The W P I.

Vol. XI. Saturday, February 22, 1896. No. 15.

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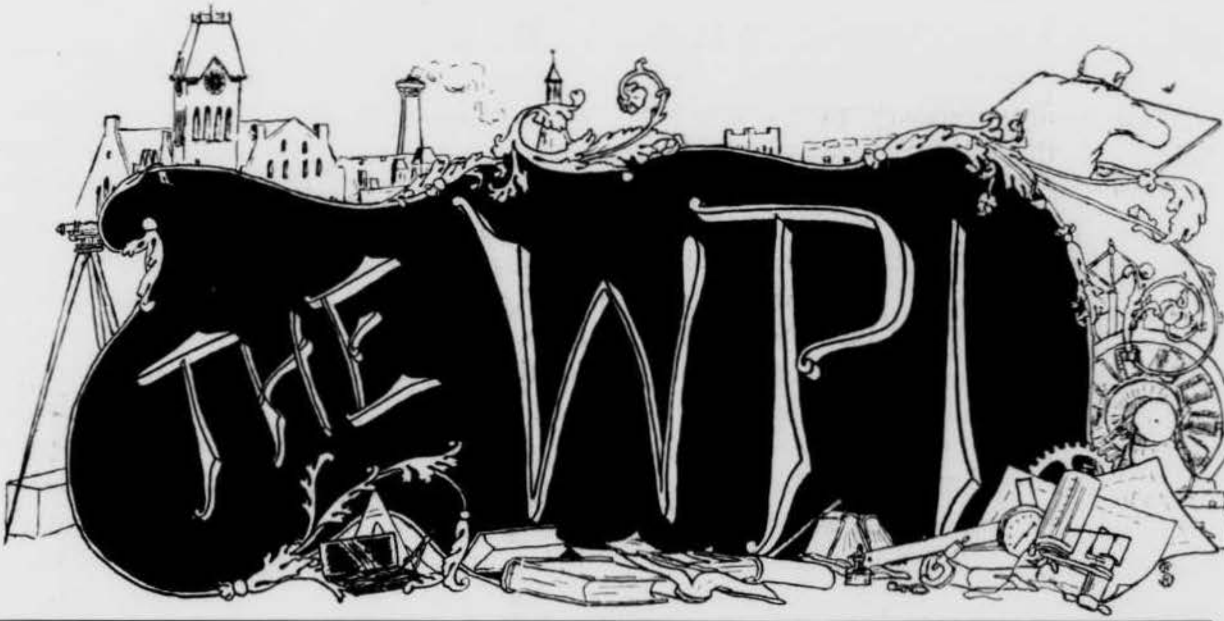
WORCESTER, MASS.

THE WORCESTER POLYTECHNIC INSTITUTE.

Chas. Hamilton, Printer.



Vol. XI. WORCESTER, FEBRUARY 22, 1896. No. 15.

The W P I is published by the students of the Worcester Polytechnic Institute on alternate Saturdays during the Institute year.
Items of interest are requested from students and alumni of the Institute. All matter must be accompanied by the name of the writer.
Subscribers who do not receive their paper regularly, or who make any change of address, will confer a favor by immediately notifying the Business Manager.
Subscription Price is $1.50 Per Annum in advance. Remittance preferred by Money Order or Cash.
Remittances and communications pertaining to business should be addressed to the Business Manager. Address all other communications to the Editor-in-Chief.

Entered at the Post-Office in Worcester, Mass., as second-class matter.

To one who attended the meeting of the Athletic Association February 14th, or rather to one who attended the gathering of a few students on that day, it would seem that athletic interest had seen its best days at the Institute, but such we do not believe to be the case. True it is that appearances are against this conclusion, but we hope that this is a case where the clothes do not make the man.

In another column will be found a communication from the University of Pennsylvania to Capt. T. F. O'Connor, of the athletic team. This letter furnishes a means for the students to show what interest they have in athletics in general, and in track athletics in particular. The invitation to Tech to take part in the U. of P. meet in April next is one that should have the careful attention, not only of the Athletic Directors, but also of every student. The case as it stands is somewhat like this, as far as we can ascertain: A certain amount of money has been subscribed by the students for all departments of athletics, with the understanding that no more money would be asked for this year; such money being deemed sufficient to meet all obligations of the athletic association. Of this money none can be taken to send our athletic team to Philadelphia without incurring a debt for the association. The natural conclusion would be that Tech should not enter its team in the Pennsylvania races, but it does seem too bad that such should be the case. Students, will you permit it?

It is hardly necessary to go into the details of the advantage that would accrue to the Tech by its participation in this meet, even if it should lose. The colleges in whose class we are placed are suitable opponents in every way for the Worcester Polytechnic Institute, and we would seem to have a fair chance of winning our race. The meet coming on Saturday, April 25th, makes it highly improbable that the Faculty will offer any objection, if the association, or rather if the students, decide to enter a team. The only obstacle we can see is the lack of funds, but there is hope that this obstacle may be removed. The expenses of sending a team to Philadelphia would not be so great as at first glance would be supposed. $100 it seems to us would more than cover all expenses. There are at present over 200 students in Tech. If each man would contribute fifty cents, we could enter a team.

Under ordinary circumstances we would not advise Tech to enter a team in such a meet provided additional subscriptions from the students would be necessary, but this case seems to be a special one, in which the end justifies the means. You, students, especially you who were too busy to answer the call of the athletic association to a meeting on February 14th, now have a golden opportunity to deny the allegation cast upon you; you, we say, have an excellent chance to show that on that day you were not dead, but only sleeping. Wake up, Look around you! See what good you can do, and then come forward and make it possible for Worcester Tech to accept the above mentioned invitation.

The prospects of a good season in baseball this spring seem fairly good now. But then prospects always seem good here at the beginning of a season, though before many weeks have passed, through the inactivity and *laissez faire* attitude of the students, the aspect for the manager becomes decidedly gloomy. Be that as it may, the coming season certainly promises to be a successful one from the present point of view. With such men as Capt. Zaeder and five others of last year's team still in college, and several candidates for the various positions on the team, a nine well fitted to represent the Institute should be in the field this year. The weakest point seems to be that of pitcher, but as there are several good men in the Freshman class, the indoor training it is hoped will develop them.

And now a word to the members of the Freshman class. Let every '99 man remember that it is just as much his duty to try for the team as it is the duty of an upper classman; that the material in the other classes is fairly well known, while several dark horses may be in his class, and he may be one of them; that all members of the Institute will stand on the same level or, in other words, that the best man will be chosen for the best place; that faithfulness in practice will be much in one's favor; that when it is hard to decide among several candidates that faithfulness in all things may carry the day; and last, but not least, that he should put Tech before class in baseball as in all things.

