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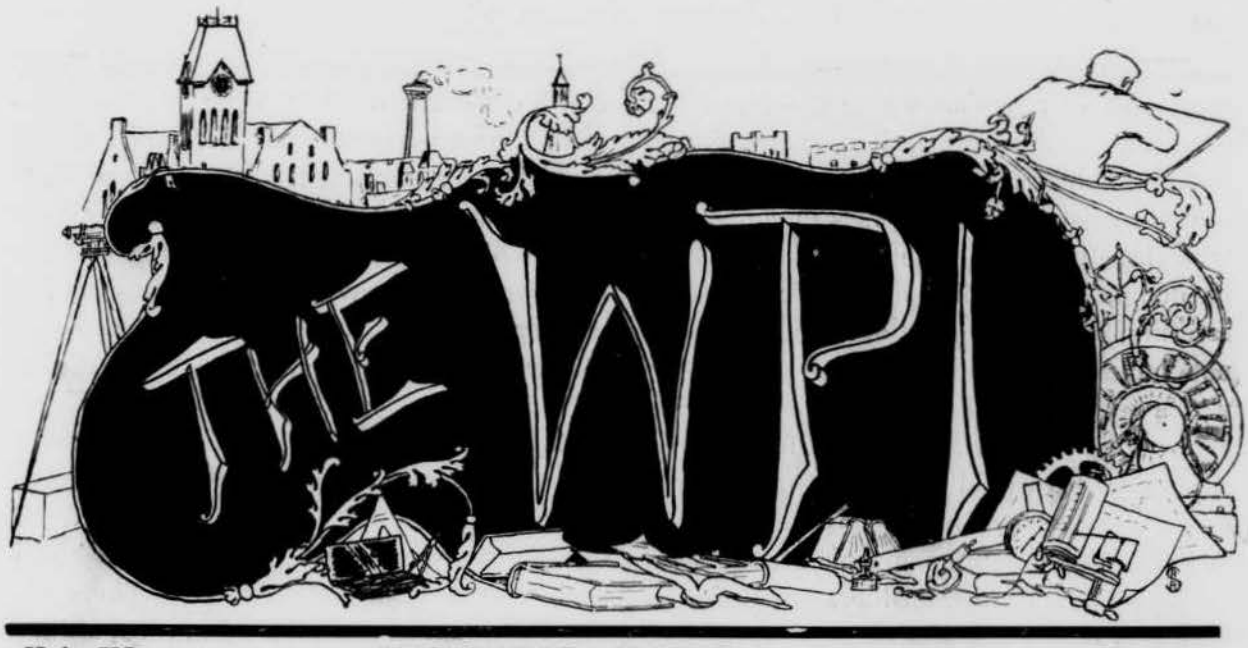

Vol. XI. WORCESTER, MARCH 7, 1896. No. 16.

The W P I is published by the students of the Worcester Polytechnic Institute on alternate Saturdays during the Institute year.

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For a second time within a year the Institute is called upon to mourn. By the death of Hon. William Whitney Rice there has been removed from the Board of Trustees one of its most faithful and efficient members. It is far beyond our power to add anything to the very many touching tributes paid by distinguished men to the memory of Mr. Rice. We can only express to his wife and family the sincere regret and deep sympathy which the entire student body feels for them, in this their hour of sorrow.

There is an old custom at the Institute the wisdom of which has been proved in the past, its value is, however, being decreased day by day, and, as things are going now, it will not be very long before it becomes obsolete. When that time arrives we will appreciate what a good thing this old custom was. We refer to the use and abuse of the bulletin boards in the several buildings.

There was once a time, not many years ago, when a notice could be posted several days without receiving any change whatever. But now all that is gradually changing. To some students the bulletins are a source of apparent amusement; others prefer to use them for scribbling paper; while some consider them a menance to the eye. So we could go on enumerating the many ways in which the students look upon these notices, and in which the privilege of the bulletin is abused.

To come to the point, this interference with posted notices is a nuisance which is exceedingly annoying, very childish, and

unworthy of any one who calls himself a gentleman. A man may have many faults, but if he minds his own business these faults are not so apparent. So it is in connection with these notices. One who takes particular delight in scribbling on a notice of some meeting, or changing the date on a notice, is not minding his own business; in other words he is "fresh," so much so that grass grows all over him. Many a fellow who alters a notice would feel hurt if told he was not a gentleman, but yet he would be told the truth, for gentlemen mind their own business and have consideration for the wishes of others.

There ought to be a spirit of fairness among us all which would do away with all these childish jokes, and which would make the bulletin board a source of real information. Let us all think twice before we tamper once with a notice.

Shall we have a glee club? is a question which will be brought before the musical men of the Institute for consideration in the near future. A few weeks ago, when this question was first agitated, nearly every one conferred with was opposed to the proposition because such an organization would require too much time. After reflection, however, the men have almost with one accord made favorable comments regarding the scheme.

Two years ago, a glee club was started, and, in co-operation with the banjo club, gave several concerts. Probably there were as few "stars" in Tech then as there are now, but by constant rehearsing, the men made a very creditable showing,—far better than was expected, considering their tardiness in organizing. Possibly there were several reasons for not continuing the movement so well started, but lack of unity and poor organization were undoubtedly the most serious defects which caused the glee club's dissolution. When the leader graduated, the entire matter fell flat and has not since been resurrected. If there had been a genuine unity on the part of the members of the old glee club, it is safe to say, that now we would have a musical association worthy the name, for there is, and has been, plenty of good material in the Institute for such a purpose.

So much for the past,—now for the present and future. It is useless to think of a show this year, but a glee club could be trained and could give at least one home concert at the end of this term. There are known to be enough men of musical ability now in Tech to form a first class glee club. There are at least thirty men who are capable of singing well one of the four parts, and three first tenors have already been brought to light. As for a banjo club, '99 alone has six good men while a Senior, who is thoroughly at home with either the banjo or guitar, is willing to aid in organizing a club. In the four classes, players of different instruments are numerous, who doubtless will be glad to help this plan along.

Several members of the Faculty have been spoken to in regard to this matter and they have been enthusiastic for the success of the movement. One professor, who offerred to help along the idea in every possible way, when asked if he would be willing to direct the glee club (should one be formed) during the absence of the regular musical instructor, replied, that he would be glad to do so. He further stated that we ought to have a glee club to sing at the Worcester Alumni Meeting, at Commencement, and at all other special Tech meetings.

Mr. Rice, a musical director of well known ability who trained the old glee club, has expressed his willingness to aid this scheme. What then need prevent a speedy formation of a glee and banjo club? No college society or club offers such

profitable enjoyment as a musical association. Training from such a man as Mr. Rice, is certainly a great inducement of itself, and this, with the social enjoyment derived, should certainly more than offset a sacrifice of time.

