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"Apprentice" and "Middler" have appeared for the last time in the Catalogue. They will soon be relics of the past and the "Freshman" and "Sophomore" will, after the April vacation, wander through Boynton Hall. Although few, if any, regret the change which must follow along with the advance made by the lengthening of the course, curious results ensue. Ninety-four must for a time return to their "Junior" days, and Ninety-five after toiling laboriously for nearly a year as "Juniors" must soon start in on another "Junior" year, while the "Prep" will now receive his appropriate name.

Some time will doubtless elapse before the old class designations, surrounded with so many pleasant memories, are entirely superseded by the new ones, but the WPI hails these as a part of the forward movement at the Institute.

The questions relating to the Institute pin are or should be of interest to every student. In another column it will be seen that the Senior class has appointed a committee with the request that the Middle and Junior classes appoint similar ones to act with it in settling these questions. The first point which for some time has been discussed by many students is in regard to the size of the pin. It would seem that its style and beauty would in no way be diminished but would rather be increased if the size were reduced about one-third and surely it would add much to its neatness and one would not feel that he was the possessor of a gold mine. We sincerely hope to see the committee report favorably upon a reduction in size. The second point is in regard to the manufacture and sale of the pin. All are aware of the shiftless manner in which these have been conducted in the past. It is high time that there were better arrangements. A definite contract should be made with some responsible house and the pins should be constantly in the market. We have a handsome pin, one which every good Tech should be proud to wear, and we are anxious to see it more generally worn. It cannot, however, be surprising that the adoption of the pin has been less general than it should have been. It has been difficult to obtain one without ordering it weeks and even months ahead, and sometimes it has been necessary to have a number ordered at once.

There is surely quite a field of work before this committee and we trust that these matters may be finally and satisfactorily settled by them. Then let every student own and wear the Institute pin.
The World's Fair at Chicago is, naturally, of absorbing interest at the present time, and the WPI has endeavored, and will in the future endeavor, to keep in touch with the Fair, so far as it in any way concerns the Institute. From the report of the Executive Committee, published in the number for Nov. 24th, we judge that any further action by the Alumni as a body now rests with the Western Associations, and we shall be glad to hear from them soon.

From the article in this number, it will be seen that there is to be practically no exhibit of the work of the Institute, which, under the circumstances, seems unavoidable. The whole matter of an educational exhibit has been and is still in a very unsettled condition. The State of Massachusetts was only allotted twenty thousand square feet of space for its entire educational exhibit of all grades. It is easily seen that the Institute would have needed at least one thousand feet for a display of wood and iron manufactures, drawings, etc., to be in any way worthily represented. But it has been impossible to obtain any assurances that such an amount could be granted to the Institute. We regret exceedingly that the matter of expense has caused the Trustees to deem it advisable to cease pushing the matter, for it would be a source of pride and gratification to every alumnus and student who may visit the Exposition to see his Alma Mater well represented.

We hope that the Alumni will not be deterred, on this account, from carrying forward and completing some definite plan for a grand reunion at Chicago. Many graduates and undergraduates are planning to be present at the Fair, and, for their sake, we hope for something more satisfactory.

A bill has passed Congress appropriating $64,000 to William and Mary College, as a reimbursement for the destruction of its buildings and other property by soldiers during the Civil War.

**ENGRAVINGS.**

How Half-tones, Gelatine Plates and Lithographs are made.

There is a most numerous class of people who love to look through the pages of magazines and comic papers, admiring the fine illustrations and engravings which are to be found among them, and wondering often times just how such results are obtained for the limited amount of money and time which can be spared for their production. Many such people have confused ideas of half-tones, gelatine-plates, lithographs, all of which words when pronounced give the speaker a feeling of satisfaction that he has impressed upon his hearers the extent of his knowledge and familiarity with the terms, coupled with a feeling of security that no questions will be asked lest his questioner reveal his ignorance. To this class the writer has for several years belonged. A half-tone was to him, well, an engraving, perhaps a little less loud than a whole tone; a lithograph was a colored picture printed from plates of stone, the engraving of which was a long, costly and tedious process.

Accordingly, to clear up his mixed notions and to have intelligent ideas upon the subject, he recently took a short pilgrimage through various engraving establishments and the following is the result of observations made and information obtained by a generous indulgence of the Yankee right of asking questions.

A form of engraving which has only recently come into use, but which every year is growing in popularity is the Half-tone. The first step in the process, and one of the most important and peculiar, is the photographing of the picture, sketch, or photograph which is to be reproduced. It can be easily seen that a plate exactly like a photograph would be useless in a printer's hands, for the lights and shades present unbroken surfaces quite alike, varying only in depth. Hence the ink from the printer's roller would either find no lines upon which it could adhere, or else cover the light and dark places with an equal coating. In this point is the key to the whole process. The camera in which the negative is exposed is provided with a peculiar combination of lenses and prisms, by means of which the photograph is taken through an extremely fine screen. As a result the rays of light gather into lines, and a negative is produced similar to the original picture, except that the surfaces instead of being unbroken are composed of extremely fine lines or successions of dots crossing each other at right angles. Where there is much light reflected from the original, more gathers about the wires of the screen and hence these fine cross lines in the darker surfaces
are heavier than in the lighter ones. To insure uniformity in the work, these photographs are all taken by electric light, and the plates are of the best French glass. Special chemicals are used in the development of the negatives with the idea of obtaining greater contrasts and deeper blacks than would be obtained in the usual way.

