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Opposite Bay State House.
The Ninety-four Board of Editors now as a bi-weekly, and its ninth year of existence as an organ of the students. The Ninety-four Board of Editors now assumes management of the paper for a year. They fully appreciate the efforts of previous editors, and especially of the Ninety-three Board, which have been spent in bringing the standing of the paper up to its present level, and they will strive to at least not lower this standing in any way. Proper communications of interest will always be gladly published, and it will be considered a favor by the Board, if those who are interested in the welfare of the paper will express their opinions concerning its character. If they are unfavorable they may show where improvements can be made, and whichever way they may be, they will enable the Board to work not absolutely in the dark. Necessarily the publishing of a bi-weekly involves a great deal more labor than publishing a monthly, but we feel that the success of last year fully warrants the continuance of the bi-weekly plan.

Candidates for the base-ball team have been doing faithful work for the last two months, and before long it will be time for the other members of the Institute to show whether or not they will let this work go for nothing. Last fall, at the time of the first meeting of the Base-Ball Association, there was considerable doubt expressed as to whether it would be policy to try to support a team this year. If all the students had attended this meeting and a majority had voted against having the Institute represented by a team and then a few men had taken matters in their own hands to push them, well and good. But it was not that way. Although there were not many present at the meeting, more discredit to those who were not there, those who were present favored having a team this spring, and now let us back them up in it. We have good material, an enthusiastic captain who is respected by all and a capable manager. Let every one take hold and "with a long pull, a strong pull, and a pull all together" pull the association out of the "hole" and make a rousing success of base ball this spring.

The catalogue is at last ready for distribution. Some of the important changes are noticed in another column. It will seem rather queer at first to use the terms Sophomore and Freshman. Poor Ninety-five, we sympathize with you in being obliged to go all through the Junior year again.

The lack of enthusiasm shown by the majority of the students in what should be of common interest to all has always been noticeable here at the Institute and especially
so of late. According to the usual way in which undertakings are put through, four or five of the more patriotic students make all the arrangements and carry them out; if the undertaking is a success, all the enthusiasm that is shown by most of the men is in telling among their outside friends how we, the Techs, did such and such a thing, and receiving praise for it. If the affair proves a failure, of course all the blame falls on the ones who aid their best to make it a success.

It seems too bad that more men are not willing to take an active part in the work which, although outside of the regular course, adds so much to Tech life. Surely the least that a man ought to be willing to do is to come to the meetings of the different associations and vote on the questions which are brought up. There must be a great deal of satisfaction for those who suggest an idea to know whether or not a majority of the students favor it and will give their support if the idea is carried out.

THE MOUND BUILDERS.

Extract from a Paper by L. F. Kinnicutt, S. D.

The existence of artificial mounds was first noted in the last century, but accurate knowledge of them has been had only since 1845. While they have been found to exist to a greater or less extent from the Rocky Mountains to the Alleghanies, and from the St. Lawrence to the Gulf of Mexico, the greatest number and the most interesting are found in the valleys of the Mississippi, Missouri, and Ohio Rivers. The mounds vary greatly in size, and have been classified as follows: defensive works, village enclosures, mounds for temple sites, altar mounds, sepulchral mounds, and effigy mounds.

The defensive works consist of a series of fortifications, extending across the entire country. Some of these mounds were of great size, comprising over one hundred acres of land, and situated at advantageous points. Thus, along the Great Miami River in Ohio, we find a series of forts extending from the mouth of the Great Miami to Dayton, a distance of about one hundred miles. These various fortifications are connected with each other by isolated mounds, placed upon hills, from which the movements of an enemy could be seen and from which signals could be transmitted.

Differing from the fortifications are the so-called village enclosures, which are found as a rule along the banks of rivers and in valleys, overlooked by heights, so that they were not intended for defensive purposes. These enclosures are always of regular form, generally square or circular, though, sometimes, elliptical or polygonal.

From the fact that all the figures are perfect, that all the angles of the square enclosures are right angles, and that a number of squares measure exactly one thousand and eighty feet on each side, it is evident that the men who built these works certainly understood the art of measuring angles and surfaces, and had some standard of measurement. Very often they combined the circle and square in building these enclosures, a typical example of which is found at Liberty, Ohio.

The reason for the use of the various designs and their combination can only be guessed at, and no satisfactory explanation has yet been given. Probably the smaller circle, so often joined to the larger one, was the dwelling of the chief and his family while in the larger circle were the habitations of the tribe.

Throughout Ohio, Kentucky, Missouri, Tennessee and the South is found a type of mound resembling a truncated pyramid, the summit of which is reached by inclined planes or steps cut into it. Occasionally these mounds are in terraces, and the base is either square, round, oval or polygonal; they always have a platform at the top.

The most remarkable mound of this kind is found at Cohobia, Ill. The platform at the top, which is ninety-one feet from the ground, is reached by four successive terraces, and measures one hundred forty-six by three hundred ten feet. On this platform was built a small pyramidal mound, in which were found pieces of burnt pottery, arrow heads and many human bones, evidently the remains of offerings or sacrifice. This mound was situated in the midst of sixty other mounds, varying in height from thirty to sixty feet.