Several students are at present devoting considerable time to the preliminary arrangements necessary for the resurrection of the old glee and banjo clubs. It is earnestly hoped that all the students, and especially those who play or sing, will support this movement. Watch the general bulletin board for further developments.

The bills for the past year's subscriptions to the W P I were issued sometime ago. Doubtless every subscriber has received his bill, but few of them have taken any notice of it. We hope these bills will be paid at once, as the present board of editors goes out of office in a few weeks, and as it is desired that all its accounts be settled before April first.

If you have not done so, kindly remit at once the amount of your bill. The price of this paper for a single year is in any individual case small, but it is of great importance to a paper conducted, as the W P I must be, on small capital and slight margin.

DEATH OF HON. WILLIAM W. RICE, TRUSTEE.

On Sunday evening, March the first, at his home, No. 9 Bowdoin Street, occurred the death of the Hon. W. W. Rice. For two or three years Mr. Rice had been suffering from the disease, heart trouble, which caused his death.

Hon. William Whitney Rice was born in Deerfield, Mass., on March 7, 1826. His father was Rev. Benjamin Rice, and the maiden name of his mother was Lucy Whitney, a native of Winchendon. Mr. Rice graduated from Bowdoin College in 1846. He was instructor at Leicester Academy till 1851, when he entered the law office of the late Hon. Emory Washburn. In 1854 Mr. Rice was admitted to the Worcester County Bar and began practice at once in Worcester, where he has since resided.

Mr. Rice was a conspicuous actor in the stirring events antedating the Civil War, and later in Congress he participated for a whole decade in the proceedings of the House of Representatives. He was a member of the Free Soil Party and everywhere was considered one of those popular men that the people like to applaud. When the Republican party was formed, 1856, Mr. Rice became one of its staunchest adherents, and in the exciting times immediately following the war his voice was frequently heard with those of such men as Hon. George F. Hoar, the late Gen. Devens, the late Adin Thayer, the late Hon. P. Emory Aldrich and many others. In 1860 Mr. Rice was elected the first Republican Mayor of Worcester, and in the exciting times of that year his term was especially successful.

Mr. Rice succeeded Hon. George F. Hoar in the House, when the former was chosen Senator. As a congressman for ten years he made himself widely known as a most successful and judicious legislator. Since his departure from congress, Mr. Rice has been a member of the law firm of Rice, King & Rice.

He was a member of the Board of Trustees of Clark University and of the Board of Trustees of the Polytechnic Institute. He was also a member of the American Antiquarian Society, and was for many years a Director of the City National Bank and its law adviser, and a Vice-President of the People's Savings Bank.

In 1891-2 he with Mrs. Rice and Senator and Mrs. Hoar made an extended tour of Europe. This trip Mr. Rice greatly enjoyed, and on his return he appeared in most excellent spirits and seemed in the enjoyment of splendid health.

In 1884 Mr. Rice gave the address at the centennial celebration of the founding of Leicester Academy. In 1886 he had conferred upon him the degree of LL.D. by his Alma Mater, Bowdoin College.

Mr. Rice had been twice married. His first wife was Miss Caroline Moen of Stamford, Conn., by whom he had two children. The first born was William W., Jr., who died in infancy, and the second son is Charles Moen, of the law firm of Rice, King & Rice. In 1862 his first wife died and in 1875 he married Alice M., a daughter of the late Henry W. Miller of Worcester. The first Mrs. Rice was a sister of the late Mr. Philip L. Moen, and his second wife is a sister of Mrs. George F. Hoar.

Mr. Rice in his religious faith was a Unitarian, and attended the Church of the Unity.

Resolutions

Were passed on his death as follows:—

The Board of Trustees met in the library of the Antiquarian Society at 2.30 o'clock Tuesday, March 3d, to take action upon the death of

Hon. W. W. Rice, who for many years served as one af the trustees of the Institute. The full board was present. The meeting was called to order by Hon. Stephen Salisbury, president of the corporation, who, in so doing, spoke as follows:—

"It is my painful duty to call your attention to the great loss the Worcester Polytechnic Institute is called to suffer in the death of one of its earliest trustees, Hon. William W. Rice. From the date of his appointment, in 1869, until ill health came upon him, Mr. Rice was faithful, earnest in the support and counsel he gave to our institution, and he was exceptionally punctilious in the careful judgment with which he weighed each question that concerned its welfare. Placed upon the most important committees, he brought to their service the double advantage of his legal ability and his great practical business wisdom which gave him much prominence as a business lawyer. The many times delicate and perplexing negotiations that were entrusted to him for the school were fulfilled with a good judgment and a tact that were always foreseen in his appointments, and never fell short of the expectations. On many occasions the ready address and conciliatory disposition of our associate made difficulties disappear, and led to united action in matters of importance. The board will miss the genial, patient adviser and kind personal friend. I have asked the secretary, Rev. Daniel Merriman, D. D., to express the sentiments of the trustees."

Dr. Merriman then made the following tribute:—

"The trustees of the Worcester Polytechnic Institute desire to place on record some expression of their deep sorrow in the loss which they have sustained by the death of their distinguished friend and associate, Hon. William W. Rice.

"Mr. Rice has been a trustee of the Institute on the part of the board of education since 1869. His service, therefore, in this position covers the entire history of the institution since its founding.

"During all this long period of twenty-six years Mr. Rice, unless ill or absent from the city, has been a diligent attendant upon the meetings of this board. He has been conspicuous for his effective and painstaking attention to all the varied interests of the Institute. He was a lover of good learning; firm in his convictions, yet gracious in his expression of them; eagerly sympathetic with all the best aims of the Institute, and disinterested and patient in his support of them.

"He brought to the discharge of his duties as trustee a penetrating discernment, breadth of vision, highly trained faculties, great good sense, pre-eminent fairness in judgment, and an unfailing courtesy and gentlemanliness. Especially in the management of all legal and financial questions his skilful and judicious counsel has been invaluable. In many difficult issues we have learned to rely implicitly upon his tact, wisdom and candor, and we shall painfully miss his able assistance, his tried friendship, and his genial presence in our deliberations. We have lost a fellow-worker of great strength, of high and symmetrical character, and the Institute has lost one of its most earnest friends.

"His service of the Institute, of the city, of the commonwealth in high places of trust, has been marked by great ability, faithfulness and public spirit, and he leaves to his bereaved family, to his wide circle of friends, and to his fellow-citizens an example of strong, high bred and conscientious devotion to duty, which will always be a source of joy, springing up in the midst of our grief, that he has passed away."

Remarks were make by President Mendenhall, warmly eulogizing the profound interest which Mr. Rice always took in the affairs of the institute, even in the midst of his last illness, and the sagacity of his judgment of men and methods of administration.