After the plate has been developed, the next interesting step in the process takes place. The picture, as it lies upon the negative ready for transference to the copper plate which is to be the "cut" or the engraving itself, is just the inverse of the original; and that the scene when printed upon the page shall be true to life, it is necessary that the negative be changed to a positive before anything further is done. To do this, strange as it may seem to the uninitiated, the picture is peeled off from the side of the negative, turned over and replaced. This at first seems nearly impossible, but the process is very simple. The albumen which forms the body of the coating of the negative, is first brushed over with a transparent substance which adheres to the dry surface without dissolving it. Then when dry, another coating of albumen is laid on above it; when this is dry, another, and so on until a film of appreciable thickness has been built up. This film is then soaked and peeled off, and in that condition is a most curious bit of nothingness. So thin that the slightest breath of air would crinkle and blow it away, it still shows when held to the light, all the lines and shadows of the original object, and as we look at it in its delicate perfectness, we fancy that one of the multiplicities of images with which all space is filled, is caught at last without the intervention of cumbersome screens and lenses.

After being turned over, the film is replaced upon the glass and dried. The copper plate which is to form the engraving, and which has had its surface covered with a sensitive coating, is then exposed beneath this positive negative. The albumen surface of the copper plate wherever unaffected by the light, is soluble in water and after washing and treatment with chemicals, the copper surface becomes exposed wherever light is to appear in the picture.

From this point on, the process is merely one of etching by acid. There is one ingenious step, however, which should not be passed by. As soon as the acid has eaten below the surface of the copper, it tends to eat also sideways and cut under and weaken the raised and protected lines of the engraving. To obviate this, as soon as the acid has begun to cut below the surface, the plate is washed and dried, and a very fine powder is brushed over it, in one direction only.

The plate is then heated, causing the minute drifts of powder which have gathered along the lines to fuse and form an effectual barrier to further damage from the acid. The plate is given a quarter-turn and the process is repeated. After all the unprotected sides have been covered, the acid is once more poured on the surface, and the etching continued until the required depth is reached.

Half-tones are used almost exclusively to reproduce photographs, because by them an unbroken surface can be represented by dots and lines, and by these a half-tone can usually be distinguished with a little inspection. But one must not always jump at the conclusion that an engraving is a half-tone because of its fine cross lines; for most steel engravings, and other engravings made by hand, are shaded in this manner. The lines in the half-tone, however, differ from others in that they usually extend over the entire surface and in but two directions. Moreover, on careful examination, no sharply defined edges or lines can be found in a half-tone, although at ordinary reading distance, the effect produced is the same.

Photo-engravings are produced in a similar manner, except that the negative, under which the coated copper plate is exposed, is used in an ordinary camera, the sketches or drawings furnishing the original, being themselves line surfaces sufficiently defined.

Gelatine prints, heliotype, phototypes, sun-types, Albert-types are names given to engravings made by processes differing but very little. As my informant said, "Smith undertakes to make gelatine plates, and he calls them Smithotypes." The process was invented by one Albert of Munich, and is as follows: The copper, zinc, or glass plate which is used, is first covered with a sensitive gelatine coating. This is exposed under a negative, and, as a result of the action of the light, portions of the surface will absorb water. When, then, a roller of greasy ink is passed over, the ink will adhere to but a portion of the surface, thus producing the picture. This process is of use only where a small number of copies is desired, as the printing is slow work, and the plates last at the most for only a few hundred copies. The prints, however, have a softness and tone that is unapproached by the other processes.

The principle of the lithograph is the same as that of the gelatine plate. Lithographic stones are composed of an extremely fine, yellow limestone, which takes a smooth, uniform polish. They are usually about six inches thick. In colored plates, separate stones are used for the different colors. If it be a stone from which the blue is to be printed, an artist carefully repro-
duces, with a greasy crayon upon its surface, all the blue parts of the original. The crayon work is then set with the flame from alcohol lamps, and the stone is ready for press. When the roller with the special ink, blue in this instance, comes along, the ink refuses to adhere except where the artist has touched the surface with his crayon, and the result is a reproduction of all the blue in the original. A plate for another color is then substituted in the press and the operation is continued until all the colors have been transferred. Some of Prang's art chromos require no less than thirty-five stones, and, of course, an equal number of impressions. The artists who do this work receive from $40 to $50 a week. All the originals from which these fine chromos are made, are owned by the company, that no other copies may be made. In the basement of Prang's establishment at Roxbury is an immense fire-proof vault filled with tons and tons of lithographic stones which have aided in the reproduction of some fine pictures.

Finally, those who wish to compare pictures made by these several processes may look at the following: The engravings in the '94 and '93 menu-cards are photo-engravings; the football picture in the W P I and the cut of the Institute on the W P I calendar are half-tones, while the picture of Dr. Kinnicutt in '91's Aftermath is a gelatine-plate. The colored pictures of Judge, Puck, and the funny papers are lithographs.

ONE TECH'S WORK FOR THE WORLD'S FAIR.