The altar mounds, used, as we believe, for the purpose of making offerings to their god or gods, are invariably found inside of village enclosures, and vary in size from a few inches square to several feet. It is from the excavation of these altar mounds that we have obtained the most information regarding these prehistoric people, for there we obtain specimens of human workmanship, telling us to what stage of culture these people had reached.

There are found in these mounds arrow heads,
stone hatchets, pottery, stone pipes representing birds and animals, ornaments carved from stone, stone tubes, implements and ornaments made of native copper and sometimes plated with native silver or meteoric iron. No article, however, that had been made from metal obtained by reduction of an ore, or made by casting or smelting a metal has ever been found. They evidently had great skill in working and manufacturing articles from materials that they could obtain, but they had not reached the stage of changing one substance into another. This places this people in certain respects below the first stage of civilization.

Regarding the sepulchral mounds which are found all over the United States, little need be said. Some undoubtedly belong to the same people that built the altar mounds, while others were built by various Indian tribes; and we find on excavating that every form of burial known in Europe was also practiced on this continent. With the skeletons we find arrow heads, hatchets, ornaments of copper and stone, pottery, and sometimes food, evidently placed in the mound at the time of burial with the idea either of making an offering to their god or that they might be of use to the dead. Careful study of the few perfect skulls that have been found has not yet shown to what race of men these people were connected.

Of all mounds, the most curious, and the hardest to explain, are the effigy mounds, built to represent birds, animals, reptiles, and even man himself. The most famous effigy mound is the serpent mound in Adams County, Ohio, the coils of which are about seven hundred feet long and which appears to be swallowing an egg. No human bones or any artificial objects have ever been found in an effigy mound and we can give no reason for their construction, except that probably they were in some way connected with the religious thought of the age. The serpent mound for instance may indicate that among these people, as with certain other races, the serpent was an object of worship.

The important question, who were the mound builders, has never been satisfactorily answered. They were certainly not a civilized race, for, as far as we can discover, they had no knowledge of a phonetic alphabet, and this is characteristic of the first stage of civilization. Further there is no evidence that they had any knowledge regarding the smelting of ores, a knowledge which we find in races that have reached only the upper stage of barbarism. This proves the absolute falseness of the wild speculations that the mound builders were a race with a culture equal and perhaps superior to our own. No relic has ever been found that indicated the existence of a vanished people even approaching the ancient Egyptians in civilization.

As to the origin of this race little can be said. They were probably indigenous to this continent, or came at an early date from Northern Asia. The cause of their disappearance may have been disease or war, or both. There is evidence that they slowly retired southward, and there is also a possibility that they were driven more to the southwest, and that in the Zuni or the Ancient Mexican, we find the descendants of the mound builders. All we really know is that a people who belonged to the upper stage of barbarism, once inhabited our western valleys, that these people were remarkable for their building and engineering skill which, together with their religious thought and expression, brings them nearer to the first stage of civilization than other races to whom the working of metals and the smelting of iron ore were unknown.

FOOT-BALL LEAGUE.

At several different times during the past year, the subject of a foot-ball league has been mentioned, but until recently, nothing definite has been done. About two months ago a communication was received from the secretary of the Massachusetts Institute of Technology Foot-ball Association, asking the general opinion at the W. P. I. concerning the formation of a league. The matter was talked over among representative foot-ball men here and all seemed to be in favor of joining a league if possible. An answer to that effect was sent to M. I. T. together with suggestions as to what colleges might constitute a league. It was suggested by M. I. T. that a league consisting of technical institutions as Troy Polytechnic, Stephens Institute, M. I. T. and W. P. I. be formed.

The idea was more carefully considered however and found not to be feasible as the institutions are situated at such a distance from each other. Messrs. Chase and Davenport were in Boston during the vacation and they met the officers of the M. I. T. F. B. A. and talked the matter over informally. From communications received from Brown University it was thought that she would favor a league composed of Brown, M. I. T. and W. P. I. The representatives of both M. I. T. and W. P. I. favored such a league and it was suggested that the matter be brought formally before the associations in the three colleges and if they acted favorably towards such a league, that representatives meet as soon as possible to draw up a constitution and arrange details.
CORNELL'S NEW PRESIDENT.

A Short Sketch of His Life and Work.

A significant thing in connection with the elevation of Professor Jacob Gould Schurman to the Presidency of Cornell University is that the man is conceded by every one to be greater than the place. He was the person at once in mind by the trustees, faculty, alumni, students and public generally when the position was known to be vacant. His reputation as a specialist in philosophy, teacher, orator, and man of all-around power had become so great in the six years of his residence at Cornell, that no one was thought of for a moment beside him. He stood so commandingly above all competitors that he had none, and enjoyed the distinguished honor of having his name the only one proposed by the trustees, of being promptly and unanimously elected by them, and of being equally as promptly and unanimously endorsed by scholars and by the general public.

President Schurman was born at Freetown, P. E. I., May 22d, 1854, out of an old Dutch family, which came to New Amsterdam about the middle of the seventeenth century.