It is not our intention to tell our readers more than we already have about the Current Topics Club, but we cannot refrain, after its last meeting, from calling the attention of the students to this club which deserves their support. To the student who is indifferent to this club we would say, that he does not know anything about it. Learn something of its workings—in other words attend one of its meetings,— and then, we warrant you, you will be anxious for its success; especially if you could have attended the last meeting would you have come away not only pleased, but also firmly convinced that the Current Topics Club fills a long felt want.

The last meeting of the Engineering Society was exceedingly interesting and profitable to all who attended. The authors of the three papers read at this meeting have very kindly given them to us for publication, but lack of space prohibits the insertion of all three of them at once. In this issue will be found Col. James Francis's paper on "Power;" our next number will contain the article of Mr. C. L. Griffin, on "The Electrical Equipment for an Overhead Travelling Crane;" and in the issue of March twenty-first will be found the paper of Mr. Clinton Alvord, on "Eccentric Bevel Gears."

WASHBURN ENGINEERING SOCIETY.

Three able and interesting papers were presented at the meeting of the Washburn Engineering Society, Monday evening, the 10th inst.

After the meeting had been called to order by President Mayo, the minutes of the preceding meeting were read by Secretary Alden. Mr. George E. Camp, '88, was elected to membership. The President then introduced Col. James Francis, Chief Engineer of the Canal and Locks Co., on the Merrimack River, who read a paper on "Power." The next paper, on "Eccentric Bevel Gears," was delivered by Clinton Alvord, '86. This paper was illustrated by a diagram and a full size model, the working of which excited considerable interest. The last paper was not advertised in the notice of the meeting, Mr. Charles L. Griffin, '88, telegraphing to Professor Alden, in the morning, from Springfield, that he would be able to deliver it. The subject, "The Electric Equipment for an Overhead Travelling Crane," dealt particularly with the cranes of the Shaw Electric Company, which were designed by Mr. Griffin. Each of the speakers, at the close of his paper, was questioned by the members.

POWER.

Read by Col. James Francis of Lowell, Mass., before the Washburn Engineering Society, February Tenth.

Power, derived from water, or from steam, or transmitted by electricity, is one of the great and important problems of the day, and it is interesting to follow and watch the gradual solution of the problem and the steady advance and improvement of methods in every department relating to the transmission of power and the machinery required to develop it. Our Technical schools are striving to educate the youth of to-day, not only in theoretical work, but also in a practical way. Laboratories and workshops of recent origin, give opportunities greatly in advance of former methods, and the results are astonishing. To-day the graduates are prepared for responsible positions at once, and as a rule bring with them new ways and new ideas which are not always accepted with good grace by old fogies educated in the old way, but nevertheless, the new ways are the best and indicate real progress.

The last census of 1880 gives the approximate amount of power utilized in New England alone as 743,000 horse powers, of which fifty-seven per cent. is water power, and in my judgment the next census will more than double this amount, and the large increase is due chiefly to the introduction and development of electric power.

Many years ago the water power of the Merrimack River at Lowell was permanently leased to the ten large manufacturing companies, by the company that controls the water power of the river. At that time the mills were run by water power only. It was before the time of the introduction of steam engines. The total power of the Merrimack River was estimated to be about 139 mill powers, equivalent to a flow of about 3,600 cubic feet per second, and this represented about the minimum flow of the river. Improvements have been made by increasing the height of the flashboards at the main dam, which has the effect of materially enlarging the Mill Pond, which is upwards of eighteen miles in length. At great expense the right to raise and use the water in Lake Winnipisseogee, the water area of which is upwards of seventy-two square miles, was secured, which served as a reservoir to draw from in low stages, and until recently was used for that purpose. With these improvements, it is a rare event when the river fails to supply the power leased, which is equivalent to a flow of 3,600 cubic feet per second for fifteen hours a day. The rapid growth of the industries requires a very large increase of power, and steam power is used in connection with the water power, and the combined power at the present time is upwards of 20,000 horse powers.

A "mill power" of the olden times, which is the unit of measurement, may be described as the power then required to run a cotton mill. A cotton mill in 1834 was considered to be complete if it contained as many as 3584 spindles spinning No. 14 yarn, with all the apparatus and machinery to convert the cotton into cloth. This was taken as the standard for what was called a mill power, and it was found by experiment that it required, as nearly as could be ascertained, 25 cubic feet of water per second on a fall of 30 feet, when used on the old style of breast wheels, to drive the standard mill of 3584 spindles, and to convert the cotton used in that mill into cloth.

The standard mill power at Lowell is the right to draw 25 cubic feet of water per second on a fall of 30 feet. The application of this standard to the variations of the height of water in the canals and river becomes a little complicated in practice, because an inflexible rule was made that one foot shall be deducted from the actual fall, and also from the standard of 30 feet, before computing the proportion between them. As an example, where the actual fall is 28 feet the quantity of water in a mill power increases from 25 cubic feet per second to $25\left(\frac{30-1}{28-1}\right)$ or to 26.85 cubic feet per second, or in proportion of 29 to 27. The deduction of one foot from the fall was considered to be an ample provision for the loss of head which might occur in conducting the water to the water wheels, and away from them after it had performed its work. Many of the water power companies throughout the country have adopted the mill power as the unit, and in several cases it represents the same amount of power as at Lowell.

A mill power at Lowell is equivalent to 82.16 gross horse powers, and, if used upon turbines giving an efficiency of 80 per cent., it is equivalent to 65.73 horse powers, and, upon turbines giving an efficiency of 75 per cent., the mill power is equivalent to 61.62 horse powers. The largest corporation drawing water from Merrimack river at Lowell is entitled to 24⅔ mill powers by indentures granted in 1853, and this represents about 17½ per cent. of the total minimum power of Merrimack river then granted to the various companies at Lowell. A serious problem came up soon afterwards as to how to properly distribute and measure out and control these several grants of water power.

In 1850 but very little was known about the measurement of water on a large scale, and it was discovered that the companies were gradually enlarging the capacity of the mills and required more and more power, and consequently the draft upon the river was greater than the limit of the grants. About this time the old breast wheels began to be superseded by turbines, a much better grade of water wheels, and better adapted for the fluctuating stages of the river. The very important problem came up as to how to properly distribute, measure out, and control these several grants of water power, all taking water from one source.

Authorities in hydraulics in foreign lands were consulted. Investigation of the subject was in order, and the best engineers of the day were engaged to work out this problem. It was found that no experiments of any magnitude existed that could be applied to the measurements of water on a large scale in the canals, and it was decided to make a series of experiments on the flow of water.