Mr. Edward H. Thompson, formerly a student at the Institute, and for the past eight years United States consul at Yucatan, was recently a guest of Hon. Stephen Salisbury. Mr. Thompson has just returned from Chicago, where he has been employed in the interests of the ethnological department, of the world's fair. His return to his consulship was made on the 3d inst. The Spy has the following interesting account of Mr. Thompson and his valuable scientific work in Yucatan:

"During Mr. Thompson's eight years continuous residence in Yucatan he has brought to light many important geographical and archaeological facts concerning the almost unexplored region lying between Guatemala, Yucatan and Chiapas. So important were some of these facts that the Royal Geographical Society of London made him an F. R. G. S., an honor rarely conferred upon a foreigner. He, however, esteems it as the highest honor that he was chosen to head the two very successful scientific expeditions among these ruined groups of Yucatan under the auspices of Harvard College. The object of these expeditions was to obtain all scientific data possible upon those massive piles of ruined structures that have lain buried no one knows how many centuries in the jungles of Yucatan.

This object was successfully carried out. Both expeditions returned laden with facts that will go far toward solving the archaeological problem as to the origin of these mysterious structures and their far more mysterious builders. Hardly had Mr. Thompson concluded his labors of the last expedition of 1891, when he received a cablegram from Prof. Putnam of Harvard College, then just chosen chief of the department of ethnology at the world's fair, asking him to carry into effect an audacious plan that they had both long ardently desired to accomplish, but which had hitherto been impossible because of the great cost. This plan was to reproduce sections of the most important ruined structures of Yucatan; to reproduce them, not in miniature, but natural size, so accurate in shape, color and size as to be undistinguishable from the original structures themselves.

The exposition commissioners, mindful of their duty to have that which represented all that was latest and best in the progress of science as well as material, cheerfully made such an appropriation as was needed, while the Mexican government courteously undertook to admit free of duty the material needed in the great undertaking.

Consul Thompson's first work was to select his men, a chosen band of native Indians, many of whom had been with him for years in his research in the jungles, and then to establish a papier mache manufactory at the foot of the very ruined structures themselves. With this papier mache combined with other material he took accurate moulds of every stone to be reproduced. So accurate were these moulds that the casts when made at Chicago showed every line, the grain even of the stone itself.

Suffice it to say, after seventeen months' hard work in the deadly miasma laden air of the jungles, with many of his natives fever stricken and even dying, the work was accomplished, and the great cases of moulds, four car loads, were safely placed in the steamer's hold. Consul Thompson was then given leave of absence, with liberty to visit the United States, in order to recover his health, that had been sadly broken by the undertaking.

After this result had been in a measure accomplished, he was detailed by the Department of State to supervise the casting and final erection of these reproductions at Chicago. Several months of labor and a large force of competent men carried the work to a most successful con-
conclusion. The structures are duly erected upon the site selected for them, and Consul Thompson has been stopping over a few days in Worcester, while en route for his post, at Merida, Yucatan.

THE TECH AT THE CHICAGO EXPOSITION.

So long ago as October, 1891, the Trustees of the Institute appointed a committee to consider the question of an exhibit at Chicago. Application for space was made in February, 1892, but the whole matter of the educational department at the exposition was left in a most unsatisfactory state of uncertainty all through the summer, and up to October last it was impossible to ascertain what space would be granted or whether any would be assigned. The delay was so exasperating that Mr. E. C. Hovey, the Secretary of the Massachusetts State Commissioners, became entirely discouraged, and at one time came very near giving up any attempt to make a State educational exhibit. It was felt by the committee that there was so little space allotted to the display of separate educational work of any one institution that there would not be the probability of securing sufficient space to make an adequately extensive exhibit of the whole work of the school. Moreover, it seemed that the money requisite to defray the expense, estimated at $2,000, could be more profitably used in some other way. Hence it was decided not to undertake it. But in two or three ways the Institute will have representation. First, in a collection of minerals which President Fuller has sent to form a part of the State exhibit. These will appear as a loan from the Institute. Most of them have been collected in this vicinity. Secondly, the Institute may send a collection of photographs, of both exterior and interior views of buildings and rooms, to form a part of the representation of educational work made under the supervision of the U. S. Bureau of Education.

That no complete exhibition of all the features of the Institute could under the circumstances be made is evident, when only nine square feet of wall space and three or four square feet of table area is allowed to a single college.

The Institute could probably have had much more space, but not easily enough for its purpose.

NOTES FROM ENTROPY.

Worcester, March 6th, '93.

Mr. Editor:

As the school grows in numbers the lack of good, acceptable excuses must be felt more plainly, especially as a little variety is essential. One that is new to me and which seems to have been the product of ingenuity worthy of the W. P. I., reads as follows:

"There was a broke on the car I came on." As it was given out in the wild West, it was excused.

* * * * *

A little time ago I had a discussion about a matter of mechanics.

The question under discussion was this: Suppose a hole to be bored by means of a single cutting tool in a bar, rotating on the centres of an engine lathe; the work is secured to the carriage and traversed along the bed of the lathe as usual. If the tail centre be set over, as in turning tapers, will it affect the roundness of the hole? My position was that a hole bored under such conditions would be elliptical in cross-section, making no qualification as to the eccentricity of the ellipse.