Dr. Schurman lived on his father's farm till twelve years of age, attending school uninterruptedly. In 1867 he became clerk in a general store at Summerside, P. E. I., a position which he held for over two years. Resolving then to have an education, he attended for a year the Summerside Grammar School, and in the autumn of 1870 won the first of the six scholarships established by the government at Prince of Wales College, Charlottetown. This gave him a living and an education for the next two years. Late in 1873 he entered the Sophomore class of Acadia College, N. S., where he remained for a year and a half, leading his class in all subjects, and winning several money prizes. In 1875 he won the Canadian Gilchrist scholarship in connection with the University of London, which was worth $500 a year for the three years. Two years later he graduated at the University of London with the University scholarship ($250 a year for three years) in philosophy. He was also first man in Greek, English, logic, philosophy, and political economy in University College, winning in the latter a scholarship of $100 a year for two years. While in London he was under the instruction of Ellis in Latin, Malden (a friend and classmate of Macaulay's), in Greek, Morley in English, Robertson and Martineau in philosophy, and Jevons in political economy. In 1877-78 he was a student in Paris and Edinburgh, enjoying in the latter institution the instruction of Calderwood and Frazer. He took his doctor's degree in philos-
ident Schurman's eminence as a lecturer or his sincerity as an investigator that alone accounted for his popularity; but, with these things, a democratic manliness and love of his fellows, which gave every true man he met a sense of nearness to him. This is probably the most charming feature of his personality, and accounts to no small degree for his hold upon his fellows. He loves men as such, and is anxious to keep near to the great common heart of the world. He deplores any social or scholarly exclusiveness which hinders sympathy and fellowship with the rank and file of humanity.

In connection with his work as a teacher of philosophy at Cornell, it is fitting to say just here that his department has grown astonishingly, and now commands not only a large undergraduate representation of the university, but a graduate department of constantly increasing proportions. Graduate students of some of the best American and foreign universities are now availing themselves of the unrivalled advantages in philosophy offered at Cornell.

During Dr. Schuman's period of service at Cornell several college presidencies have been offered to him, the most flattering of which was that of the University of California last summer.

Since his entrance upon his duties as President of Cornell, everybody has felt the force of a firm and confident hold of its affairs. He does his work easily, finding time for multitudinous duties without the least strain upon his resources. His inaugural address last term was a noteworthy exhibition of the fact that the University had a "head." Every department shows confidence in the new head, and larger plans, more students than ever before, and greater expectations of the future manifest the one spirit of trustees, faculty and students.

He is personally one of the most genial and approachable of men, a delightful companion and friend. He is an indefatigable worker, being in his lecture room by eight o'clock in the morning, and rarely on his pillow till eleven or twelve at night. He has marvellous health, and the physique of an athlete.

—The Book Buyer.

WORLD'S FAIR EXHIBIT OF THE NORTON EMMERY WHEEL CO.

A space thirty-seven feet long by ten feet deep has been allotted to the Norton Emery Wheel Co. by the World's Fair commissioners. April 2nd, the three cars containing the Company's exhibit were started on their journey westward to Chicago, where they probably arrived April 10th. The superintendent of the works will oversee the arrangement of the display. Men employed by the company will be there to run the machines and show off their working.

The three freight cars contain about twenty tons of emery wheels and machinery for making them.

The principal feature of this exhibit will be the appearance and construction of five large emery pillars, three at the front of the allotted space and two at the rear. These will be built wholly of emery wheels, and will weigh about two tons each. They will be fifteen feet in height, and for a distance of twelve feet from the floor will be made of wheels eighteen inches in diameter. A twenty-four inch wheel will then be placed on and from this point to the top the pillar will be conical, with a so-called pot-ball, six inches in diameter, mounted on top. The three front pillars will be connected at ten feet from the floor by the sign of the company. The letters of this sign are made entirely of emery, and are eight inches in height and about two in thickness. There will also be an emery cone in the centre of the space, having for its base a thirty-inch wheel, and for its apex a seven-inch wheel. On the top of this cone an ornament made to represent an old Indian vase will rest. This vase was made by the superintendent and is composed of twenty-one separate pieces of emery, each individual piece of which may be used in grinding and cutting machines. In the rear of the space there is to be a partition ten feet high, and on this partition will be arranged a great many emery wheels of different sizes, the principal arrangement of which will be as the diagonals of the partition, the wheels being large at the centre and gradually growing smaller as the lines extend toward the four corners.

The company also has three large plate glass show cases, in which will be displayed thousands of the smaller wheels, ranging from the three-thirty-seconds of an inch wheel to those of ten or twelve inches, which will be the largest ones shown in the cases. The wheels to be displayed are of almost limitless thicknesses and grades of hardness, and include those used for the simplest castings and for the most delicate polishing. Emery sticks of every description, pot-balls for interior scouring and grading, and drills for boring artesian wells, are included among the other articles which will be on exhibition.

The machinery display of the company will include fourteen machines while the exhibit of wheels will include nearly fifty thousand.
RECEPTION TO SENIORS.

Mr. — — —.

The Class of '94 of the Worcester Polytechnic Institute request the pleasure of your company with ladies, at

A RECEPTION
to the Senior Class at
COLONIAL HALL, MARCH 28th, 1893, at 8 o'clock.


Dancing from 9 to 12.

