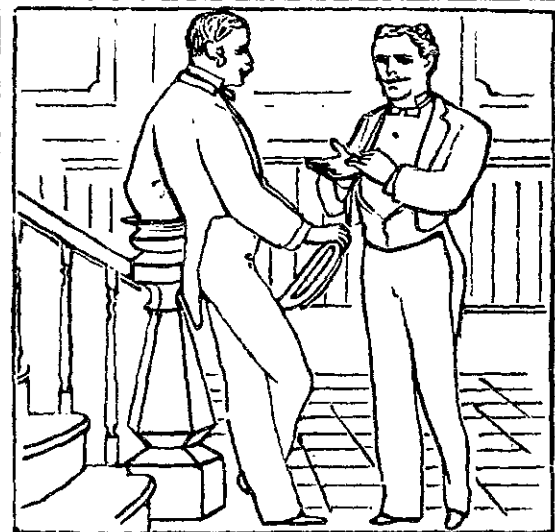
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Smitkins wrote to his father, who's farmin' out West, that he was very busy with his annuals, and the old man wrote back that he "wants to be mighty keerful about wot kin' o' seed he bo't."—*Herald.*

The new problem, that of a design for a railroad station in a suburban town, is not very far advanced as yet, owing to the recent vacation; but, from present appearances, the designs are far too elaborate for "a considerable country town" to erect.

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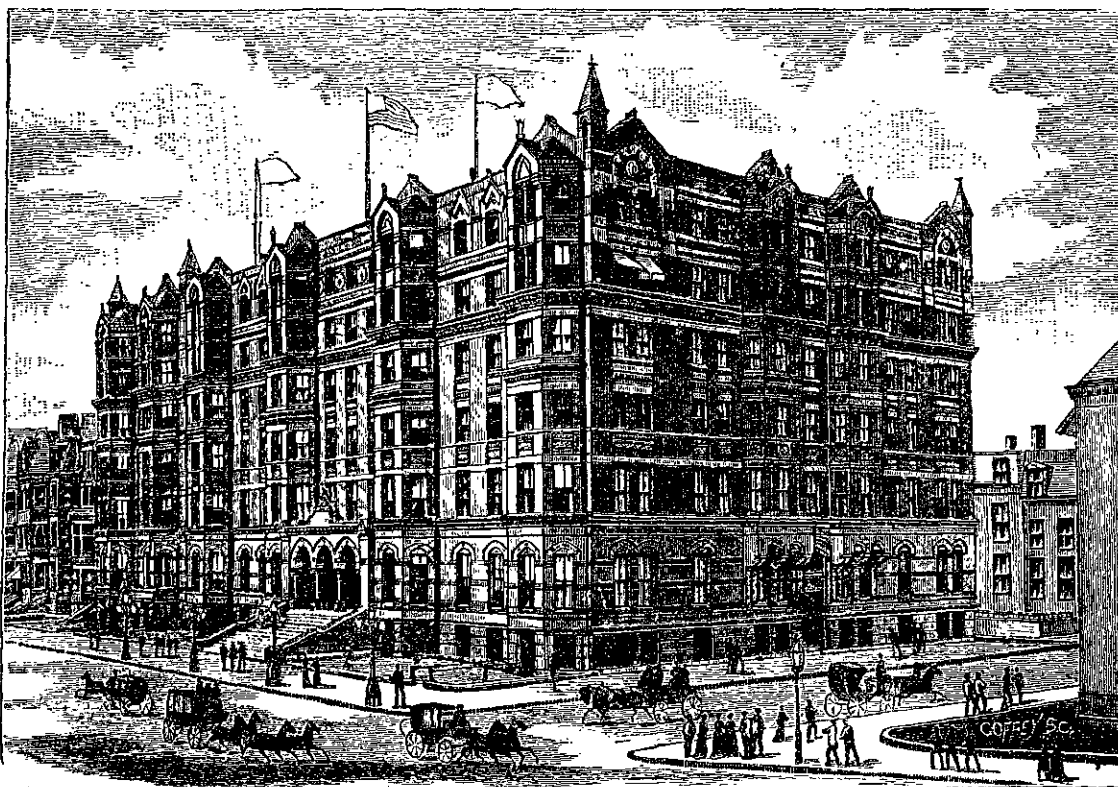
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Besides the above distinctly professional courses, the Institute offers scientific courses of a less technical character, designed to give students a preparation for business callings through the medium of a scientific training.

Modern languages are taught so far as is needed for the ready and accurate reading of scientific works and periodicals, and may, at the option of the student, be further pursued as a means of general training.

The constitutional and political history of England and the United States, political economy, and international law are taught, in a measure, to the students of all regular courses.

Applicants for admission to the Institute are examined in English grammar, geography, French, arithmetic, algebra, and geometry. A fuller statement of the requirements for admission will be found in the catalogue, which will be sent without charge on application.

A clear admission paper from any college of recognized character will be accepted as evidence of preparation in place of an examination.

Graduates of colleges conferring degrees are presumed to have the necessary qualifications for entering the third-year class in any of the regular courses of the Institute, and will be so admitted provisionally, on the presentation of their diplomas.

The feature of instruction which has been most largely developed in the school is laboratory training, shop-work and field-practice, to supplement, to illustrate, and to emphasize the instruction of the recitation and lecture room.

Surveying instruments are provided for field work in civil and topographical engineering. Shops fitted up for the use of both hand and machine tools and a laboratory of steam engineering have been established as a part of the instruction in mechanical engineering. The department of mining engineering and metallurgy has the use of laboratories in which the milling and smelting of lead, copper, silver, and other ores, in economic quantities, are regularly performed by the students themselves. The classes in architecture supplement the work of the drawing and designing rooms by the examination of structures completed or in course of erection, and by practical experiment in the laboratory of applied mechanics, testing the strength of materials and working out problems in construction. Extensive laboratories are provided for students in chemistry and in natural history, as well as laboratories in physics and applied mechanics, for the use alike of special students in these departments and of the students of the several regular courses.

On the successful completion of any one of the four-year courses of the Institute, the degree of bachelor of science will be conferred. The Institute is also empowered to confer the degree of doctor of science.

The Institute of Technology, as a recipient of a portion of the United States grant to colleges of agriculture and the mechanic arts, gives instruction in military tactics.

The fees for tuition of students taking the full course is \$200.00 a year. Besides this, \$25.00 or \$30.00 per year are needed for books and instruments. There are no separate laboratory fees: only payment for articles broken is required.

Attached to the Institute are also two special schools, viz.: the "School of Mechanic Arts" and the "Lowell School of Industrial Design." The former gives a training in the use of tools together with elementary mathematics and drawing. English, French, and geography are also taught in this school. The fees for tuition are \$150.00 a year. The Lowell School teaches the making of designs for prints, carpets, wall-papers, laces, ginghams and other woven goods. A weaving department with a variety of looms is connected with this school. No charge for instruction is made.

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President Arthur, in his annual message, recommends a reduction of tariff and that the national debt be not paid so fast.

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