The gentleman whose statement brought about the discussion claimed that, even if the tail centre were set over even four feet (a rather rash amount) the hole bored would be round, making no qualification as to what he meant by the word round. He advised me to try it, as I would "learn something." I tried it and I am free to confess that I did learn something. Not the thing he was going to teach me however. What I learned was not precisely mechanical. It wasn't exactly up to the level of psychology. It was a specimen of human nature. Age has no effect on a man's judgment, when that judgment is questioned by one who is considered inferior in intellect or experience. Of course the extent to which the above statement is true depends a great deal on the man. I have yet to find a man whose judgment is worth anything to whom it does not apply to a small degree. What I learned was that it applied with great force to the particular specimen of the genus homo under consideration.

To get back to the mechanical part of the matter. The reason for the production of an elliptical hole was this; although the cutting point travelled in a true circle still that circle was not in a plane perpendicular to the axis of the hole bored; an elliptical hole.

Well I tried it. A slight mathematical calculation will suffice to show that the difference between the major and minor axis of the ellipse varies as the versed sine of the angle between the boring bar and the ways of the lathe. For small angles the versed sine is small, but is a rapidly increasing function of the angle. Consequently with the small amount of "set over" which I could obtain I could not get a great eccentricity. In fact, in a two-inch hole it
amounted to only .02 or .03 of an inch. When my friend came around to crow over me and tell me "I told you so," his antics would have been laughable if it had not been for the shallowness of his attempts to show that black was white.

He claimed that the hole was practically round but had to admit that, if a man in his shop had bored such a hole and called it round he would have occasion to seek another situation. His principal argument after that was, that it took him twenty years to find it out and he had worked twenty years in a shop since to get the knowledge driven in, of course a young man with only six months' shop experience didn't know anything.

Well, to cut it short, the American Machinist has since decided in my favor. The other gentleman took occasion to deny the correctness of my statement and re-stated it in other words which meant the same thing. The Machinist has not changed its decision. I simply state this thus freely because when I first wrote to the Machinist on this subject, I did so over my own signature while when he accused me of falsely stating the facts he used an assumed name as I do now.

COMMUNICATION.

[The following unsigned communication was handed to one of the Ninety-four editors by a man who refuses to disclose his identity to the editor-in-chief. Under these circumstances we have ventured to use a few capitals and italics, which we hope, will add a little to the reader's understanding of the article.

We take great pleasure in publishing it, however, as it relieves our mind of a great deal of curiosity and makes many things as clear as a crystal of the "rhombohedral form of the hexagonal system." If any more information is wanted upon this subject doubtless the kind-hearted Ninety-four man, whose arguments prevailed with the wood man, can furnish it. Ed.]

Mr. Editor:

There seems to be a general misunderstanding among members of the Institute, except Ninety-four, concerning the bon-fire at the time of our Half-Way Through Supper. Ninety-three, or several members of that class, think they played a pretty good joke on us. It is too bad to take the pleasure of this from them, but it is only right that the matter should be showed up in its true light. While enjoying our supper at the Commonwealth Hotel, we received news that our combustibles for a bon-fire had been burned. This didn't spoil our supper, however. After the exercises were over at the hotel, we adjourned to Tech hill. A committee was des-patched to the woodman's and grocer's houses and soon, very soon, a load of wood and some kerosene, etc., was forthcoming. All of this material was paid for, and that is all that was paid for by Ninety-four.

NOW COMES THE INTERESTING PART. The woodman naturally wanted his pay for the wood, etc., burned by someone else than Ninety-four, and he was also rather disturbed that anyone should come and fool him out of a lot of wood. He described very accurately the person who did the fooling, and later picked him out of a crowd. The bill for the wood was then put in the hands of a lawyer for collection. At this point in the proceedings the matter was enquired into by a Ninety-four man, and it was found out how the matter stood. The accused man had been summoned to appear in court.

Proof had been secured that no mistake had been made in getting the right man. If the man refused to pay the bill, and if he couldn't be compelled to by the court, a warrant would have immediately been got out for his arrest for obtaining goods under false pretences. It seems that another Ninety-four man had been punching up the wood man and encouraging him in his proceedings, but when he found out that the affair was taking such a serious turn, and that if a student was brought up in court, it probably meant his suspension from the Institute, he repented and told the wood man that the feeling at the Tech was pretty strong against him, and that if the man was suspended he would never get his pay and that the students never would forget it. This, with a few more arguments, persuaded the wood man to let the matter rest, and there it stands now. Perhaps it might have been a good thing for Ninety-three's pride if it had gone a little farther.

PROF. YOUNG'S LECTURE.

Prof. C. A. Young gave his second lecture Friday evening, February 24th, in Memorial Hall, upon "The Planets."

The lecture was of a similar character to the preceding one, but was very entertaining. Prof. Young is a conservative astronomer and does not give much credence to the various theories of life on the planets and of the evidence of amazing discoveries in planetary and stellar space, which his more imaginative brethren, such as Schiaparelli, the Italian astronomer at Milan, have within the last few years advanced.

After speaking at some length upon the planets and asteroids, their relative sizes, methods used in their discovery, etc., Prof. Young illustrated his words the remainder of the evening with stereopticon views. These showed the Ptolemaic...
conception of the universe, the Copernican, the orbits of the planets collectively and their relative sizes, and the planets in various phases individually. Prof. Young agrees with Schiaparelli in saying that Mercury behaves with respect to the sun as the moon does to the earth,—that is, presents only one side of itself to view.