Every member of the Senior Class received, a few days before the 28th, an invitation worded like the above. From what has been said this was something of a surprise to many of the Seniors, as the two classes, as classes, have been rather enemies than otherwise. But a reception like this one ought, and it is hoped will, establish more amicable relations during the remainder of our sojourn together. As committee for general oversight of the affair, the class appointed: Heald, chairman; Dwin nell, Burt, Harris and Cobb, who have been rejoicing ever since, that the first event of the kind in the history of the school and which fell on their shoulders to look out for, has turned out to be such a success in spite of some apparently unsurmountable difficulties.

At 7.30 on Tuesday evening everything at the hall was ready for the expected guests. Shortly after 8 o'clock Mrs. Homer T. Fuller and Mrs. William McDonald, who had accepted the invitation to act as matrons, arrived. These ladies were shown places at the north end of the smaller of the two rooms, where they were to receive.

About 8.15, members of Ninety-three and Ninety-four began to arrive, some with and others without ladies. The reception committee acted as ushers and for about twenty-five minutes were kept very busy. Then there was a short period devoted to conversation and general sociability. During the first promenade the orders of dances were distributed. On one side was

W. P. I.

JUNIOR PROMENADE,
COLONIAL HALL,
March 28th, 1893.

And on the other the dances as follows:

ORDER.

1. Promenade.
2. Polka.
3. Lancers.
4. Promenade.

INTERMISSION.

5. Schottische.
6. Caprice and Waltz.
7. Quadrille.
8. Polka and Galop.
10. Schottische.
11. Waltz.
12. Promenade.

About 9 o'clock the regular dances began with a polka. Music, and good music too, was furnished by Bicknell's Orchestra of three pieces. During the intermission refreshments consisting of ice cream, cake and lemonade were served. In the small room near the south end of the hall two card-tables had been placed, and those who did not care to dance amused themselves by games and tricks with the cards.

After the intermission, dancing was carried on in both of the larger rooms, while those who did not indulge sat and watched the graceful participants.

About 12 o'clock the couples began to take their departure, and many remarks expressive of pleasure were to be heard. Soon all had left and the first Junior Promenade was a thing of the past.

Among the ladies who were present were Miss Bertha Smith, Miss Walker, Miss Reed, Miss Gertrude Smith, Miss Stone, Miss Merrill, Miss Armsby, Miss Florence Armsby, Miss Lincoln, Miss Poore, Miss Emily Smith, Miss Alice Sinclair, Miss Henderson, Miss Baker, Miss Louise Sinclair, Miss Banfield, Miss Day, Miss Norcross, Miss Buckingham, Miss Friday, Miss Kelley, Miss Bigelow, Miss Edith Barton, Miss Lillian Barton, Miss Henderson, Miss Jenkins, Miss Burbank, Miss Littlefield, Miss Ella Larkin, Miss Grace Larkin, Miss Blake, Miss Fanny Smith, Miss Joslin, Miss Inman, Miss Harris, Miss Ruth Grout, Miss Philbrook, the Misses Clark, Miss Hastings, Miss Rugg, Miss Marsey, Miss Bancroft, Miss Peacock, Miss Bolles, Miss Cook, Miss Hathaway, Mrs. Sinclair.

Dr. Fuller, Professor MacDonald, Professor Sinclair and Mr. Coombs were also present.

The event was called the Junior Promenade because this is the name generally given to the reception of the Seniors by the next lower class. Also the nomenclature is about to be changed and the present Middlers will become Juniors. As has been said before this is the first reception and promenade ever tendered a Senior class by the next class below. The affair will be long and happily remembered by both classes and it is hoped that like receptions will take place during the coming years.
types of floating dry-docks
of new york.

A person coming down the East River on one of the Sound boats will notice on the New York side, a short time before reaching the Brooklyn Bridge, a curious U-shaped wooden structure floating in one of the slips. It is a balance dry-dock.

This dock consists of an immense box or pontoon, about 325 ft. long by 100 ft. wide and 10 ft. deep over all. Running lengthwise on either side are two walls rising 30 ft. from the deck of the pontoon and about 10 or 15 ft. thick. The side walls and pontoon are framed together and near the bottom the diagonal braces make the side walls very much thicker than they are at the top. The whole structure is built of heavy timber, sheathed with thick plank and caulked so as to be water tight. At the ends the dock is left open for the admission of the ship.

The pontoon is divided into two compartments by a massive timber partition or bulkhead running lengthwise through the middle. This acts as the foundation for the keel-blocks, as the timbers are called upon which the vessel’s keel rests when in the dock. The two compartments are again divided into smaller ones by several transverse bulkheads, as are also the side walls. Each compartment or chamber has an inlet opening controlled by a valve and a similar outlet connected with the pumps.

Running on slides or ways at right angles to the centre line of the dock and on each side of the row of keel-blocks are the bilge-blocks for supporting the bottom or bilge of the vessel. These blocks are so arranged that they cannot float off when the dock is submerged and can be moved from the top of the side walls by ropes. Near the top of each side wall is a row of timbers or breast shores, which are hinged to the wall and are adjustable in length. They are for keeping the vessel from tipping over when raised out of the water.