His Honor Mayor Sprague, also testified from long personal acquaintance with Mr. Rice, to his ability, public spirit and urbanity in the discharge of the various duties that devolved upon him in connection with public office.

Rev. H. J. White also spoke in eulogy.

The minute was unanimously adopted and it was voted that it be spread upon the records and that a copy be sent to his family.

As a further mark of respect to the memory of Mr. Rice, the trustees attended the funeral, and the faculty and students of the institute were requested to send delegations. All exercises were suspended at the institute on the afternoon of the funeral.

The following minute, in memory of the late Hon. W. W. Rice, was adopted at a special meeting of the faculty of Worcester Polytechnic Institute held late Tuesday afternoon, March 3d.

We, the faculty of the Polytechnic Institute, realizing the heavy loss to the institute and to the community in the death of Hon. W. W. Rice, feel impelled to record our sense of his great worth, of sorrow at his removal and of sympathy for those most immediately be reaved.

To an extent not generally realized, we have been strengthened and supported by his discriminating judgment of men, by his w sdom in counsel, by his rich experience in affairs, and by his generous interest in the progress of education.

We are saddened at the thought that he is no more with us, but we are grateful for his constant efficient service in promoting the welfare of the institute for the quarter-century during which his name has stood conspicuous on the list of our trustees as representing the State Board of Education.

Whereas, In the all-wise providence of Almighty God, the late Hon. W. W. Rice, another of our most honored and highly esteemed citizens and ex-mayors of our city, has been called from our midst by the hand of death; therefore,

Resolved, That we, the city council of the city of Worcester, in joint convention assembled, desire to place on record our appreciation of the exalted character and worth of our late distinguished and much-loved fellow-citizen and ex-mayor of our city, and in this public manner to give expression in some degree to our great sorrow at the loss of one who has been so long, so closely and so honorably identified with the truest and best interests of our growing and beautiful city, not only as its chief executive officer, but as an ever-loyal citizen, and, whether in the councils of the city, the county, the commonwealth, or the nation, whenever he has been called to positions of honor and responsibility, he has filled them with such conspicuous ability and fidelity as to give his friends and fellow-citizens just cause for pride, and his name and deeds to be held ever in grateful remembrance.

Resolved, That these resolutions be spread upon the records of this body, and also that a copy be sent to the family of the deceased ex-mayor and fellow-citizen.

The board of directors of the City National Bank held a meeting at noon Monday, when action was taken on the death of Hon. William W. Rice. It was voted to attend the funeral in a body, and, on motion of Dr. Thomas H. Gage, it was voted to place the following tribute to his memory on the records of the Bank, and to send a copy to the family of Mr. Rice:—

The directors of the City National Bank received with great sorrow the announcement of the death of their distinguished associate and friend, the Hon. William W. Rice, and avail themselves of the earliest opportunity to express their deep sense of the personal loss they each and all sustain in the sad event.

Mr. Rice's official relations with the board began with the earliest years of the bank's existence, and he has given to it, during the long intervening period, the invaluable advantage of wide business acquaintance, sound judgment in business affairs, and great professional ability, devoting himself with constant and conscientious faithfulness to the promotion of its interests and prosperity. He has had the unquestioning confidence of his associates, and the services he has rendered will be held by them in permanent and appreciative remembrance.

Personal association with him has been a constant pleasure. His genial manner, uniform and abounding courtesy, and kindly regard for the feelings and views of others, have made him distinctly a favorite, and he has been beloved by all. His memory will be delightfully cherished here as long as any of the present board survive.

To his bereaved and stricken family the hearts of his late associates go out in sincere and affectionate sympathy. Time may assuage their grief, but it can never take from them the priceless memory of a great and useful life.

A largely attended meeting of the Bar Association was held at the stone court house Tuesday, March 3d, to take action on the death of Hon. W. W. Rice. The meeting was called to order by Secretary Webster Thayer, Esq., in the absence of Col. W. S. B. Hopkins, the president. Frank P. Goulding was elected president pro tem.

In taking the chair Mr. Goulding remarked the solemnity of the occasion when the bar was called to mourn the death of one of their most conspicuous members. Death is sure to come, and there is no time when it does not surprise and shock us. On this occasion it has come to a man prominent as a member of the bar. He was a member of a great party, and there were few in this city more prominent in the councils of that party than he in its early struggles for a great principle. He was influential in directing its policy.

On motion of Col. W. A. Williams it was unanimously voted to attend the funeral at the Church of the Unity, and to meet at the Walker building at 2 o'clock. Col. T. S. Johnson, clerk of courts, was elected marshal.

It was voted to appoint a committee on resolutions. The chairman, F. P. Goulding, was elected chairman of the committee, aud the following were added:—Col. W. S. B. Hopkins, Col. E. B. Stoddard, T. G. Kent and Col. W. A. Williams.

The Funeral.

The funeral of Hon. W. W. Rice was held on the afternoon of March 4th. There were prayers at the family residence on Bowdoin street at 2 o'clock, after which the remains were conveyed to the Church of the Unity on Elm street, where, at 2:30, the public service began.

The honorary bearers were: Mayor A. B. R.

Sprague, Henry W. King, Dr. Thomas H. Gage, Hon. Stephen Salisbury, Hon. E. B. Stoddard, Col. A. George Bullock, Dr. G. Stanley Hall, Col. W. S. B. Hopkins.

The following gentlemen officiated as ushers at the church: Charles M. Thayer, George S. Taft, Charles F. Aldrich, Arthur P. Rugg, Edward F. Tolman, Thomas H. Gage, Jr.

The members of the city government assembled at 2 o'clock, at the City Hall, whence they proceeded to the church in a body.

The services were conducted by Rev. Calvin Stebbins, pastor of the Church of the Unity, and the interment was at Rural Cemetery.

THE ELECTRICAL EQUIPMENT FOR AN OVERHEAD TRAVELLING CRANE.

Read by Chas. L. Griffin before the Washburn Engineering Society, February Tenth.