In 1851 and 1852 very extensive and satisfactory experiments were made on the flow of water over weirs and in rectangular flumes, and formulas were established which are now in daily use at Lowell and elsewhere, and the same formulas may be found in some of the text-books on hydraulics of the present day in this country and in Europe. The history, data and results of these experiments are published in book form under the title of Lowell Hydraulic Experiments, and are particularly valuable to the student, because great care was taken to place on record the actual observations made in detail for the sole purpose of encouraging and assisting him in the matter of investigation and study of problems relating to the measurement of the flow of water as well as for reference,

A short description of the method of measuring the water used for power at the largest corporation in Lowell may be of interest at this time. The measuring flume is made of timber, with smooth sides and bottom. It is about 80 feet long between the transit timbers placed across the canal, and about 50 feet wide. The depth of water in the flume fluctuates to some extent, but is determined at short intervals by means of a gauge placed in a box situated on the bank at the westerly side of the flume, and about half way between the upper and lower transit timbers. This box has a pipe connecting with the flume, and the level of the snrface of the water in the box is intended to indicate the average depth of water in the flume above the mean level of the bottom. Careful measurements of the width of the flume and the average level of the bottom are made from time to time during the season, after which it remains to determine the velocity of the water passing through the flume in order to compute the flow.

Tin tubes two inches in diameter, loaded at one end, and of a length to sink within two to three inches of the bottom, are made to float down stream with the current, and at the upper transit an observer starts a stop-watch the moment the tube reaches it, and follows down with the tube until it reaches the lower transit timber, a distance of 80 feet, when he stops the watch and reads off the interval of time required for the tube to pass a distance of 80 feet. The first tube is placed in the water about 20 feet up stream from the transit timber, and close to the side of the flume, where the velocity is the slowest. The next tube is placed a foot and a half away from the side, and the next three feet away, and so on, until the velocities have been taken every foot and a half apart across the flume. Two tubes, used alternately, serve very well to make these observations. In order to determine the exact track of each tube the transit timbers are marked off into feet across the canal, and, as the tube passes under each transit, the distance from the side of the flume is called off and recorded. The depth of water in the flume is noted during the passage of each tube. This standard measurement, as measured in the canal, represents the quantity of water used by the company for power and for all other purposes. The leakages are carefully noted, and allowance made for them when it is proper to do so.

At the same time that the measurement is made in the canal another set of observations is made at the various turbines in the mill yard. Every turbine has been rated, and a diagram for each prepared to show at a glance the discharge of the turbine when the height or opening of the speed gate and the head acting upon the turbine is known. These observations and the results are entered on a sheet made for the purpose. A comparison of these two measurements made at the same time serves the important purpose of establishing a co-efficient that can be applied to observations which are made at the turbines twice daily throughout the year.

A comparison of a few measurements made in 1895, which are selected on account of different conditions of flow, will give a fair idea of the results obtained in general practice. They are as follows:

Date. 1895.	Measurements made in flume.	Measurements made at the turbines at same time.	Differences between them.	Co-efficients, or factor to apply to the turbine Measure.
	Cub. ft. per sec.	Cub. ft. per sec.	Cub. ft. per sec.	
June 17, A. M.,	891	918	27	0.97
" " "	779	804	25	0.97
July 11, P. M.,	1154	1164	10	0.99
Nov. 26, A. M.,	1241	1271	30	0.98

The original grant to this company amounts, as I have stated, to 24⅔ mill powers, equivalent to a flow of 617 cubic feet per second, and a glance at the table indicates that there are times when the company uses nearly double the amount of the original grant. The value of the surplus power of the river to these companies is fully equivalent to the value of steam power, but, to encourage the use of it, the ordinary charge is made a little less than the cost of steam power. As a rule, the companies prefer the water power when it can be had, A charge of $4 per day per mill power on turbines giving 80 per cent. efficiency, allowing 282 working days per year, is equivalent to a charge of about $17 per annum per horse power; but it is found in practice that the turbines cannot be depended upon to give an efficiency of 80 per cent. under all conditions, and it is well to consider its cost under ordinary conditions rather than on high duty turbines. Twenty dollars per horse power per year represents a fair price for water power used during the ordinary mill hours, which are eleven hours a day for five days a week, and five hours on Saturdays, making five and one-half working days in a week, or 286 working days in a year, less four holidays, making the net number 282 working days, as before stated.

At the present time the charges for surplus water power at Lowell are variable, and they are governed by the amount of flow in the river. In times of freshets and high water the charges are reduced one-half, or at the rate of about $10 per horse power per annum, and this period also covers about one-third of the year. Another period, when the flow of the river is between 40 and 60 per cent. in excess of the grants, the charges are at the rate of about $15 per horse power per annum, and this period also covers about one-third of the year. These charges do not represent the total expense of water power, but only the cost of water delivered at the wheels.

The cost of a water power plant and the expenses incidental to running it varies very much in different localities, depending upon the head that can be utilized, and upon the length of the canal, and upon the natural fluctuations of the stream from which the power is taken, and other changeable elements. Under favorable circumstances a plant may cost $35 per horse power to develop; another giving same power may cost $100 per horse power. If $50 represents the first cost per horse power of a water power plant the total yearly expense will be about as follows:

Water at $20. per H. P. per annum.	Water at $15. per H. P. per annum	Water at $10. per H. P. per annum.
$26.	$21.	$16.

The cost of steam power is variable also, and authorities differ very much in their conclusions.

Of the many important elements to be considered in determining the cost of a steam plant and the yearly expense of running it, may be mentioned the size of the plant, the cost of fuel, the type of engine, the manner of treating the exhaust, etc. Some authorities go so far as to tabulate the yearly expense of each type of engine, under various prices of coal, and these tables are very valuable for reference.

One cent per horse power per hour has been considered a fair estimate of the total expense of running a compound steam engine of modern type, such as may be found in the large and prosperous factories in this vicinity, where coal costs $4 per long ton, and two pounds of coal are required per horse power per hour to make steam. This cost of one cent per horse power per hour is estimated to include the cost of repairs, attendance, interest, insurance, provision for renewal of plant, coal and other supplies, etc.

The annual cost of steam power on this basis depends upon the number of hours the engine runs. At Lowell it would amount to about $31.00 per horse power per year, or about $5 more per horse power per year than the highest price paid for water power.

These results serve to show in a general way the comparative cost of steam and water power in this vicinity at the present time, but they are not presented as indisputable nor as perfect authority in the matter.

In the near future we may expect rapid development in the way of transmitting power by electricity. It is a power admirably well adapted for manufacturing purposes. It dispenses with the necessity of placing the plant within the limits of the mill yard, and avoids the danger incident to having steam boilers in close proximity to the mills. It dispenses with heavy main shafting, belt pullies and large belts. In the event of a breakdown of machinery in any part of the mill the section can be shut off without disturbance to the rest of the mill. The power can be conveniently and accurately measured at slight expense. The movement has already begun, and more than one large mill has recently been built in the South thoroughly equipped to run by power transmitted from turbines situated quite a distance away. At Niagara three magnificent 5000 horse power turbines are in place, the largest and most powerful turbines in existence, and the power is to be transmitted at various points wherever it may be needed. These turbines are acting under about 136 feet head, and the computed discharge of each is somewhere in the vicinity of 435 cubic feet of water per second, which is but a small fraction of the ordinary flow passing the falls, a conservative estimate of which is upwards of 300,000 cubic feet per second, and the total power upwards of 3,500,000 horse powers.