Each side has a house on top of it containing the boiler and engine for running the pumps. These are fourteen in number and are about 36 inches in diameter by 3 ft. stroke.

In docking a vessel the inlet openings are uncovered and the water rushes in and fills the compartments until it is as high inside as it is outside. Then these openings are closed and the pumps started, and the water is pumped into the chambers in the pontoon and side walls, where its weight acts as ballast and causes the dock to slowly sink to the required depth for the vessel to enter.

After the vessel is hauled into the dock and made fast directly over the keel-blocks, the water in the side-wall chambers is allowed to escape and the dock rises until the keel-blocks rest on the vessel’s keel. Then the bilge-blocks are hauled up until they touch the bottom, the breast shores are adjusted, and the vessel is ready for raising. This is done by simply pumping the water out of the compartments until the deck of the pontoon is above the water level. The water surrounding the ship in the dock flows out at the ends as fast as the dock is raised.

The vessel is taken out of the dock by gradually admitting water until the whole dock sinks and the vessel floats and can be towed away.

A ship of 3500 tons can be raised in about two hours after the placing of the bilge-blocks. The maximum capacity of the dock is for vessels of over twice this size.

About half a mile farther down the river one will see another form of floating dock, known from its construction as the sectional dry-dock. In general outline this dock somewhat resembles the other. The main difference of appearance being in the side walls.

In the former the framework is sheathed with plank while in the latter the sheathing is omitted. This point makes the dock much better for the admission of light and gives a freer circulation of air.

The sectional dock is composed of ten watertight pontoons, each carrying a framework at the ends. The frame projects about 15 ft. beyond each end of the pontoon and extends up for 30 or 35 ft. above the deck. The top is out of water when the dock is submerged.

The middle sections carry at the top the engines for working the dock. The pontoons are placed side by side and make a structure 425 ft. long and 130 ft. wide, which is held together by tie beams. Inside of each frame is a smaller pontoon known as the balance tank, which is guided by the frame and is capable of being moved up or down by suitable gearing driven by the engines. Both the pontoons and the balance tanks are fitted so they can be filled with water and emptied by the pumps as occasion demands.

The dock is fitted with keel and bilge blocks and breast shores as in the balance dock.

In docking a vessel the pontoons are first filled with water and then the balance tanks, filled with air, are gradually raised, letting the pontoons and frames sink to the required depth. If necessary the tanks are also partially filled with water.

After the vessel has entered the dock, the balance tanks are first pumped out, the vessel
securely blocked and then between lowering the balance tanks and pumping out the pontoons the vessel is slowly raised. The balance tanks play an important part in this style of dock, for when the pontoons are submerged they furnish the floating power and when the pontoons are raised by the extra width which the tanks make, the stability of the dock is increased.

The dock will take a vessel of 6500 tons, and the time required to raise it after the vessel is blocked is about an hour and a quarter.

This is the only dry dock in New York City that will take the big steamer Pilgrim of the Fall River line, and she about fills up the entire width of it.

The floating dry-docks here described are not the only ones in New York, being simple representative ones of each class. They have stood the test of time, being nearly, if not quite, fifty years old, or at least so old that the "oldest inhabitant" has forgotten when they were built.

G. W. SCUDDER.

ABOUT THE W. M. E. SOCIETY.

The Editor of the WPI has expressed a wish that a few words said to a part of the middle class might have a larger hearing. This is my excuse for using this space:

My words were suggested by the last meeting of the Washburn Engineering Society. I wished to call attention to the value of these meetings. Here the undergraduate has an opportunity to learn about the problems and perplexities, which the recent graduate finds in his experience; and best of all, just how these problems are met. I have always had great faith in the stimulus which comes from a knowledge of the achievements of those not too far removed from the circumstances in which we work.

When we see on the walls of our drawing rooms work executed by a recent generation of students, we recognize that, as a stimulus to better work, such drawings are worth more than elaborate engravings, no matter how finely executed.

The fact that young men recently doing the same daily work, which now fills your thoughts, are able to solve successfully the engineering problems as they come up, should encourage you in the confidence that your present studies are in the right direction and will tell in time. While some of the papers, like that on "Ballasting the British Ship" may not be fully understood, yet, while listening to such a reading, none can fail to have his ideas broadened regarding the range of subjects which he is likely to meet in the coming years. The papers by Mr. Green and Mr. Rogers and the discussions they led to, were very interesting and helpful, and showed how wide awake our graduates are to the practical problems of the day.

The plan of the Society to bring students and graduates into contact and acquaintance, seems worthy of special emphasis. By a little planning, one evening each two months can with very great advantage be given to this meeting.

JOHN E. SINCLAIR.

THE CAMERA CLUB.

There is no society in the Tech at present which is in a more prosperous condition than the Tech Camera Club. The treasury is fully sufficient to meet all current expenses, and still the members are not overburdened by the dues, which are, in themselves, very small. The number of members is quite large, showing that many of the students love to disclose the many and varied mysteries of the "Black Art."

And yet the club is not doing all that it can, or one-half what it hopes to do in the near future. Of course, during the Winter, photography is almost wholly confined to flash lights, making slides, copying, etc., but when Spring is once fairly here, and the "fiend" can venture out of doors with his box with some small degree of comfort, we may expect to see some fine results from his experiments on Nature.