The power travelling crane is not a recent invention. The application of electricity as motive power is recent. Of the several methods for the distribution of power to the travelling crane, the writer chooses to take for description what is known as the three-motor system. This system implies the use of a separate motor, independently controlled, for each of the three motions; viz., hoisting, trolley traverse and bridge traverse. It allows the operation of each motion separately or in combination with any of the others. The tendency to the use of this method of crane power distribution has become almost universal, so that the three-motor crane might properly be called "the standard electric crane." The credit for the invention belongs to Mr. A. J. Shaw, recently deceased, of Muskegon, Mich., letters patent having been taken out by him in Milwaukee, Wis., about the year 1888. The peculiar circumstances under which the first three-motor crane was built are worthy of note. A large power travelling crane on the flying rope system in the foundry of the Allis Co. at Milwaukee collapsed while handling a heavy cope. The machine fell thirty feet, killing the operator and rendering the structure a mass of twisted and broken iron and steel. To Mr. Shaw, at that time an engineer with the Allis Co., was given the job of re-designing the crane, which he did upon electrical lines, and incorporated the three-motor principle, the subject of his recent patent papers. This crane was equipped with Sprague motors, and is still operated with success over one of the largest foundry floors in the United States, although the work is now divided between it and two other Shaw cranes on the same track. The writer cannot forbear instancing this as a high tribute both to Mr. Shaw and Mr. Sprague: to the former for the high engineering skill which made the first machine of its kind a permanent success; to the latter for the perfection of motor design, at that time in its pioneer stages, which made possible an unbroken motive power for the severest kind of service, —that of operation in the dirt and smoke laden atmosphere of the foundry.

The travelling crane for a shop should be installed upon an independent power circuit, supplied by its own generator. With the usual voltage of 220, the temptation is always great to combine the power and light circuits, for the sake of less first cost of installation. It is argued that it is not working at maximum efficiency to allow a lighting machine to stand idle during a large portion of the day when it might be used for power, such as the crane demands. The question has several phases worthy of consideration. In the first place, when we want light, we must have it and we must have it good. Dim light will not do, fluctuating light is worse, both will decrease the shop output. A crane drawing power from the light dynamo will surely cause the lights to flicker. The crane load varies almost instantaneously from zero to maximum. When the load is stopped the current is zero, when the load is started the current drawn is quickly at a maximum. There is no gradual creeping up to give time for regulation. The operator usually throws his lever clear over at almost a single movement. Even though the engine responds quickly enough, the compounding of the dynamo will not, and hence we get a change in field strength with a corresponding fluctuation of voltage and lights. If the crane load were small in proportion to the load caused by the lights, the fluctuation would be less, but this condition of things does not usually exist. It should be further noted that a fluctuation in voltage, besides giving an unpleasant light, lessens the life of the lamp, and thereby becomes a factor of shop economy not to be overlooked.

But this is not the worst feature of the single generator plan. To the writer's mind, it is bad policy to be dependent for two such important services as light and crane power upon a single machine. A breakdown in either, with nothing to fall back upon, in multitudes of cases would cost far more than the extra generator. A machine which has been run intermittently all day on a power circuit always passes a critical point when the lights are thrown on as a constant load at night. Then, if ever, a fault will occur. Then, if ever, it must not occur. Turn now to the plan of a generator each for power and light, and we have a flexible system subject to no such contingency. The power machine can be run all day long on the crane, or if a fault develops the light machine can be at once switched on to the power circuit while repairs are effected or armature changed. The reverse can be accomplished, the circuits being so arranged that the power generator can, on requirement, supply the light circuit. The normal condition of the light machine during the daytime being rest, there is no excuse for it not always being in good condition, hence the chance for a breakdown is a remote one.

The power generator for crane service should be a compound wound machine, arranged preferably to deliver current at 250 volts. This allows about 12 per cent. drop between the generator and motor terminals, supposing the motors to be designed for 220 volt circuit. This somewhat large allowance may be explained by stating that it covers the loss in the solenoids for operating the magnetic brakes. A slight variation either way from normal voltage at the crane terminals is permissible, the only noticeable effect being a corresponding change in motor speed.

As previously stated, the worst feature to contend with in the supply of power to a crane is the suddenness with which the load comes on and the range which it takes at such a time. Considering for a moment street railway service, it is easily seen that while the range of load is great, yet the range of fluctuation at any one time is much less and but a small proportion of the former, for it is manifest that but a few motors out of many can be simul-

taneously thrown from zero to full load. With a crane, however, the hoist motor maximum load, for example, draws quite likely a large proportion of the maximum capacity of the generator. When a heavy lift is started the surge of current is very large, and the writer has seen the ammeter needle fly clear past the scale reading of the normal lifting current. It is practically impossible to start a heavy load without such a surge. On a poorly designed generator, or even one which may work well on other service, this will cause a vicious flash at the commutator, which, often repeated, means its destruction. No automatic regulation of the brushes can be quick enough to meet this surge. The field strength must simply be made so strong as to confine the neutral point to a very narrow limit under the brush, so that commutation may be properly effected over the whole range with one setting of the brushes. This is a severe test for a generator, but a well designed machine will stand it.

In determining the capacity of generator for a given crane, it should be remembered that most machines are rated for a constant all day load. Machines so rated can usually be run at a somewhat higher rating for intermittent service, for the intervals between heavy loads which would heat the wires to a dangerous point if allowed to continue, give opportunity for the wires to cool. Hence on crane service, which is always intermittent, this point may be used to advantage. One thing not to be lost sight of, however, is that a machine rated at a certain capacity in an atmosphere whose temperature is, say, 70° Fahrenheit, will not be good for that rating in a hot engine room at a temperature of 120°. The wire loss, or C^2R, always adds a certain amount to the initial temperature. Hence the precept follows, either choose a cool place for the generator, or install a machine with a nominally large rating.

To give a general idea of the size of power equipment for an average case, let it be assumed that we are to operate a crane with a capacity of 20 tons, or 40,000 lbs., span of bridge 50 ft., length of run about 300 ft. This will require, for ordinary speeds of operation, a generator of about 32 K. W. capacity, the rating being for an intermittent load. The switchboard for such isolated plants should be as compact as possible and close by the generator. It carries the usual instruments, voltmeter, ammeter, main switch, field theostat, fuses, and ground detector lamps. Marble or slate is of course the only suitable material for the body of the board, and a very cheap and strong one can be made from small squares of slate by fastening same to two uprights of angle iron.

Turning now to the motor end of our line, it may be well to introduce the subject by continuing our supposed case of a 20 ton crane, and noting in what proportions the power is distributed. Assuming the crane under full load, to effect the several motions, it will be necessary to supply about 25 H. P. to the hoist motor, 3 H. P. to the trolley traverse, and 12 H. P. to the bridge traverse. These figures are all in electrical horse power delivered at the motor terminals. For the particular type of crane under consideration, the speeds would be about 12 ft. per minute hoist, 100 ft. per minute trolley traverse, 225 ft. per minute bridge traverse. These speeds are those usually specified for standard service on a crane of the size suggested. The figure for the hoist speed is consistent with a total efficiency of about 60 per cent. between the suspended load and the terminals of the motor. It takes a good crane and a good motor to realize this figure, but actual test has shown that with the machinery in normal condition and the hoisting chains well slushed with grease, it can be attained. Returning to the figures for horse power given above, and considering the worst condition of operation as being the simultaneous motion of hoist and bridge traverse at full load, we have a call for 25+12=37 H. P. Our generator will deliver 32 K. W., or about 43 H. P., hence we have 6 H. P. to cover loss in the line, loss in the magnetic brake solenoids, and spare power.