At the large institutions for scientific education, including, as a matter of course, the Worcester Polytechnic Institute, it has become part of the regular work to investigate, by experiment, some of the important sections of mechanics and hydraulics which cannot be solved by theory alone. Among them may be mentioned experiments upon the economy of steam; experiments upon the flow of water through orifices and hose pipes; experiments upon the strength of wooden and iron columns; and experiments upon many other important matters, the results of which prove to be of great value to the professional engineer.

In connection with your Institute are found excellent facilities for this kind of work. The hydraulic experimental plant at Chaffin's affords unexcelled opportunities for obtaining certain data and information relating to the flow of water. It is hardly enough for the Institute to go through the same methods of experimenting over and over again on the efficiency of the one turbine now in place, or of the other apparatus arranged for experiments. The location and liberal provision for the use of water is admirable, and it may be a pardonable offence if a suggestion is offered in regard to making a careful and comprehensive series of experiments on the flow of water through different forms of draft tubes at Chaffin's.

The draft tube has become a prominent factor in the construction and arrangement of modern centre vent turbines, and especially of the type made to run on horizontal shafts. A turbine arranged as the one at the experimental station at Chaffin's is a very good example of the modern structure, where the wheel is placed on a horizontal shaft far above the water line in the wheel-pit, and at a height convenient for the best arrangement of the main shaft, to which the turbine is connected, and having a draft tube, so called, which not only takes the water after it has passed through the turbine and discharges the same at a level below the water line in the wheel-pit, but it is designed with a view to utilize that part of the fall and to originate or create as much power as would be done if the turbine was placed at the bottom of it. If there was no draft tube, and the water discharged from the turbine freely into the air, it is evident that only a portion of the fall at Chaffin's would be utilized, equivalent to the power due to the height of water in the penstock above the axis of the turbine. The draft tube, with its lower end immersed, has the effect of utilizing the balance of the fall, or that portion of the fall which is between the axis of the turbine and the level of the water in the wheel-pit, or in other words, the fall within the limit of the draft tube.

The water, as it passes through the draft tube, performs its work by suction. The power due to the draft tube, as measured theoretically, is the product of the flow in pounds per unit of time into the height of the column of water in the draft tube. The flow of the water through the draft tube, when the lower end is immersed, accelerates the velocity of the water passing through the buckets of the turbine by suction to a speed that is equivalent to the velocity due to the total head, or the whole height from the surface of the water in the wheel-pit to the surface of the water in the penstock above the turbine.

Practically but little is known of the efficiency of the various forms of draft tubes in use at the present time, and it remains for the careful and intelligent experimenter to work out the models that will give the best results. Designers of turbines are often governed by circumstances which are unfavorable for a good form and arrangement of the draft tube. Undoubtedly the makers have given much thought and study to the subject, but with the facilities for exhaustive experiments, such as are found at Chaffin's, they can obtain information which will enable them to undersiand the subject with intelligence.

Tests of the efficiency of turbines are made at Holyoke in a flume constructed for that purpose, and turbines of all sorts and kinds have been tested there. Turbine makers, as a rule, have used this flume for the purpose of obtaining data to enable them to prepare printed tables or catalogues of the power and discharge of turbines. The tests are, however, made with the wheel running on a vertical shaft, and as they have no facilities for testing turbines arranged as the one at Chaffin's with horizontal shaft and draft tube, it becomes a matter of judgment with the makers as to the comparative merits of the two methods. It is a singular fact that many, if not all, of the turbine makers who have prepared printed catalogues, are inclined to rate the wheels at the same power, regardless of the conditions as to whether or not the turbine can perform with the same efficiency on a horizontal shaft and draft tube as it can on a vertical shaft and without a draft tube, under the same head.

Under the best of conditions, with a draft tube constructed on scientific principles, and with a view of utilizing every atom of power, it is an even question whether as much power can be obtained from a turbine arranged that way, as from the old form on a vertical shaft, and this important matter can only be determined by experiments, which up to this time are very limited in number.

A single illustration of the practice among makers of turbines who are in close competition with each other, will serve to show how a serious error in the arrangement of turbines can easily be made. A large corporation in Lowell recently placed three pairs of 42-inch turbines on one horizontal shaft. Each pair was arranged in a separate case. The wheels faced each other, one turning to the right and the other to the left, and they were placed with the outlets about five feet apart and both wheels discharged into one straight draft tube which was seven feet in diameter and about five feet long. They were put in by contract with the makers, who gave a written guarantee that they would give the power rated in the printed catalogue and to run satisfactorily. The catalogue rated each of the six wheels, under a head of thirteen feet, as follows:

Discharge of each wheel, 5,570 cubic ft. per minute.

Power of each wheel, 112.81 horse powers.

Efficiency of each wheel, 82 1-2 per cent. of the power of the water.

The corporation decided to have these wheels tested, the work of which was carefully done at the mills after the wheels were in readiness for use, and the results obtained were reduced to a uniform head of 13 feet, as follows:

Discharge of each wheel,	5457 cub. ft. per minute.
Power of each wheel,	91.8 horse powers.
Efficiency of each wheel	68 1-2 per cent.

One of the six wheels was tested at Holyoke on a vertical shaft with the following results, after being reduced to a head of of 13 feet.

Discharge of one wheel,	5795 cub. ft. per minute.
Power of one wheel,	111.0 horse powers.
Efficiency of one wheel,	78 per cent.

The combined power of the six turbines was found to be, under 13 feet head, 126 horse powers less than the power guaranteed by the makers, or about 81 1-2 per cent. of the power guaranteed by the printed catalogue. The absolute loss of 126 horse powers, which was in a great measure due to the faulty arrangement of the wheels and draft tubes, was a serious matter to the corporation. After considerable vexatious delay, a compromise was effected. All of the wheels were taken out and wheels of another pattern were substituted; but some of the objectionable features of the arrangement and form of the draft tubes remain as they were.

Such failures are very instructive to the professional engineer. They tend to encourage more careful investigation, and it is clearly evident that much must be done towards eliminating from the markets some of the common and crude forms of draft tubes, the use of which is rather encouraged from the fact that but little attention has been given towards ascertaining the efficiency of them, and it is probable that the poorer forms of models are sometimes selected on acount of occupying but little space, and for the convenience and economy of placing them in position.

Many of the large mill owners and turbine builders who make a study of the true economy of utilizing water power without waste, are interested alike in these matters; and it is very reasonable to expect that they would cheerfully contribute liberally towards defraying the expenses incident to a thorough investigation of the subject, and especially under circumstances favorable to valuable results, as would be the case if the experiments were conducted by the Worcester Polytechnic Institute, or at least under its supervision.

The study of draft tubes is but one of a great many problems in hydraulics that must be better understood. The measurement of the flow of water, in canals and streams, in pipes and for irrigation purposes, is to say the least complicated and often the results obtained will bear severe criticism. The expense of such work as is done in Lowell every day, is very great in proportion to the income derived.