But why should these results be kept covered until the annual exhibit? Would it not be well to have each member bring his latest pictures to each meeting and let each member have a good look at them instead of saving them all till the exhibit, where there are so many that one does not have near time enough to enjoy each one.

And what is more entertaining than a collection of nicely taken photographs? They are reminders of the pleasant times that are past, and often a perusal of such a collection will "drive dull care away," very effectively. About the first thing noticed, on going into a student's room, is the array of photos on the glass, or stuck promiscuously around the room. So they are not only reminders of pleasantries of the past, but are also objects of interest to those who do not know the little history connected with each one.

But all the enjoyment of photography does not come after the picture is taken and mounted. It is also very enjoyable taking one's camera and spending an afternoon off in the country in search of the beauties of which Nature is so full. To be sure, we understand there are many scenes also in the life of a photographer which are not so pleasing as the ones cited. The "Bull rush" act is doubtless
clearly impressed on each "fiend" and many other little incidents too numerous to mention.

On the whole, photography is a very broad and interesting art, and there is great opportunity for one to use his ingenuity and tact in the production of novel effects.

And in closing, let it be said to members of Ninety-five and Ninety-six that it is hoped they will avail themselves of the privileges of the Club and see that their respective classes are well represented in the next exhibition.

LABORATORY NOTES.

During the spring recess, the Senior and Junior chemists have been busy making up the usual six days of required practice. The work of the Seniors has been principally upon thesis subjects.

Mr. Cheney has been examining a new method employed by Washburn and Moen in testing for phosphorus and arsenic in copper. The process is long, one part of it requiring forty-eight and another twenty-four hours.

Mr. Hopkins has been continuing his work in testing the spring and well water of Williams­town for alkaline salts. He has also been investigating a method for the determination of chromium by oxidizing the sesquioxide to chromic acid by the use of sodium peroxide.

Mr. Parker's work in the examination of the water of the Lake Quinsigamond water-shed consists of the analysis of samples of water taken from the different influents and tributaries as well as from the lake itself.

The separation of nickel and cobalt, upon which Mr. Lincoln is working, depends upon the precipitation of cobalt as the pyro-phosphate, which is insoluble, while that of nickel remains in solution.

Messrs. Howard and Hodgkins have been engaged in the analysis of mud taken from the top, middle and bottom of deposits in the beds of sewage-bearing streams, as the Blackstone, and of ponds that contain no sewage, as North Pond. The object of the work is to form some conclusion in regard to the relation of the nitrogen and phosphorus to the amount of sewage.

The Juniors began the vacation with volumetric analysis and have been engaged in determining the acidity of vinegar and the alkaline power of soda-ash and wood-ash.

BICYCLE MANUFACTURE IN WORCESTER.

Among the many manufactures for which Worcester is so justly noted, none perhaps is of more interest to the average Tech than the bicycle industry. This is a new industry, but a very rapidly increasing one.

It will be of interest, perhaps, to look back at the history of 'cycling, although by far the most important and rapid changes have taken place in the last two decades. When the idea of a manumotor was first conceived, is not definitely known, but the oldest record of any such idea is on a stained-glass window in an English church, the very one in which Gray is buried, and in the churchyard of which he wrote his "Elegy in a Country Churchyard." This window is dated 1642. The first manumotor we know of was built by a professor in Dublin college in 1776. It was really a carriage worked by levers and could be driven nearly three miles an hour! A little later an improvement on the above was made in France. About 1816 a man was seen riding daily in the parks of Paris mounted on a beam connecting two wheels. This was the first conception of the modern bicycle. It was propelled by pushing on the ground with the feet. It was introduced into England and for a time the "Dandy-horse" was all the craze, but the novelty soon wore off and the machine fell into disuse. No further progress was made till 1866, when a Frenchman patented a crank-driven machine. After this improvements were rapidly made. The front wheel was enlarged so as to enable the rider to get more directly over his pedals, and the rear wheel diminished till the proportions of the graceful "ordinary" were reached. Steel and iron took the place of wood, and ball-bearings were invented. In 1872 rubber tires were first used.

The first bicycle brought to this country was imported in 1877. Soon after the manufacture of these machines was taken up in this country, till at the present day we certainly equal if not excel our English cousins.

The high or ordinary wheel was so difficult to mount and so easy to dismount (and not always right side up) that 'cycling was mainly confined to young men. About 1885 a return was made to the styles of 1866 except that the bicycle was driven by a chain connecting the sprocket wheel to the hub of the rear wheel. Since then the "safety" has achieved great popularity, till old and young of both sexes are devotees of the silent steed. To fill the demand many manufactories have been started, one of them in Worcester.