Reference has several times been made to the magnetic brake, and in this connection it may be well to state the principle of its working. In brief, the brake consists of a cast iron drum keyed to some shaft of the hoisting train, and upon the surface of which is gripped some form of friction strap. This normal condition is maintained by the force of a weight or spring when no current is passing, hence the load is at rest. When it is desired to effect motion, the strap is pulled free from the drum surface by a pair of solenoids, whose exciting current is derive l from the same source and allowed to flow through the operation of the same mechanism as controls the hoisting motor.

As the motor responds to the call for torsional effort, the generator responds to a nearly proportional call for current. Hence many generator requirements pertain to the motor also. Crane motors are usually series wound, thus exerting a large starting torque and giving an increased speed under light load, being the precise effect required. They must be reversible, and stand reversal at heavy load without sparking. They are preferably slow speed, hence often of the multipolar type. Slow speed not only makes possible a more stable construction for the motor but makes the details of crane mechanism more durable and smooth of action. The writer ventures to state with regard to the severity of service demanded of the crane motor that it frequently exceeds that of the street car motor. Consider a crane in a steel foundry, for instance. In handling the ladle of metal the heat to which all the machinery is exposed is quite enough sometimes to destroy a cheaply built armature. Then when the molds are shaken out, clouds of dust, smoke, and sand rise and settle on every available ledge. Grease and oil are everywhere present, and if not falling in the wrong place by accident the operator is quite likely to put them there. And yet under such conditions the crane motor is expected to and does perform its work with unfailing promptitude. To attain this end requires simply the very best skill that the mechanic and the electrician know how to put into its construction. The armature must be iron clad, well ventilated, and run with a very low factor of heat radiation. The insulation must be mica throughout, and special care must be taken to avoid grounds or short circuits which might occur from bridging over by small metallic particles settling from the dust-charged atmosphere. The field coils must be protected as thoroughly as possible and must be of such size wire as will keep the factor of heat radiation low. Add to these considerations the fact that architects usually cramp the head room above the crane runway so that no space is left for the motors, to say nothing of the crane machinery, and the element of compactness enters into the design of a machine already overburdened with limitations. It is not the "last straw" however, for the art has kept pace with the requirement.

Turning now to the motor-controlling device we meet another interesting feature of crane equipment, a feature upon the successful operation of which the close manipulation of the crane depends. The call

for good regulation in a travelling crane is more imperative than at first apparent to the uninitiated. In swinging work upon the lathe centres, in erecting and locating machinery, the motion required is but a fraction of an inch. Even with a skilful operator this means a device having a large number of points of control. The requirement is met by the use of a controlling rheostat, and by this we mean that we must have a series of resistance coils so arranged as to be cut out gradually from a maximum to zero, and so proportioned as to heat radiating surface that we may stop at any point and hold the current for an indefinite period without undue accumulation of heat. Iron wire or ribbon is the most available material for these resistances, and when so used should not be proportioned to carry more current than enough to heat to a dull red color. A rheostat is an unsatisfactory device to discuss, for in its use we are continually running against the unpleasant fact that we are frittering away power into heat at the rate of C^2R watts. The controller problem in the street car has been met by the introduction of the series parallel controller, and energy is wasted only in passing from point to point, which is practically nothing. Only a small number of points is possible even with the use of two motors, but it is a sufficient subdivision for street car work. On a crane, not only do we have but a single motor to work with, but our subdivisions must be much finer in order to give a satisfactory gradation of speed. The rheostat accomplishes our purpose well, and, after all, does not waste a relatively large amount of power. In closely watching the operation of a crane, it will be noted that the time spent on the intermediate rheostat points compared with the time that the rheostat is cut out entirely is small. In other words the crane is operated at full speed the greater share of the time. The same argument would have held for the old street car rheostat, but in that case the wasted power would have had to be multiplied by a large number of units. So the question settles itself into one of degree, until somebody invents a device that will control perfectly, without loss, on a direct current circuit.

The only considerable feature of equipment remaining to be considered is the line. A continuous metallic circuit must be had, and the only primary question which arises is whether it is best to ground one side of the circuit. The writer understands that the theory of the grounded circuit is that all grounded wires are brought to the same potential as the earth, and consequently cannot be a source of danger or leakage through contact with them. The principle involves the branding of the non-grounded wire with a danger signal, in fact, isolating it. This is usually done on city lighting circuits. In crane service the writer does not believe it advisable. The constant care of the machinery necessitating contact with the parts renders the risk of shock great, especially as it is impossible to isolate any of the wires. The only effect of a 220 volt current on a man would probably be the surprise it would give, but it might be sufficient to throw him from the crane, in which case he might as well be killed outright by a 2000 volt current. Hence the writer believes that all parts carrying current should be carefully insulated from the crane structure. The main line conductors are strung close by one of the crane runways, and the crane feeders take current therefrom through a pair of sliding or rolling collectors. These line conductors should be provided with a spring tension or take-up at the ends to provide for changes in length due to expansion and contraction. A series of wires strung across and inside of the bridge to convey current to the trolley are similarly provided. A main switch, which should be double pole, is imperative as a part of the cage equipment and should be at the most convenient location for the operator. Fusible cut-outs or circuit breakers should protect each motor circuit. All concealed wiring should be placed in covered conduits, but with the cover readily removable. Complicated circuits are a forbidden feature of the travelling crane. A crane can be built so that a man of ordinary perception can attend to it, yet many a crane is built which should be sold with an educated engineer as an attachment, for he will be as greatly needed for its maintenance as a superintendent is needed for a power station.

In concluding these remarks on a particular form of power equipment and transmission, comparison with other methods would perhaps be in order. The writer feels, however, that to draw conclusions from a discussion of hydraulic, pneumatic or rope transmission, would be to formulate a general statement which would be of little specific value. The fact is that mechanical approval has been set upon the use of the electric current for *general* crane service. In large or special plants the writer believes hydraulic or pneumatic hoists may still have advantage for special uses. The wisest engineer is he who does not ride his hobby at the sacrifice of his judgment and the experience of others.

AN INVENTION OF A JUNIOR.

A New Electric Rail Bond.

S. Nikoloff, a member of the Junior class, has just been granted, through the agency of Charles H. Burleigh of Worcester, a patent on an electric bond used in connecting the electric car rails. Mr. Nikoloff is a Bulgarian by birth, but has been in this country for about eight years, the last three of which have been spent at the Institute.