The same methods exist to-day, with but slight improvements, which were in existence at the time of the very beginning of measuring water used for power, upwards of 40 years ago. The details of this work are carried to an extent which prohibits the use of the system at ordinary water power plants, and it is done only at Lowell and Lawrence, and perhaps one or two other places, where the owners are determined upon having reliable results, even at a cost that is out of proportion to the amount of income derived. The tendency to simplicity of methods of measuring water power and the encouragement of thorough investigation of the subject by the various scientific institutions of learning, will ultimately have the effect of producing methods of measuring power which can be applied to small power plants, as well as to the larger plants, and at a reasonable cost.

CURRENT TOPICS CLUB.

The second meeting of the Current Topics Club, which was postponed one week on account of the storm, was held in room 19 of Boynton Hall, Thursday evening, Feb. 13th. There was but a very small attendance, owing to the weather, which was a second time unfavorable for the meeting. Vice-President Merchant presided, and after a short business session Dr. Mendenhall was introduced.

Before proceeding with the topic of the evening, "The Venezuelan Question," the Doctor urged upon the students the necessity of taking *active* part in a club of this kind, for breadth of culture can be obtained in no better way. In taking up the Venezuela question he gave a brief account of the history of Venezuela and the events that led up to the controversy. The origin of the Monroe doctrine was also traced, and it was upon this doctrine that it was supposed the United States had a right to interfere. Dr. Mendenhall spoke of the two clauses in the famous message of 1823, one of which referred to the attempt of any foreign country to extend her possessions in this hemisphere; the other related to any attempt to control or oppress any American republic. He said that through no interpretation could it be shown that our government could rightfully interfere under the first clause. If they had any right it came under the second part of the doctrine. It did not seem to the speaker that England was attempting to either control or oppress Venezuela, and that the United States government was not authorized to take the position it had in the matter. The ultimate settlement of the question was one of great moment. Public opinion would have much to do with its settlement, for it always had great weight with legislators.

If the two countries wish to settle the question of boundary line, thereby deciding to which country belong the rich gold mines included in the disputed territory, the United States had no right to interfere until it was carried to a certain stage far from that of the present time. For us to interfere until the Monroe doctrine had been violated seemed very wrong. Our stand in the matter did not seem to be consistent. In the first place we say that we cannot allow England to take the territory, for it will be in direct violation of the Monroe doctrine; and in the next breath we say that whatever is satisfactory to Venezuela will be satisfactory to the United States. We have controversies now pending with England which are far more important than the Venezuelan matter.

Dr. Mendenhall said that the attitude assumed by England, on sober second thought, was exactly what he had expected, although the appointment of a commission by this government was an offense against England that only the keenest sort of diplomacy on her part prevented from causing an open rupture. She saw Alaskan gold fields rising before her eyes, and she submitted to the insult. While England and her statesmen assumed a show of apparent friendliness and desire that we should adjust the difficulty, and allowed us to advance our claims for arbitration, she pursued this policy for her own ultimate advantage.

Within a year or so the question of the Alaskan boundary line will be disputed by England, and, with a smile upon her diplomatic face, she will ask us to arbitrate a thing that we have no right to arbitrate, saying you wanted us to arbitrate, and now you must do the same. The United States now holds a strip of land of ten marine leagues wide (about 35 miles), running from the 54th parallel to Mount St. Elias. England wants to split up this land and take a part of it herself, and when we oppose her she will want to arbitrate, and get thereby something that she does not deserve. This is his (speaker's) great opposition to the policy of the government.

The treaty says that we shall have a strip of land extending from 54 degrees 40 seconds to Mt. Elias, and running along the coast. The boundary line shall be marked by the summits of the range of mountains parallel to the coast, but where these summits are more than 10 marine leagues from the coast a line 10 marine leagues from the coast shall constitute the boundary. We contend that there is no such range of mountains, and that we should have a strip 10 marine leagues in width the entire distance, the leagues being measured from the main coast. England, on the other hand, is going to contend, if she is convinced that there is no range of mountains, that this line shall start from the islands near the shore, and call that the shore line. The trouble is that the line was fixed by politicians rather than by geographers.

After the remarks of Dr. Mendenhall the discussion was thrown open to the students. The Alaskan boundary affair, however, which had been brought into the discussion only incidentally, was discussed as much as that of Venezuela. Dr. Mendenhall seemed to have settled the Monroe doctrine earlier in the evening, as no one ventured an opinion to the contrary.

GENERAL LECTURES.

The first general lecture in the second course was given in the chapel, Wednesday morning, Feb. 5th. Professor Edward S. Morse of Salem, who made such a decided hit last year with his lecture on "The Theory of Evolution," duplicated his success with an equally interesting lecture on "The Art of Illustrating."

Prof. Morse described in an interesting manner, the processes for obtaining wood cuts, steel engravings, half tones, and lithographs. Perhaps the most interesting process explained was that of printing in colors by the aid of photography. The process, in brief, is as follows: three negatives of the desired object are taken with as many different kinds of plates; first with a plate which is sensitive to all rays except yellow, then with a plate sensitive to all except red, and finally with a plate sensitive to all except blue. These plates are then used to produce the plates by which the printing is done, one plate printing only yellow, one red and the other blue. The combined colors, after the three plates have printed upon the same sheet, reproduce any color or shade exactly as it was in the original.

The second lecture was given Wednesday, Feb. 12th, by Mr. William Kent, editor of *The Engineering News*, of New York, who presented a very interesting view of "The Labor Question and its Relation to Engineering." Mr. Kent is the author of one of the best and most recent works of its class, *Kent's Engineers' Hand-book*, with which many of the alumni and students are already familiar. During the hour, the lecturer made free use of statistics, which were presented in an admirable and interesting manner. He was of the opinion, that the increase in the product of industry is being well distributed. By means of figures he showed that during the last ten years products have increased nearly seventy per cent. and in far greater proportion than the increase of population, while the price of articles, per pound and per yard, has decreased. Wages have increased forty-eight per cent. while necessities have decreased. He disagreed with Francis Walker, whose *Political Economy* is used at the Institute, on many questions, and took exception to the stereotyped phrase that "The rich are growing richer, and the poor, poorer," believing that "The richer a man may become, the more benefit he does to the laboring man." He stated that he looked forward to the time when labor would hire capital instead of capital hiring labor, and also to the time when, "Political economists may meet together and discuss the improved social order, burn their old books, and erect a monument to the man, who, above all others, contributed the means for obtaining the wealth of nations, James Watt, the engineer."

DR. KINNICUTT ONCE MORE AT HOME.

Had a Profitable and Pleasing Trip to Europe.

Leonard P. Kinnicutt, Ph. D., Professor of Chemistry, arrived in Worcester Friday evening, February 14th. The Doctor is much benefited by his six months' visit abroad, and he returns to his work at the Institute much better fitted in every way to assume his duties. While abroad he devoted much time and care to the study of certain branches of chemistry, but wisely combined business with pleasure.