The works of the Speirs Drop Forging Company are on Shrewsbury street and consist of four buildings well adapted for their purpose. The wheel made by this firm is known as the "Majestic" and is of the well
known Humber type of frame. The tubing used is of the best quality of weldless steel and is made in England. All other metal parts except the balls for the bearings are made at the works. As one approaches the works he hears the thump, thump of the steel hammer, and entering the building in which it is situated sees a workman place a piece of red-hot steel on the base of the hammer, press a lever and the hammer descends making a hub or lug all ready to be taken to the machine shop and finished. No castings whatever are used, all parts being cut from the solid forging. On the first two floors of the main building is the machine shop. The lugs are brought here from the forge-room and drilled to receive the ends of the tubing which come cut to the proper length. A hole is then drilled through both lug and tubing and a pin put in, holding the frame together. The frames are then sent to the brazing-room and the frame is solidly brazed together. The hubs are drilled by special drills and then turned to shape. The bearings with which the machine is supplied are all ball. The cups and cones between which the balls run are cut from bars of steel and subsequently case-hardened. The cups are placed in sockets in the hubs, making it very easy to replace an injured bearing. The rims and mud-guarders are rolled from sheet steel between powerful rollers, and the ends of the rims brazed after the rolling and then drilled to receive the spokes. The sprocket wheels are cut a dozen at a time on a milling machine. The necessary nuts, bolts and screws are cut in this room by screw machines. On the second floor the chains are made and tested by running over sprocket wheels. Here also all parts are tested by gauges and all that vary perceptibly are rejected, the greatest care being taken in all departments in order that as perfect a wheel as possible may be built. The polishing and buffing departments are also situated here. Leather belts are covered with glue and quickly placed in a long trough containing emery, which is pounded on. When "set" these belts are run on pulleys, at a high speed, and the article to be polished pressed against them. Emery wheels are also used.

On the third floor is the setting-up room and nickel-plating departments. Here the numerous parts are assembled, the bearings adjusted and the tires put on. It is very interesting to see the ease with which the men who build the wheels, put in the spokes and make them run true. Anyone who has tried to remedy a badly "buckled" wheel, will appreciate the saying, "Practice makes perfect." The tires used may be divided into three classes—the cushion, the single tube pneumatic, contemptuously called "hose-pipes" by the advocates of the double tubes, and the double-tube pneumatics. The solid tire has practically gone out of use. The "Majestic" is furnished with different styles of tires, giving the purchaser his choice. The finish on these machines, is noted for its excellence. All nickelled parts are first coated with copper, and then a coating of pure nickel is put on and carefully polished. The copper makes the nickel less likely to peel.

The enamel with which the main parts of the machines are finished is very carefully put on, each part receiving several coats, each coat being baked on repeatedly, and then buffed, making a beautiful and durable finish. The firm turns out fifty complete machines a day.

Although visitors are not usually admitted, Mr. Speirs kindly makes an exception with Techs.

THE ATLANTA UNIVERSITY AT THE WORLD'S FAIR.

The Atlanta University exhibit, in the south-east gallery of the Liberal Arts building, will cover 300 sq. ft. of floor and 400 sq. ft. of wall space.

The school work will be bound in book form, and illustrated by a hundred photos; including twenty 16 x 20 bromide enlargements made by one of the boys.

The cooking department will exhibit canned fruit.

The sewing classes will have fancy needlework, portières, piano lamp-shades, silk neckties, and a complete A. U. base-ball uniform.

The mechanical department exhibit includes five model boards, two wing frames (equal to a wall space of 400 sq. ft.), two tables, two showcases, picture frames, wheelbarrow, saw-horse, and ladder, office desk, two hundred pieces of wood turning, seventy-five mechanical drawings, including prize designs and specifications for a cottage, iron fence, machinists' tools, piano lamp, and a mantel-piece with fender and andirons, etc.

All the above being the work of the students. Mr. E. W. Tuttle is now (April 3rd) in Chicago setting up the exhibit.


THE CATALOGUE.

The annual catalogue which has appeared this week, creates more than the usual interest for the students on account of the numerous changes. The familiar terms, "Apprentice" and "Middler" have become things of the past, and the classes now rejoice in the ordinary college nomencl-
ture. On the front page a half-tone shows the buildings and grounds to good advantage.

The attendance for the past year by classes is as follows: Graduate Students in Electrical Engineering, five; Seniors, fifty-five; Juniors, fifty-eight; Sophomores, eighty-six; Freshmen, sixty-eight; Specials, seven. The total attendance for the year is two hundred seventy-nine, being an increase of fifteen per cent. over that of the preceding year.

The popularity of the undergraduate course in electricity is shown by the fact that eleven Seniors will graduate from that course and about one-half of the Junior Mechanics have chosen it for next year. There are still left in the Senior class twenty-eight Mechanics, six Chemists, and five each of the Civil and General Scientific men. In the Junior Class, four are taking Chemistry; nine, Civil Engineering; and one, the General Scientific course. The remaining forty-four are about evenly divided between Mechanical and Electrical Engineering. Eleven Sophomores, a larger number than usual, are taking Chemistry. Twelve have chosen the Civil Engineering course; and two, the General Scientific.

On referring to the residences of the students, we find that there are one hundred and eleven whose homes are in Worcester. Outside of the city of Worcester, seventy-four reside in Worcester county. Massachusetts is represented by thirty-six, besides those already mentioned. Connecticut claims ten of the remaining students, and Vermont and New Hampshire are tied with six each. Rhode Island sends five, Pennsylvania and Nova Scotia, four; and New York, South Carolina, and California, two. Kentucky, Florida, Illinois, Minnesota, Kansas, Oregon, District of Columbia, England, New Brunswick, Quebec, Manitoba, Mexico, Brazil, and Japan are represented by one each.