The device of Mr. Nikoloff consists of two concentric cylinders made of copper, about the size of a spool of thread. Through the inner cylinder there is a hole just about the diameter of that of the wire. Upon the outer cylinder is a small flange. The space between the two cylinders extends to about a quarter of an inch of the bottom. The other part of the device consists of a tubular steel "key," which really is nothing more than a hollow cylinder slightly rounded at the ends. The outer diameter is a small fraction of an inch greater than the inside diameter of the outer concentric cylinder. The inside diameter of the "key" is a little less than the outer diameter of the inner concentric cylinder. It is what would be called, technically speaking, "a driving fit." After the concentric circle has been placed in the hole drilled for it in the rail the wire is placed in position and the "key" driven in. Fitting as tightly as it does, the key forces the outer concentric cylinder against the rail and contracts the inner con-

centric cylinder against the wire. The fitting is so close that it amounts practically to a weld, and not the slightest open space is revealed, even under the microsope. Under these conditions the electric contact is the best possible, the current passing through the bond in its journey to the wire as easily as it does through the wire itself.

Mr. Nikoloff has been at work on the bond for some time, and made application for a patent during the last part of December. All the work and experimental testing in connection with the new bond was done by the inventor at the Salisbury laboratories of the Institute.

The advantages claimed for the new bond are that it is much easier to apply than some of the other bonds; that it presents a greater surface of contact, and therefore is a better conductor between the copper wire and the rails; and that the bond can be manufactured for at least one-third less than the bonds now generally employed. Mr. Nikoloff has shown his invention to a number of railroad contractors, including the Worcester Construction Company, and all speak of it in the highest terms, and predict its adoption in place of other bonds. Several of the companies that manufacture railway bonds, including the Washburn & Moen Manufacturing Company, are interested in the bond, and it is certain that some one of them will undertake the manufacture in a short time.

THE TECH MEET.

To be held March 19.

At present everything points to the success of the meet to be held at the rink on Thursday, March 19th. The entry blanks are out and the open events advertised are 40 yd. dash, 1,000 yd. run and 600 yd. run. The closed events will be a 600 yd., 1,000 yd. runs, high jump, and pole vault. All events are to be handicap contests. A relay team race for the class championship will also be run by the four classes of the Institute.

Many Tech men, besides a large number of outsiders, are in training daily at the rink for the coming meet. Handsome prizes will be given for first and second places in all events, and a large list of entries is anticipated. Entries close with C. A. Harrington, W. P. I., Mar. 7th. The special attractions are to be of such a nature as to be a powerful drawing card. A team race has been arranged between Harvard College and the Worcester Athletic Club. By the showing made at the B. A. A. games Feb. 8th, these teams stand as the two fastest in-door relay teams in the country, and the race will be one well worth seeing. It will be a battle of champions, and the outcome will be looked for with interest. The Worcester team has many staunch backers among Worcester men, but at the same time there is never a lack of good old Harvard supporters in this city. There will also be a team race between Tech and Tufts.

The Tech management have been making every effort to secure a race that would create an amount of excitement not exceeded by that aroused over the McLaughlin-Delaney race of last week. This was a match half-mile race between J. J. McLaughlin and H. L. Dadmun. At first both parties seemed to favor the match, and it looked as though the race would be arranged. Later, however, McLaughlin declined to run a half-mile match, but signified his willingness to run a 1,000 yd. race. Dadmun's favorite distance is 600 yds., and hence he did not wish to increase the distance from a half-mile to 1,000 yds. Matters came to a standstill at this point, and it looked as though the whole thing would drop through. The Tech men, however, kept at McLaughlin, and he has agreed to reconsider his statement that he positively would not run. "Jimmie" is a true sportsman, willing to help amateur athletics along in every way, and would be glad to do Tech a service, hence he has said that if he does not see his way clear to run a match race, he will run 1,000 yds. against 2:30, the time made by him in his race with Delaney at the City Guards' meet.

Whatever special events may be arranged will be announced later, and even without any more than those already secured, the meet is sure to be one of interest and excitement. The expense will be heavy, but the managers have faith in the public and hope to come out ahead.

BASE BALL.

Base ball practice has commenced in the cage at Agricultural Hall, and from now until the opening of the outdoor season, Capt. Zaeder will keep the candidates busy hustling for their respective positions. Hard conscientious work will surely make a winning team, and judging from the present outlook, there is every reason to suppose that such will be the case.

The list of candidates for the team is not a very long one, but it is expected that quality will make up for the lack of quantity. The list is as follows:

Pitchers: Saunders, '99, Shute, '99, Booth, '98, Merchant, '97.

Catcher: Fisher, '96.

Infielders: Smith, '99, Clark, '99, Saunders, '99, Fish, '97, Zaeder, '96, Cullen, '96, Knowles, '96.

Outfielders: Chamberlain, '99, Glazier, '99, Trail, '99, Shute, '99, Ferry, '98, Booth, '98, Walsh, '97, Goodrich, '96, Harris, '96, Bunker, '96.

Most of the freshmen candidates came to the Tech well recommended. Saunders has quite a reputation as a pitcher, and is also an experienced infielder. Smith has played first base on the team of the Kansas City Athletic Club, and is said to be a very strong batter. Shute and Trail have played on their preparatory school teams, and they are expected to make very strong bids for their positions. The older men are well known in the Institute, most of them having played on the first or second teams.

Manager Merchant has arranged the following schedule:

April 11.—Holy Cross at H. C. Grounds.
April 18.—Boston University at Oval.
April 25.—Wesleyan at Middletown.
May 2.—Harvard 2nd at Cambridge.
May 16.—Harvard 2nd at Worcester.
May 23.—Open.
May 30.—Open.
June 6.—Boston College at Oval.

As the schedule consists almost wholly of home games, the financial success of the team depends upon the co-operation and support of the students.

After the regular schedule is completed, the team will take a trip in Maine, playing Bates, Bowdoin, Colby and one or two other teams. The nine will probably leave on Monday and return on the following Saturday. This little trip ought to serve as something to be looked forward to with anticipation by the players. It should make the candidates work harder for their positions, and perhaps it may cause a few sleepers to wake up and try for the team.

COMMUNICATION.

To the Editor of the W P I: —

For delay in responding to your kind letter I plead the excuse, so common, that I am pressed for time. About twenty hours of class-room work per week, and that in new surroundings, to say nothing of the demands on one's attention made by the investigations of the "X rays," really leave comparatively little time for outside matters. I presume the coils in your laboratories have been busy, as elsewhere, in producing the interesting vibrations. Unfortunately our Crooke's tubes were not in good condition; but, after trying two or three incandescent lamps, we found one of these that gave the desired effect, and have used it with success in taking a few plates; and from the Worcester papers I see that Prof. Phelon has used that method of producing the rays.