Leaving Worcester last July, Dr. Kinnicutt went first to Ireland and England, in which countries he made exhaustive investigation of the water supply and sewage disposal of the large cities.

Birmingham has secured the best results in the disposal of sewage among the European cities. The system employed is chemical precipitation, the same used at the Quinsigamond plant, with broad irrigation. For irrigation a large farm covering over 1,400 acres is used. The sludge is spread upon the soil and then dug in. London's system is the most interesting because of its enormous magnitude, and to Worcester people, because it is exactly the system of this city. Worcester disposes of twelve million gallons of sewage each day, London of 183 millions, over fifteen times as much, by chemical precipitation, without further treatment. The sludge is carried and dumped nine miles out to sea by a fleet of nine fast steamers.

The Doctor found that the Continental countries are far behind Great Britain and America in their treatment of sewage. He has brought back with him the reports on sewage of every city of over 75,000 inhabitants in England and Germany, but he says, that no city in England, with the possible exception of London, has done as careful and systematic work, as that carried on by Mr. Eddy, '90, with the sewage of Worcester.

As a rule, said Dr. Kinnicutt, the German and English cities are better provided with good water than those of this country, for much greater care is taken in purifying by filtration, a necessary precaution, as the waters of rivers are generally the sources of supply. In Hamburg, since the cholera epidemic, a perfect plant and system have been established. The water is given a bacteriological examination daily and is filtered until the presence of bacteria is reduced to a standard of safety. Manchester has much the same system as that proposed by the Metropolitan District. Water is conducted by an aqueduct from one of the English lakes, over fifty miles away. Another point of similarity is that a township was wiped out as will be West Boylston.

About the middle of September the Doctor visited the Stockholm School of Mines, his object being to study the methods and processes used there for iron; this school is undoubtedly one of the best in the world for the metallurgy of iron. From Stockholm the Doctor went to the University of Upsula in Sweden, then to the Danish University and Polytechnic at Copenhagen. Three months were then spent at Dresden in studying the analysis of fuels, the products of combustion, and the analysis of various gases. Particular attentionwas given by the Doctor to the methods of teaching technical chemistry at Dresden. He then proceeded to Zurich.

At the Polytechicum of Zurich, Dr. Kinnicutt devoted especial pains to master their peculiar and excellent manner of teaching chemistry. It may be well to mention in passing that the laboratories at Zurich, in addition to being very extensively equipped (costing 2,500,000 francs), possess a feature found in few institutions of learning. This feature is the so-called Intermediate Laboratory, in which the student in performing experiments instead of using, for instance, a few grammes of a substance, will use the same number of kilogrammes. This laboratory is an exceedingly useful one and plays an important part in the education of a student at Zurich. It is the wish and expectation of Dr. Kinnicutt to have such a laboratory at the Tech. The two large rooms on the lower floors of the Salisbury Laboratories made vacant by the removal of the Mechanical Department to the Engineering Laboratory, will be fitted with apparatus for this purpose.

Just before returning to America the Doctor took a pleasure trip into Italy and the Mediterranean countries. He sailed from Naples and found the voyage on the Mediterranean mild and pleasing, but when the Atlantic Ocean was reached, the condition of things was just reversed. While not at all seasick, he was, as he expressed it, very glad to reach dry land again.

Yale will employ no professional baseball coach this year.

Harvard makes the study of English the only required work in the curriculum.

The editors of a periodical at the University of California were recently suspended for caricaturing one of the faculty.

A NEW PICTURE IN THE LIBRARY.

A crayon of Dr. Smith has recently been placed in the library. On the bottom of the neat frame of quartered oak is a small silver plate with the following inscription:

Edward Payson Smith, Ph.D. Professor of Modern Languages and Political Science.
1872—1892.

On the back of the picture a card has been put on which has been written:

This portrait was placed at Boynton Hall, by means of a sum of money left in the treasury of the Institute Historical Club at the time of its dissolution in May, 1893.

INTERCOLLEGIATE TEAM RACES.

The following letter received by Capt. O'Connor, last week, is self-explanatory. Whether Tech will be represented has not yet been determined.

Here is the letter:

Capt. T. F. O'Connor:

My Dear Sir:

The Athletic Association of the University of Pennsylvania has decided to give an intercollegiate relay race meeting on Saturday, April 25, open to all colleges and universities of the United States and Canada. One race will be a contest to determine the college champion of America, and it will be open to any college that desires to contest for that championship. Harvard and the University of Pennsylvania have signified an intention to enter such a race.

There will be a number of other races between colleges. An effort has been made to arrange colleges in groups that are about equal in strength and of the same locality. Making such a classification has been very difficult. If you do not feel that your college has been placed in its proper group we shall be glad to put you in any other that you may suggest. Of course, by racing in one of the general contests, you are not prevented from entering the race for the intercollegiate championship. If you desire, you can race with the colleges in which you have been grouped, and also in the championship, provided that you are the winner of your race; we will also probably hold a consolation race open to all the college teams that fail to get either first or second prizes.

As you will see from the classification of colleges which follows, we desire, as far as possible, to have at least four college teams run in each race. Last year at our annual relay races we had but two; where they were not evenly matched, the interest in the contest, to a certain extent, was lost. We feel with four colleges that even if the first should lead by a big margin, there would probably be an exciting contest among the others.

We will award the following prizes: A silk banner will be given to the winning team as a college trophy, and each member of the winning team will be given a gold watch. To the members of the team finishing second we will give a silver cup. If only three colleges are able to enter the race we will give a silk banner and a gold watch to the members of the winning team; no second prizes, however, will be given. If but two of the four teams that have been invited contest, a silk banner will be given and silver cups to the individuals of the winning team. In case you should enter and the other colleges with which we have classed you should not enter, we will make arrangements to put you in a race with some team of about your own strength.

The race will be governed by the same rules of qualification and eligibility that now prevail in the Intercollegiate Association; namely, competitors must be members of their respective colleges since the 15th of the previous October, and shall have taken at least five hours of recitation during that period. The Worcester Polytechnic Institute, as it has been classified, will run in the series with the Massachusetts Institute of Technology, Tufts College, Wesleyan and Trinity. We trust you will consent to compete.

FRANK B. ELLIS, Manager, U. of P.

N. E. I. A. A. CONVENTION.

The annual meeting of the New England Intercollegiate Athletic Association, was held at the Hotel Brunswick, Boston, Saturday, Feb. 8th. Delegates from every college in the Association were present. Only a few matters of business were brought before the convention, but the meeting was a lively one.