In speaking of Venus, he said that many people were on the watch for the return of the star of Bethlehem, and often mistook this planet for that famous star. Many inquiries about this are received at all the prominent observatories, and at Greenwich they have a printed card which is sent at once by way of reply. It reads: "The star you inquire about is Venus, not the star of Bethlehem."

Perhaps the most interesting, and certainly one of the most valuable points in the lecture was that, apparently at more than one place in the heavens, nebulae are being resolved into planetary systems. A striking photograph of a nebula in Andromache thus partially separated into rings was exhibited on the screen. It was as the lecturer described it, "a picture of a system of worlds in the process of being born." Other similar photographs have been taken. These observations are strongly confirmatory of the nebular hypothesis as applied to our solar system. It was also satisfying to hear the views of an expert concerning the extent of our real knowledge of the planet Mars. So much has been written on the subject of late, and often so clearly in an exaggerated style, and Schiaparelli has so confidently announced his theories as if they were well assured facts, that we were all glad to hear the judgment of a high authority that the so-called "canals" could hardly be identified as yet as narrow streams or channels of water. We sometimes need to be told just what we do not know. Science is what we know; facts are scientific. Our haste to reach something beyond often leads to fanciful conclusions, and if the habit grows, to credulity.

CHARLES OTIS WELLS.

At the meeting of the N. E. I. A. A. held in Boston, February 11th, a committee was appointed to draft resolutions on the death of Mr. Wells, late President of the association. They have submitted the following: —

Whereas, God, in His Infinite Wisdom, during the past year has deemed it best to remove from earth our true and well beloved ex-President, Charles Otis Wells, and

Whereas, We feel that the Association has lost by his death, a tried and loyal friend, and one ever interested in her welfare and progress, be it

Resolved, That we extend our sincere sympathy to his relatives and to all who are bereaved by his death.

Resolved, That these resolutions be placed on the records of the Association and that a copy of the same be printed in the various papers of the associate colleges.

Henry J. Notes, Jr., Clarence W. McKay, Leon B. Bacon,
Committee for the Convention.

Boston, February 11th, 1893.

THE TECH SHOW.

The committee appointed by the Athletic Association to have charge of the arrangements for and conduct of the musical burlesque entertainment have been busily at work and have things fairly well under way.

The play, if such it may be called, is based upon the Mother Goose story of Jack and the Bean Stalk, familiar to all from childhood days. It was composed and arranged by one of the students and has been pronounced a good piece of work by an expert. It is made up of a large amount of original music interspersed with some familiar airs. There will be a large number of special features and, judging from the general character of the work, it promises to be of great variety and will be sure to be amusing to any audience and to a Worcester one in particular.

As is well known an annual entertainment is a comparatively new feature at the Institute but the students proved last year in the minstrel show that they were capable of doing what they undertook in first class style. Although the entertainment this year is of quite a different character, there seems to be no reason for its being anything but a success. It means, however, much work for the committee in charge, the vigorous support of the students, and the earnest, careful efforts of all who are to participate in the play.

Opportunities have been given the students to display their vocal powers and the choruses are nearly made up, about twenty-five having been selected. The cast of characters and outline of the play will appear probably in the next number of the W P I.

The entertainment will not be given until immediately after the Easter recess, because it will be impossible to get in the necessary rehearsals before that time. No one should on this account be any the less diligent in attend-
ance at the rehearsals because it is absolutely necessary that each shall do his best that everything may go successfully and redound to the credit of the Institute.

LABORATORY NOTES.

Chemistry.

The department has recently obtained a sample of sodium peroxide from Germany made by a new and patented process. Sodium peroxide was formerly made by adding metallic sodium to the nitrate of sodium, but the product obtained in this way was too expensive for industrial uses. This German process, which has been brought forward within three months, very much cheapens this chemical. The peroxide of sodium is a powerful oxidizing agent and is used in bleaching. It is much superior to hydrogen peroxide because it is a solid, and when kept in sealed bottles retains its strength without change, while the latter is a liquid and cannot be kept without deterioration, its strength being always uncertain. Mr. Hopkins of the Senior class is studying this chemical in order to determine to what uses it can be put in analytical chemistry.

THESIS SUBJECTS.

Department of Electrical Engineering.

Kent, E. E. Measurement of Self-Induction.
Marshall, E. W. Transformer efficiencies
Coombs, H. A. Insulation resistance and
Capacity Measurements of Cables.
Dodge, A. R. Transformer Efficiencies;
Perkins, T. S. Various Methods.
Starbuck, R. M., Jr.
Clark, H. G. Efficiency of Motor Dyna-
Parks, R. S. mos by Electrical Measure-
ment.
Bowen, H. W. Storage Batteries.

Post Graduate Electrical Course.

Howard, E. W. Estimates for Electrical
Smith, C. O. Equipment of Street Railways.
Street Car Motors.

Theses, Department of Chemistry.