The Rose Polytechnic student, unlike his Worcester friend, does not toil up a steep and slippery hill in going to his recitation and lecture rooms, for Terre Haute, despite its name, is in a flat country. It is almost depressingly flat indeed, and I would gladly climb a considerable hill were it amid so beautiful natural surroundings as your Institute in Worcester.

Outwardly there is no resemblance between the Rose Polytechnic and the Worcester Polytechnic Institutes, but when one looks beneath the exterior he quickly finds points of similarity in methods and arrangements. In fact in the entrance hall of our main building one's first glance is directed to a case of models plainly labelled, "made by the Students of the Worcester Polytechnic Institute." The hour plan also in its fullness resembles yours, and especially in the practice, which fills up the half days for the successive classes.

You may be interested to know of the arrangement of thesis time here. About five or six weeks are devoted to that work, and in solid chunks as it were, a whole week or more at a time being given exclusively to that by the seniors. Thus the first week was in February, one week will be taken at the close of this term, and two weeks together next term, with the Easter recess in addition. This plan has much in its favor in that it concentrates thought and labor while the student is engaged on his work, and that it leaves him free to attend strictly to the class work at other times. For general physics the fairly generous time of six hours per week for laboratory work is given the senior class; but you will hardly be interested to have me write a catalogue. The printed publication is available.

While methods and announcement differ, however, in some degree, the aims and purposes of the Rose Polytechnic are identical with those of the Worcester Polytechnic, and the comment is not out of place in this connection that these two institutions are peculiarly fortunate in having both enjoyed the influence and personality of President Thompson, who came from Worcester to Rose, and of Dr. Mendenhall, your President, who was formerly the President of Rose. And I have the frequent pleasure of hearing from people here in Terre Haute expressions of the sincerest respect and admiration for both these men.

With pleasantest recollections of the Worcester Polytechnic Institute and best wishes for its prosperity, I am very truly yours,

ARTHUR KENDRICK.

Rose Polytechnic Institute, Feb. 25th, 1896.

SENIOR NEWS.

A class meeting was held recently, at which R. S. Riley, P. E. Barbour and F. W. Gay were appointed a committee to bring in a list of committees for Commencement. The results of their deliberations, which were approved by the class at a subsequent meeting, are as follows:—Committee on Graduation: E. E. Brown, W. M. Fuller, H. M. Warren; Committee on Class Day: J. B. Mayo, F. D. Crawshaw, C. R. Harris; Committee on Reception: W. H. Cunningham, F. W. Parks, G. S. Gibbs; Committee on Banquet: Horace Carpenter, C. F. Leonard, P. E. Barbour.

The work on the class book is being pushed with vigor. Photographers C. F. Vaughn and C. R. Harris are having splendid success, and as a result the book will contain from two to three times as many views as any previous class production. The half-tone work will probably be done in Philadelphia, and the printing in this city.

CURRENT TOPICS CLUB.

The third successful meeting of the Current Topics Club was held on Thursday evening, Feb. 27th. The topic discussed was "The Invasion of the Transvaal."

The discussion was opened by Ernest Mosman, '97, who read a paper on the "Geographical Situation of the Transvaal and its System of Government." The history of the country was also described at some length. The second paper was read by Almon L. Fales, '98, and it dealt with the "Present Condition of Life in the Transvaal," and also with the great mineral resources of the country. The cyanide process for obtaining gold was explained in this paper. Harry E. Wheeler, '97, gave an account of the South African Company, or Chartered Company as it is called, and of Dr. Jameson's raid. Thomas M. Molloy, '97, spoke briefly on the sentiment of England and Germany as to the result.

After disposing of these general topics the meeting was thrown open to the members and the question, as to whether or not Dr. Jameson was justified in his raid, was considered. Prof. Coombs, and a majority of those present, took part.

GENERAL LECTURE.

The General Lecture for Wednesday, Feb. 26, was given by Professor Charles F. Maberry, of the Case School of Applied Science, Cleveland, Ohio, the subject being, Petroleum Oils and their Products. An attempt was made to have the lecture illustrated; but the result was far from satisfactory, in fact was a decided hindrance to the lecturer. Prof. Maberry gave a lengthy account of the history of petroleum in America, describing the wells and the geological structures of the oil regions both of the United States and of Canada. The discussions of the different limestones and oil formations was made quite clear to the chemists, but was far beyond the chemistry of the ordinary mechanic or civil.

ATHLETIC ASSOCIATION MEETING.

The meeting called for February 7th had to adjourn for lack of a quorum, but was finally held in the chapel on February 12th, after Dr. Gunnison's lecture.

The meeting was called to order by Vice-President Lundgren. The election of a football manager, resulted in J. E. Brown, '97, receiving thirty-five votes, and C. C. Chalfant, '97, thirty-four. H. E. Scott was chosen director, from '98.

TECHNICALITIES.

W. H. Stone, '97, has decided to leave the Institute.

Frank W. Smith, '97, has left Tech. The jovial voice of "Skipper" Smith is greatly missed.

It is reported that a Sophomore is so fascinated with mechanical drawing that he recently made up four hours' time on a classmate's board.

Dr. Mendenhall lectured before the Society of Arts at M. I. T. Thursday evening, Feb. 27th. His subject was, "The Northeastern and Alaskan Boundary Disputes with England."

"I wonder why *in time* they don't set that clock right?" remarked one Freshman to the other during the mechanics lecture. "They probably will,—in time," said the other.

There seems to be an epidemic of misplaced eyebrow, on the upper lip, going the rounds of the Tech,—the boys all say it's "catching," too,—wonder what it catches?

Mr. Ralph R. Knowles, '98, slipped and severely sprained his ankle while descending the hill one afternoon last week. He is pluckily attending recitations with the aid of a crutch and a cane.

"The *Governor's* back again," he casually remarked. "What's that?" shrieked his chum. "I meant the governor of the engine," was the reply. "Oh!" he muttered, as the perspiration streamed from his face, "I thought you meant mine."

The numerous friends of Mr. Guy Stevens,

the presiding genius of the stock-room at the Salisbury Labs., will be sorry to hear that he is to sever his connection with the Institute. He will accept a more remunerative position with a prominent manufacturing concern of this city.

On Valentine's day a well known Senior received an elaborate Valentine. The side of the card, which was about 6x4, was decorated with neat little bows of ribbon, about every color of the rainbow being represented. Opposite each was an endearing little couplet which must have been very solacing to the recipient.

Prof. Phelon recently gave a very interesting and profitable lecture to the Seniors on the "X Rays." The history of the Crooke tube and a brief account of its phenomena prefaced the main point of the lecture. Lantern views of the apparatus used at Tech for the experiments, and pictures of the negatives obtained were explained in detail.