Among the improvements that have been made during the past year may be mentioned the addition to the shops, which also furnishes additional facilities for free drawing and blue print work. Additions have been made to the equipment of the electrical laboratory at an expense of nearly one thousand dollars, and over five hundred volumes have been added to the library. The Faculty remains the same, but the number of Instructors has been increased from eleven to fourteen. The most striking difference between this year's catalogue and those of previous years consists in the change in the length of the courses to four years. The Mechanics are not so much affected by this change as the students in the other courses to whom it allows an extra year's practice with an additional one hundred and sixty-

eight hours summer practice. In the Freshman year of all courses, twice as much time is allowed to Chemical Laboratory, Rhetoric, and English, as under the three years' course. A brief course in ethics has been added, and advanced French, which has been omitted for two years owing to the pressure of mathematics, will again be taken up. The additional time afforded will be devoted by the Chemists to more quantitative analysis, and sanitary and industrial chemistry will be given more attention. In the Civil Engineering department, more will be done in roof and bridge work, and hydraulics will be allowed more time.

The old outline of courses made no distinction between practice, which required no preparation, and mathematics or languages, for each recitation in which two hours study were needed besides the hour of recitation. Naturally, one not thoroughly acquainted with the work in the Institute would be given a vague and uncertain, if not a wrong, idea of the amount of work done. In the new catalogue this is rectified by indicating the studies demanding outside work, and the amount of preparation required by each.

At the present time, there are fifty-eight hours weekly of assigned work and preparation. The new outline of study calls for only a little over fifty-two hours, or an hour a day less.

On turning to the list of graduates, we notice that all of last year's graduates are either advanced students or engaged in business. Among the other alumni, are many occupying positions of honor and responsibility. Hugo P. Frear, '83, is chief draughtsman at the Union Iron Works, San Francisco, where the cruisers for the United States Navy are built. Nathan A. Cobb, '81, received the degree of Ph.D. at Jena in 1888, and has attained great renown as lecturer and investigator of biological subjects. He is now at the University of New South Wales and is government expert in entomology.

It is noticeable that while the per cent. of graduates since the founding of the Institute is fifty-one, the per cent. during the last six years is fifty-nine, showing that the men entering are better fitted for the work than formerly, and that the standard is being constantly raised.

The requirements for admission are also being increased. In algebra pure and affected quadratics, equations in the quadratic form, simultaneous quadratics and the theory of quadratics have been added. Beginning with June, 1894, solid geometry will be a requirement for admission. Candidates must also be prepared in French upon one of Racene's tragedies. While this will doubtless require more work in preparation, yet no man who fails on the entrance examinations would be able to grasp the work
required in any of the courses. This will merely do at the beginning what would be done necessarily later, drop the stragglers, and should be welcomed as a forward step in the life of the Institute.

ALUMNI NOTES.

'71. Walter L. Chaloner, has given up his position with the Forbes Lithographic Co., Boston, and gone into business for himself under the firm name of Frissell & Chaloner, Designers, No. 2 Park Sq., Boston.

'86. Wm. E. Drake has accepted a position as instructor in mechanics and physics at the Rhode Island Agricultural School at Kingston, and will enter upon his duties May 1st.

'89. Walter S. Ball, who has been in the employ of the Dean Steam Pump Co., Holyoke, Mass., has accepted a position with the Beacon Cycle Co., Westboro, Mass.

'90. H. E. Warren is at 26 Hildreth Building, Lowell, Mass.

Julius W. Bugbee is chemist at the Worcester Sewage Purification Works at Quinsigamond.


'91. E. A. Taylor recently left for Provincetown, Mass., where he expects to remain three months superintending the construction of water works.

'92. T. E. Brayton, who has been serving as Prof. Alden's private assistant, has severed his connection with the Institute and entered the employ of E. and T. Fairbanks & Co., Scale Manufacturers, St. Johnsbury, Vt.

TECHNICALITIES.

Whipple, '94, has been suffering from a slight attack of the grip.

Hollis Adams, formerly '94, is with H. D. Stone, Bicycle Dealer, 683 Main Street.

A new monthly, Worcester's Young Men, will soon be published under the auspices of the Worcester Y. M. C. A.

Denny, '93, and Rawson, '93, are testing the engine at the Norton Emery Wheel Works, Barber's Crossing.

Strong, '93, and Metcalf, '93, completed their tests on the compound engine at the Salisbury Laboratory last week.

As it was found impossible to organize a nine to represent the Tech. during the vacation, the games arranged with Holy Cross for April 1st and 5th were cancelled.

Dr. Fuller has received from W. S. Morehouse, '86, a specimen of concretion in marble, which was found to be a mixture of black mica, magnetite and calcite, a very rare combination. The specimen is from Gouverneur, N. Y.

Quite a large delegation of Tech students were at the Theatre last week Tuesday to witness the presentation of "As You Like It," with Julia Marlowe as Rosalind. This play being in the required reading for the class of Ninety-four is of special interest to members of that class, and those who saw the play are certain they have lost nothing by it.

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