Cheney, F. W.—Determination of arsenic and phosphorus in metallic copper.
Hopkins, E.—Analysis of spring-water from Williamstown, Mass.
Hodgkins, D. H. Examination of deposits found in sewage-carrying streams.
Howard, C. D.
Lincoln, P. W.—Separation of nickel and cobalt.
Parker, W. H.—Sanitary condition of the water of Lake Quinsigamond.

SENIOR CLASS MEETINGS.

At a meeting of the class, held February 28th, the matter of the Institute pin was brought up and a committee of two appointed to act in conjunction with a similar committee from the Middle and Junior classes, to investigate the feasibility of reducing the size of the pin and also to make different arrangements in regard to the manufacture and sale of the pin.

At the request of Dr. Fuller, the class met on Wednesday noon, March 1st, in Room 19, and received instructions and information in regard to Commencement affairs. The Faculty have prepared a list of nine men as suitable from their point of view to deliver the valedictory. The class is to select a list of nine men whom they would like to receive the honor, and then may elect one from among those who are common to both lists.

Other minor matters were brought up. The Seniors were also told that, in addition to the requirements for a diploma and a degree named in the catalogue under which students up to this time have entered the Institute, "Under authority of the Legislature, the Board of Trustees will, at Commencement, confer Diplomas, with the degree of Bachelor of Science, upon all members of the Senior Class who have completed the prescribed course of study, passed satisfactorily the required examinations, and are commended by the Faculty as deserving," the Trustees have voted to further place the Seniors upon probation for one year. If during this time they do anything offensive to the Trustees, their degree is to be taken away and their names taken from the catalogue, although they may have fulfilled all previous requirements and graduated with honor.

MIDDLE CLASS MEETING.

At a meeting of the Middle class held Tuesday noon, March 7th, a committee of two was chosen to confer with like committees from Ninety-three and Ninety-five about the matter of an Institute Pin. An informal vote was taken to see whether the class desired to publish a book. It was the unanimous desire of the class to publish such a book and steps were taken towards the appointment of a board of editors.

THE OUTLOOK FOR BASE-BALL.

Under the management of Capt. Gordon base-ball affairs for the coming season are assuming a definite shape. A thorough canvass of all the classes has revealed the presence of over thirty base-ball players in school. Some of them were members of last year's team,
while others will be seen this year for the first time on a Tech nine. There are more candidates from the Prep. class than from any other, some of these have very good chances of securing positions on the school team. Zaeder as a first baseman is hard to beat. Philpot, Knowles and Cullen have played on the High School team of this city. Among the others are men who have represented Worcester, Westford, and Cushing Academies and many high schools.

Among the higher classmen, Lincoln, Dyer, Parker, and Leland are candidates for catchers; Abbott, Allen, and Stone, pitchers; Perkins, Muir, and Harris on the bases; Warren at short; Stone, Whipple, and Gallagher in the out-field. Gordon will play centre-field. The prospect of a fine team this spring is very favorable. There is plenty of material and we have a good captain. It is to be regretted that there is no cage or place of this kind where the batteries may work during the winter. Gordon, however, hopes soon to have a room over the new shops where the men may get their arms in condition, and spring is not far distant. Games have been arranged with the Aggies, both in Amherst and in this city, with Tufts and Wesleyan, and others doubtless will be played here. If good attendance and a lively interest in the fortunes of the nine can be secured there is no reason why the Worcester Polytechnic Institute should not be well represented in the ball field during the season of '93.

**FOOT-BALL.**

At a meeting of the last year's foot-ball eleven, February 28th, M. B. Chase was elected captain to serve until next fall. A tackling bag will be placed in the Y. M. C. A. gymnasium in a very short time, and a squad will begin light training. There seems to be some good material in Ninetysix, and as soon as the snow goes this will be brought out as much as possible. There is a plan on foot which, if carried out, will place foot-ball at the Tech far above where it has ever been before, and the outlook, now, for this plan being carried out is very good. As soon as anything definite is done, it will be made public.

**THE DECISION OF THE N. E. I. A. EXECUTIVE COMMITTEE.**

President Beekman, of the N. E. I. A. A., has received from Samuel E. Winslow, President of the Worcester Athletic Club, a statement of what the club will do in case the Executive Committee decides to have the games held at the Oval. President Winslow also sent a list of last year's expenses, and opposite each item the estimated saving, if the games are held in Worcester. This amounts to over four hundred dollars. Copies of the offer and a statement of some of the advantages of Worcester, together with the list of estimated savings, have been sent to each member of the Executive Committee, and probably the decision will be known in a few days.

**CHESS AND CHECKER TOURNAMENTS.**

For some time past members of the Institute have been engaged in solving the mysteries of chess and a few weeks ago a tournament was proposed. This soon met favor with the lovers of the game and a committee was appointed to receive entries. Only ten, however, could be induced to engage in a tournament and it was decided that each man should play three games with every other, the player winning the most games to be the champion. The entries are the following: Southgate and Nelson, '92; Derby and Rogers, '93; F. E. Killam, Gallagher, MacFarland and Eastman, '94; Killam and Field, '95. The checker players have also decided to hold a tournament, for which the following have entered: Perkins, Butterfield, Derby, Rogers and Coughlin, '93; Gallagher and F. E. Killam, '94; Riley, '96. The chess tournament is now in progress, but the checker tournament has not yet enough entries to make it successful, and no plans have been made to commence it. Entries in either contest will be accepted until the end of this week.