Upon a written application Tufts College was admitted to the Association by a unanimous vote of the delegates. A vote was carried to revise the constitution, and to have copies of it printed and sent to each college. This work was left to a committee of three. Bids were then listened to for the holding of the annual meet in May. The clubs which had representatives present, and who made offers to the Association were: Providence A. C., Springfield Bicycle Club, and the Worcester A. C. After consideration, the convention by a unanimous vote, accepted the bid of the Worcester Athletic Club, and it was voted to hold the meet on Saturday, May 23d.

Harvard has started an open air gymnasium.

250 students are taking the course in modern novels at Yale.

COMMUNICATION.

Editor of W P I:

In reply to the editorial of last issue, I would like to make it known to the students, and to those interested, that the building at the Fair Grounds has been secured for in-door training. We hope to begin the last week of this month and continue until the weather is suitable for out-door work.

It is very desirable that those, who wish to become candidates for positions on the team, should, if they have not already done so, hand their names to the Captain or Manager *at once*. There are three or four positions to be filled and competition for them should be hot. I wish to call attention to the pitcher's position especially. We should at least have one good one,—we want more. Let him, who has ever pitched at all, begin to train at once.

A. W. MERCHANT, Mgr.

FUEL GAS.

The recent introduction of a bill in the State legislature asking for privileges in the manufacture of fuel gas is significant, as indicating the trend of the times in the matter of fuel. The scheme roughly is to take coal from Nova Scotia, convert it into fuel gas somewhere on the coast between Boston and Salem, and then distribute it in mains to the various sections of the State, and possibly to other parts of New England. That the scheme is perfectly feasible cannot be doubted for a moment, as witness the distribution of natural gas out west for hundreds of miles.

The advantages of the plan are varied and numerous, and quite as interesting from their social aspect as from a commercial point of view. The ultimate result of the plan, if perfected, will be to do away entirely with smoke and ashes in cities, and hence tend to make them cleaner and more comfortable. If the gas can be furnished at from 50 to 60 cents per 1000 cubic feet, as it is said it can be, it will enable some industries to be carried on in this part of the country with profit, notably blast furnaces. The ordinary method of utilizing the gas would be to burn it the same as coal in boilers, and make steam to run engines, but the great improvements which are being made in the gas engine, which as it stands to-day is much more economical than the steam engine, would admit of the gas being exploded directly in the cylinders of the engines with better results than going through the intermediate process of making steam. A series of experiments are to be made shortly under the direction of Professor Reeve which contemplate the use of gas in the ordinary steam engine. The results of these experiments, which are something entirely new, will be looked forward to with considerable interest, for, if successful, they will have a direct bearing on this new industry.

The future of gas for heating and fuel purposes is exceedingly bright, and, from the recent invention of acetylene and the general introduction of the Welsbach burner, it is very doubtful whether, as an illuminant, gas will succumb to electricity, particularly when it is remembered that the methods of making gas have improved in the last twenty years quite as much as the production of electricity.

"THE NUMBER CONCEPT."

A New Book by Dr. Conant.

A glance at the pages of this work will show its unique and interesting character. But very little work on this subject has ever before been done, and the little that has been published is found principally in scattered papers. In fact, no other work has ever investigated the subject of the origin and development of number. This book will enlighten many men on this subject, and doubtless will prove very beneficial and attractive, even to those who have little or no interest in mathematics.

In his opening chapter Prof. Conant says: "Among the speculative questions which arise in connection with the study of arithmetic from a historical standpoint, the origin of number is one that has provoked much lively discussion, and has led to a great amount of learned research among the primitive and savage languages of the human race. * * * * Among the barbarous tribes whose languages have been studied, even in a cursory manner, none have ever been discovered which did not show some familiarity with the number concept. The knowledge thus indicated has proved to be most limited; not extending beyond the numbers 1 and 2, or 1, 2, and 3. * * * At first thought it seems quite inconceivable that any human being should be destitute of the power of counting beyond 2."

The book is the result of careful research and is the result of the labor of nearly three years. Great pains has been taken by the author to use only original sources of information, whenever it was possible to do so, but when they were not attainable only the very recent authorities have been consulted. Some idea of the scope of the work can be had from consulting the index of chapters, which reads as follows: Counting, Number System Limits, Origin of Number Words, Miscellaneous Number Bases, The Quinary System, The Vigesimal System.

The book is published by Macmillan & Co., and is attractively bound in brown buckram cloth.

SHOP NOTES.

Elevator orders have been received from the City Market, Springfield, Mass., and C. K. Samson, Westford, Mass. Three trueing machines are being built for the Norton Emery Wheel Co., of Worcester, Mass., and a full set of Engine Lathe Castings has been sent to a Washington Manual Training School.

The Mechanical Laboratory has been supplied with more drawing stands and stools, and the twist-drill grinder business continually is improving.

THESES SUBJECTS.

The following is a list of the thesis subjects of the members of the graduating class of ninety-six. The list is not quite complete, owing to the fact that a few of the electrical engineers have not as yet decided on their subjects. The exact wording of some of the titles may be somewhat changed before the theses are submitted:

MECHANICAL ENGINEERING.

Barber, Phelps.—Test of the Allis and Wheelock Engines.

Gifford.—Emery Testing Machine.

Howe.—Design and Test of an Absorbtion Dynamometer.

Fuller, Walter.—Test of Putnam Engine.

Jencks, Riley.—Test of a Compound Engine (Allis and Wheelock).

Harris, Leonard, Parks.—Test of a 100 Horse Power Gas Engine.

Ross, Southwick.—Test of a Compact Compound Engine.

ELECTRICAL ENGINEERING.

Alford, Alderman.—Design of a Laboratory Alternator.

Brown, Goodrich.—Design and Test of 500 Volt Shunt Motor.

Carpenter, Crawshaw.—Design of a Cradle Dynamometer for a Commuted Field Series Motor.

Cullen, Knowles.—Design and Test of a 500 volt Shunt Motor.

Chalfant.—Design and Test of a 125 volt Shunt Dynamo.

Cunningham, Gibbs.—Determination of the B. H. Curve.

Bascom, Bunker.—Design and Test of a 125 volt Shunt Dynamo.

Heath, Tilton.—Computations based on Westinghouse Alternator.

Gay, McClure.—Determination of Non-Inductive Resistances.

Higgins, Stockdale.—Design of a Factory Lighting Plant.

Warren, Zaeder.—Design and Test of a 500 volt Shunt Motor.

TECHNICALITIES.

Prof. Kimball delivered an extremely interesting lecture before '98 recently on the "Röntgen Cathode Ray Photography."

In Physics, the Sophomore class is having lectures by three different professors,—Dr. Mendenhall on "Sound;" Dr. Kimball on "Heat," and Mr. Phelon on "Electricity."

Prof.: "You will find instances of this in the New Testament, for instance in the first chapter of Genesis.

In answer to the question, "Who may not naturalize in the U. S.?" a student gives the following: "No yellow-skinned alien may naturalize in the U. S."

Prof. Haynes objects to burning books on Political Economy, and bowing down to worship the steam-engine.