COLLEGE NOTES.

Harvard will hold a bicycle meet in May.

The financial responsibility of Indiana University is borne by the faculty.

Not quite half of the Representatives in Congress are college graduates.

Cornell is to have a new veterinary building which will cost $150,000.

At Pennsylvania there is a balance of $15,000 for next year's football eleven.

One-fourth the whole number of students at the University of Berlin are Americans.

The girls at Cornell are now permitted instruction in fencing.

One-sixteenth of the college students in this country are studying for the ministry.

A bicycle company which will be drilled in cavalry movements is to be formed at Cornell.

The end of the football season at the University of Minnesota left a cash balance of $4000.

Holy Cross has been admitted to the Intercollegiate Athletic Association.

The Trustees of Worcester Academy have recently voted to purchase land and erect a new building for the department of science of that institution.

Boston University has made a rule that those students who are unwilling to give up tobacco while in the University Building may withdraw, and their tuition will be refunded.

The students of the Law Department at Pennsylvania have begun the publication of a paper called the *American Law Register and Review*.

Yale has bought the College Street Church in New Haven. The property will be used for the musical department and will probably be remodelled.

ALUMNI NOTES.

'79. C. D. Parker recently set up a 100-horse power Crossley gas engine for the Morgan Spring Co. at Barber's Crossing. He is making a specialty of gas engines, with headquarters in Worcester.

'81. A. B. Slater, Jr., of the Providence Gaslight Co., is secretary and treasurer of the American Gaslight Association. This association represents five hundred million dollars of invested capital.

'88. Geo. E. Camp is with Standard Harrow Co., Utica, N. Y.

R. Eugene Eldridge is Instructor Manual Training, Public Schools, San Francisco, Cal.

John M. Goodell is Civil and Sanitary Engineer, Brooklyn, New York.

Chas. L. Griffin, 38 Tyler Street, Springfield, Mass.

Joseph H. Jenkins, with General Electric Co., Schenectady, N. Y.

Parmalee J. McFadden is with A. C. McClurg & Co., Publishers, Chicago.

John M. Schofield is a Diamond Broker, 376 Washington Street, Boston, Mass.

Carl B. Smith is Assistant Chief Draughtsman Boston & Maine R. R., Boston.

'89. Albert P. Allen is District Inspector American Telegraph and Telephone Co., Boston, Mass.

Harry V. Baldwin is Editor Providence, R. I. Sunday Telegram.

Myron J. Bigelow is Chief Draughtsman, Geo. Draper & Sons, Hopedale, Mass.

Frank H. Brophy is Electrician, Boston Electric Light Co.

Jas. W. Mills is Ass't Sup't Granite City Steel Co., Ill.

Edwin G. Penniman is Supt. Construction for Wm. F. Dearborn & Sons, Worcester.

Willis S. Putnam, 36 Castle St., Worcester.

Frank L. Sessions is Chief Draughtsman, Fort Wayne Electric Corporation.

Robert W. Smyth is Inspector, Fort Wayne Electric Corporation.

'90. Herbert E. Austin, Prof. Chemistry and Natural Science, State Normal School, Baltimore, Md.

Harry P. Crosby is Ass't Engineer, General Electric Co., Lynn, Mass.

Joseph H. Devlin is in Dept. Structural Design, Maryland Steel Co.

Frank A. Gardner is Principal Manual Training Dept., Polytechnic High School, San Francisco, Cal.

Warren E. Mumford is Chemist, Granite City Steel Co., Ill.

Geo. W. Perry is Mechanical Engineer with Washburn & Moen, Waukegan, Ill.

Albert J. Reinbold is with Elgin American Gas Co., Elgin, Ill.

Arthur P. Smith is Assistant Engineer, R. F. Hawkins Iron Works, Springfield, Mass.

Chas. F. Treadway is New England Agent for Nicola Brothers, Pittsburg, Pa.

'91. Wm. H. Baird is Head Chemist, Norfolk Beet Sugar Co., Nebraska.

Fred A. Bigelow is partner Boller & Bigelow, New York.

Geo. W. Booth is with Metropolitan Water Board, Clinton, Mass.

Chas. H. Dunbar is Manager Elgin American Gas Co., Elgin, Ill.

Norman V. Fitts is Manager Illus. Dept., Denver Times and Republican.

Howard B. Foster is with Merrill Stevens Engine Co., Jacksonville, Fla.

Sumner A. Kinsley is studying Art in Paris.

Edwin S. Phelps is Ass't to Town Engineer, Brookline, Mass.

Arthur L. Rice is post graduate student at Cornell Univ.

Chas. H. Stearns is a student at Teachers' College, New York, N. Y.

Edwin A. Taylor is Civil Engineer, U. S. Hotel, Boston, Mass.

Herbert A. Warren is Engineer Vermont Construction Co., St. Albans, Vt.

'95. Alba H. Warren is Professor of Mathematics and Physics, and Director of Athletics, at the Waban School, Waban, Mass.

"Did you ever," said the fair young thing,
As they gazed at the starlit heavens;
"Did you ever stand on a rocky bluff?"—"You're right,"
Said he, "I have stood on a pair of sevens."

—*Bowdoin Orient.*

Let dogs delight to bark and bite,
Thus doth the adage run;
But I delight a dog to bite,
When placed inside a bun.

—*Yale Record.*

The new woman could find a place
Quite quick at Tech, 'tis said,
Because, of course, she'd naturally
Be good at cutting thread (s).

—E. R. J., '99.

They make at Tech peculiar things
Of many different kinds.
Both in the shop and out of it
They make the things called "*Grinds.*"
I think it strange, exceeding strange,
As o'er my fancy steals
The idea that both kinds of "*Grinds*"
Seem well equipped with "*Wheels.*"

—E. R. J., '99.

A TRIGONOMETRICAL IDYLL.

A gay and giddy Poly Tech
The coppers had hauled in.
"He's been a-stealing signs," they said,
"The judge shall know his sin."

"Explain,"—judge cried,—then Tech replied
(To save himself from fine),
"I couldn't use the tangent,
So I had to take the si(g)ne."

—E. R. J., '99.

HURRAH FOR THE GLEE CLUB!

College life should be most pleasant,—
And it lasts but four short years,—
But by taking no enjoyment
All the pleasure disappears.
Happiness is what we live for,
And without it,—oh how drear,—
If we find it at our college
She will be to us most dear.
True it is that we must hustle,
For our Tech life is not play,
But a bit of social pleasure
Will a loss of time repay.
Thus the athlete, in his training,
And the player on his team,
Gains by taking his diversion,
Strange though this to some does seem;
And a glee club, if conducted
In a strong and business way,
Would receive a hearty welcome,
And what's more, would come to stay.

T.