**THE SOCIALISTS.**

Very little has appeared about this society for some time in the WPI, and the truth is very little has been done beyond meeting in the pleasant room on Main street and passing an enjoyable hour or two in the companionship of classmates. There are now somewhere about thirty-five members with a likelihood of a number more joining soon. At almost all hours of the afternoon or evening two or more may be found at the room.

Just now tournaments in chess and checkers are under way and a whist tournament occurs March 10th. Derby and Rogers are looked upon as strong chess players and should these two reach the final, the games will be well contested. In checkers it is hard to say who will be the winner, although Rogers and Perkins play well.

**THE BANJO CLUB.**

On Friday evening, February 24th, the Tech Banjo and Guitar Club assisted the members of
Salisbury Laboratory.

some who have conditions only look to it that '93, of much interest, not adopted for

The catalogue, or after the April recess, the college nomenclature may be officially adopted for all classes. The Senior class ought to graduate fifty strong and probably will if some who have conditions only look to it that these are made up in good season.

THE CATALOGUE.

The forthcoming catalogue of the Institute will register 279 students as against 243 last year, a gain for the year of about 15 per cent. There are 5 in the Graduate Electrical Engineering Course, 55 Seniors, 58 Juniors, 86 Sophomores, 68 Freshmen and 7 Specials. On the issue of the catalogue, or after the April recess, the college nomenclature may be officially adopted for all classes. The Senior class ought to graduate fifty strong and probably will if some who have conditions only look to it that these are made up in good season.

W. M. E. MEETING.

The next meeting of the Washburn Mechanical Engineering Society will be held in the Salisbury Laboratories on Monday Evening, March 27th, at 8 o'clock.

It is expected that Mr. Samuel Green, '85, will present a paper on "Open Feed Water Heaters as applied to mill work and heating water used in a compound condensing engine."

A paper by Mr. Hugo P. Frear, '83, on "Ballasting the British Ship 'Brunel,'" will be read by the secretary. Mr. Charles O. Rogers, '93, will give the results of a boiler trial in which Petroleum was used for fuel.

It is hoped that this early notice of the meeting will enable members to be fully prepared to discuss the papers.

George I. Alden, Secretary.

Mr. Hugo P. Frear, '83, whose paper will constitute one of the prominent features of the meeting will be unable to be present because he is located in San Francisco. He has however carefully prepared and sent his paper, which is of much interest, not alone from its intrinsic value but also as coming from an authority. Mr. Frear is engineer and designer, with the Naval Architectural Union Iron Works, San Francisco, holding a very responsible position, and is also known as the author of some Tables and Computations for ship building which are among the most valuable of that nature.

NEW EDITORS TO BE CHOSEN.

At the annual meeting of the Board of Editors, which is held this year on March 25th, two new members are to be chosen to the Board, one from Ninety-four and one from Ninety-six. Any member of either of these classes who submits an article on or before March 24th will be a candidate, and the men are chosen almost wholly according to these articles. The Assistant Editor will be glad to explain the duties and state some of the advantages of a member of the Board to any Ninety-six man who is thinking of competing. It is to be hoped that Ninety-six will take an interest in this matter and see that she is well represented on the WPI Board.

ALUMNI NOTES.

'85. W. O. Emery's address after April 10 will be 889 Jackson Boulevard, Chicago, Ill.

'90. H. P. Wires is Assistant Engineer with E. Worthington, Jr., & Co., Boston, Mass.

T. T. Allard is in the employ of the same firm at the Dedham office.

Pres. Frank Aborn, '72, entertained the Cleveland Alumni Association at a dinner at the Hollenden in that city on the eve of Washington's birthday, in honor of Edwin H. Whitney, '71, of Providence, R. I., who was in the city for a few days on business. Brother Alumni are requested when in Cleveland to make their presence known.

COLLEGE NOTES.

Yale and Princeton are to have a joint debate, March 15th, at Princeton.

The University of Michigan has fifty of its graduates on the faculty.

The expenses of the Harvard Freshman football team amounted to $5,000; the expenses of the Amherst team were $2,432.81.

It was amusing, to say the least, to see a Ninety-six man spend several minutes, the other day, trying to find a place in the fire-alarm box to post his letter.

The University of California and Stanford University are arranging for a series of foot-ball games to be played at Santa Barbara during the floral carnival in April.

Both branches of the legislature of Washington State have passed a bill making it unlawful to manufacture, buy, sell, give away or have in one's possession cigarettes or cigarette papers.
After a long time Chicago University is to have fraternities but they must submit all rules to the faculty. They must have a representative with whom the faculty can confer, and the University reserves the right to abolish any chapter.

Brown and Wesleyan have been admitted to the Intercollegiate Association of America. Yale alone opposed the admission of the former, while Harvard, Columbia, University of New York, and Pennsylvania voted against the latter.

In the Spring, Harvard intends to have a ten-mile relay race against time, in which 40 men will participate, each man running 440 yards. It is estimated that the ten miles will be run in 37 minutes, as there are at least 200 men in training who can run a quarter mile in less than a minute.