C. M. Allen, '94, received a bad cut while assisting in setting up machinery at the power-house recently.

Only ten of the Seniors who clamored so loudly for metallurgy, which was omitted from the course, are availing themselves of the opportunity which is now presented.

A photograph of a man's hand, taken in Germany with the aid of the new x rays, was exhibited to the students by Dr. Kimball last week.

Dr. Mendenhall delivered a very interesting address on "Physics Teaching" at the English High School of this city, Feb. 15. He strongly advocated a general study of Physics before the introduction of laboratory work, which should consist of experiments especially calculated to induce self-reliance and accuracy in the student.

The Juniors took indicator cards from the shop engine a few days since and upon developing them their results showed from nine to two thousand H. P. It is probable that when the latter card was taken the Daniels planer was running, else the Freshies were applying the brakes to the lathes in the wood-room. Judging from the majority, however, the indicated H. P. is about twenty-four.

There will be a "second" or "College Nine" this year at Harvard.

A new class in book-keeping has begun at Yale.

COLLEGE NOTES.

A fencing class has been started at Yale.

The receipts of the college paper in Stanford's are yearly fifty per cent. more than cost.

There are about 80,000 members of college Greek letter fraternities.

At Syracuse only fifteen hours of work are required a week.

Extensive improvements have been made at the Dartmouth Gym.

A book of "Poly" verse will probably soon be published at the Brooklyn P. I.

The Cornell crew candidates have begun regular training.

University of Michigan has a Masonic Club, and expects soon to have a club-house.

University of Michigan will soon have a new $50,000 gymnasium for women.

M. I. T. has 1,187 students this year. The instructors number 119.

Pennsylvania is to have a dining-hall capable of seating about 1,000 students.

University of Chicago's income last year was $520,000.

$54,000 was spent at Yale last year for athletics. Of this amount $10,000 was subscribed by undergraduates, and the remainder was raised chiefly by baseball and football games proceeds.

The Chicago Alumni of Princeton have voted to send a copy of "Princeton stories" with a book of Princeton views to every prep. school in Illinois.

The Board of Visitors at West Point recommends an advance in the standard of admission. The requirements are now very low compared with those of most colleges.

The musical clubs of the University of Pennsylvania will take a short trip in the latter part of February. Wilmington, Baltimore and Washington will be visited.

ALUMNI NOTES.

'80. Chas. E. Wells is Assistant Engineer, Metropolitan Water Board, Clinton, Mass.

Ernest P. Sparrow is with the Boston Rubber Shoe Co.

'81. Wm. V. Lowe is draughtsman with C. H. Brown & Co., Fitchburg, Mass.

Alpheus B. Slater, Jr., is Superintendent and Engineer, Providence Gas Co.

Edgar A. Williams is with Bardons & Oliver, Cleveland, Ohio.

'82. Herbert W. Cowan is resident engineer, U. P., Denver and Gulf Railway.

Chas. C. Hall is Manager Steel Dept., Union Steel Co., Alexandria, Ind.

Herbert C. Hastings is Foreman, Machine Shop, R. F. Hawkins' Iron Works.

Clarence H. Hubbard is Manager Berkshire Cycle Co., North Adams, Mass.

Fred. W. Moore is Chief Engineer, Milwaukee Bridge Works.

R. C. Von Bibersteim is Head Draughtsman, Charlotte Machine Co., N. C.

Wm. S. Washburn is with Churchill & Washburn, Sanitary Engineers, Brockton.

'83. Allan A. Foster, Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

John E. Gallagher is Foreman of Government Construction, P. O. Building, Worcester, Mass.

Geo. P. Nichols is Senior Partner, George P. Nichols & Co., Engineers and Contractors, Chicago, Ill.

Alfred Thomas, Jr., is Foreman Electrical Dept., Pullman Palace Car Co., Pullman, Ill.

'84. Roscoe H. Aldrich is Supt. and Eng'r, Buffalo Steam Pump Works.

Edw. E. Johnson is Manager, Engineering Dept., Henion & Hubbell, Chicago, Ill.

Wallace C. Johnson is a Civil Engineer, Niagara Falls, N. Y.

Chas. S. Phelps is Chief Engineer, S. C. & Ga. R. R.

John C. Setchel is Draughtsman with C. B. Rogers Manufacturing Co., Norwich, Conn.

'85. Wm. O. Emery, Ph.D., is Professor of Chemistry, Wabash College, Crawfordsville, Ind.

Henry O. Evans is with Henry McShane Mfg. Co., Baltimore, Md.

Moses B. Kaven is Assistant Manager Portland Co., Portland, Me.

Marcus J. Patterson is Consulting Engineer, Good Block, Denver, Col.

Frank B. Rice resides at 67 Columbus Ave., Somerville, Mass.

'86. Chas. A. Bennett is Professor in Manual Training Teachers' College, New York City.

Henry W. Carter is partner, Parkinson & Carter, Patent Lawyers, Chicago.

Hamilton J. Chapman is Vice-President of the Petersburg Granite Quarrying Co., Petersburg, Va.

Clarence E. Cleveland is Superintendent with Eben S. Stevens, Woolen Manufacturer, Quinebaug, Conn.

Arthur B. Fairbanks is Supervisor Manual Training, Public Schools, Oak Park, Ill.

Frank A. Higgins, M.D., is Physician, 22 Marlborough St., Boston, Mass.

Norman Marshall is Vice-President Anchor Electric Co., Boston, Mass.

Walter G. Wesson is Principal Manual Training School, Worcester, Mass.

'87. John W. Burke is Civil Engineer, 45 Broadway, New York City.

Geo. C. Davis is Chemist, Embreville Estate, Washington Co., Tennessee.

Ira L. Fish is a Counsellor at Law and Solicitor of Patents, Providence, R. I.

John C. Knight is Assistant Master Mechanic, Edison Electric Illuminating Co., Boston, Mass.

Janz Landsing is Mechanical Engineer, 99 Nassau St., New York City.

Erwin S. Lloyd is with J. W. Burke, 45 Broadway, New York.

Chas. B. Murray is Chief Chemist, Carnegie Steel Co., Pittsburg, Pa.

Chas. J. Sawyer, Manufacturer Wooden and Paper Boxes, Hudson, Mass.

Y^e NOBLE TECHMAN !

We clambered up the chapel stairs,—
But less than fifty men,—
The motion to adjourn was put,
So we walked down again.

I am not a usual dreamer,
But one night I dreamed a dream,
Thought I sat up in the chapel,
With a bright and cheerful mein,
For at last there sat a quorum (!)
With a dozen men to spare,
And the business was a rushing (?)
With a hustler in the chair.
Ev'ry man was quick and active,
And the way they made things hum
Was a caution, I assure you,—
Not a single man was dumb.
Now they raised a hundred dollars,
Then accepted some bright scheme,
Officers were soon elected,
Then they struck another theme;
All the men showed great school spirit,
And an interest supreme,—
Here I awoke—I was confounded,
For it truly was a dream!