The new Cabinet Officers graduated from the following colleges: Gresham, Bloomington University; Lamont and Morton, Union College, Schenectady, N.Y.; Smith, Union of Georgia; Olney, Brown, '56; Herbert, University of Virginia; Bissell, Yale; Carlisle never received more than a common school education.

McGill College, Montreal, has just (Feb. 24th) dedicated a new, commodious and well equipped engineering building. It is chiefly devoted to work in Civil and Mechanical Engineering and Electricity. Several of the Faculty of the Institute had invitations to attend the exercises, but other engagements and the severe storms of that week prevented.

One of the largest and most interesting contests ever held will be that of the Intercollegiate Prohibition Association at the World's Fair Temperance Headquarters, in Chicago, June 30th. Seventy-five colleges will be represented, and each contestant must have won the State prize in a contest participated in by not less than four representatives of as many institutions.

The Harvard Athletic Association has just adopted a set of rules which tend toward purifying athletics. The substance of these rules is: None but amigastes shall represent Harvard in any public athletic contest. No one shall represent Harvard unless he is and intends to be throughout the year a bona fide member of the college. A student dropped for neglect of studies into a lower class shall not be allowed to compete in intercollegiate contests until the end of the next academic year, or until the faculty allows him to rejoin his class. No one who does not enter as a freshman, and no freshman who has ever engaged in an intercollegiate contest upon a team from any other college, shall be placed on a Harvard team until he has spent a year at Harvard and passed examinations on a full year's work. No student in Harvard shall be allowed to compete in intercollegiate contests for more than four years, whether representing Harvard or any other college.

**TECHNICALITIES.**

"The next, gentlemen, will be two pairs of three each."

The contents of D—ry's jack-pot are now quite large and are well worth playing for.

A very few of the calendars still remain unsold and may be had by applying to the Business Manager or his assistant.

The following is from a Middler's note-book, and is said to have been copied verbatim: "Milky-quartz, so called from its name."

L. P. Strong has been appointed agent for the Rapid Writer Fountain Pen and is willing to make a discount of twenty per cent. to Tech students.

One of the Junior Chemists in his youthful innocence inquired recently of an instructor, if it made any difference as to which side of the asbestos was put against the flame.

D—by, W—d, Andr-ws, et als, '93, seem very much interested in gazing upon a certain young lady at the Public Library. Will not H-dgk-nss or some one else give them an introduction?

Dr. Fuller attended and spoke at a dinner of Dartmouth Alumni in Springfield on Friday evening, March 3d. Prof. L. L. Conant was also present and both were elected members of the Executive Committee.

Any students interested in Bible study are invited to meet with the Bible class of the Institute Y. M. C. A. which is held in the parlor of the local Association on Elm St. The work is entirely voluntary and the class is self-conducted.

**LOST.—** Mr. C. T. Haynes of this city left a cane in the Institute library about two weeks ago. It is a plain oak stick with a silver label near the top bearing the owner's name. The finder will confer a favor by returning to the office.

At the annual banquet of the Worcester County Society of Engineers, held Friday evening, March 3d, at the Lincoln House in this city, five members of the Tech Banjo and Guitar club were present and pleasantly entertained the company.

Rev. Edward M. Chapman, Associate Pastor of Central Church, spoke before the Y. M. C. A. on Wednesday noon, March 1st. Mr. Chapman is a young man, a graduate of Yale, in full sympathy with college men, and his remarks were very interesting and helpful.
In place of the regular lecture in Physics to the Middle class last Tuesday, Prof. Kimball spent the time in giving an outline of the openings for an electrical engineer and of some of the advancements in electricity which he thought would be made in the next few years.

The youthful exuberance of the embryo mechanics in the wood room rose on Tuesday to an irresistible pitch and resulted in a finely rendered “George Washington.” This form of amusement is passé and has been declared unconstitutional, and so three Preps were banished from the room for the remainder of the week.

P-r-k-r, '93 (who has not read the lesson).

What, Professor, are these plus and minus signs for?

Prof. Well, you will find them fully explained on the next page and (continuing) I think the class would be better able to comprehend the lecture if they read over the matter assigned beforehand.

Under the auspices of the Historical Society, on Thursday evening, March 9th, a lecture will be given in the Physical Lecture Room by Rev. Austin S. Garver, on “Old Assyrian Life,” illustrated by stereopticon views. All members of the Institute and friends of the society are heartily invited to attend, as the lecture will be one of general interest to all.

It was learned the other day from Mr. Flynn, agent for Scribner & Co., that he had suffered the loss of two copies of the pamphlet “Modern Machine Practice” which he delivers to the students. Some one stole them from him while he was engaged in conversation. Such actions are disgraceful and we publish it only in the hope that the guilty ones may be led to reflect upon their conduct and do so no more.

The two men who were suspended from a Conn. university for hazing and who recently favored the Institute with a visit were the subject of remarks a few evenings ago in a student’s room. The conversation was as follows:

Senior A: “They looked as if they thought they were about right.”
Senior B: “Their must have felt all-fired—”
Senior A: “Nice.”

There has been some abuse lately of the privileges of the reference library. It is manifest that any student who takes from the room and keeps for several days a book which is in constant demand greatly inconveniences many others. Another point; it is rather difficult to get much benefit from the perusal of an abstract volume when a noisy conversation is going on in the room. Let us be considerate and reasonable in our use of this reading-room.
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