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THE WPI
Vol. VIII. WORCESTER, JANUARY 26, 1893. No. 16.

Published on alternate weeks, during the School Year, and devoted to the interests of the Worcester Polytechnic Institute.

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CHAS. HAMILTON, PRINTER, 311 MAIN ST., WORCESTER, MASS.

It is to be hoped that each member of the Faculty, and each student as well, will appoint himself a committee of one to see that mail matter addressed to persons formerly connected with the Institute is sent to their present address as soon as possible. If care is taken in this regard a great deal of delay and risk of loss of the mail will be done away with.

It would be advantageous if those who expect to visit the World's Fair next summer would form a kind of co-operative society for the purpose of securing lodging, board, and reduced rates on railroads, and also for a more systematic view of the Fair. Very likely apartments might be rented within reasonable distance of the Exposition at a moderate price, if taken soon. Cannot some one interested call a school meeting and have a committee appointed to look the matter up? Undoubtedly some Chicago alumnus would put this committee in communication with persons who would furnish any information desired.

Elsewhere is published a complete outline of the five courses of study arranged for four years. These outlines were adopted by the Trustees at their meeting Jan. 21.

There is little doubt that the adoption of these outlines is a long step forward. The four-year courses are not dilutions of the shorter ones; they are amplifications of them. Especially is this the case in the new Civil Course and yet we doubt if the men will really be crowded so much as under the old system.

Modified in whatever slight degree experience may suggest, we predict for the W. P. I. under the new system greater success than ever and a more rapid approach to the position among the institutions of the country which she rightfully ought to hold.

It is to be hoped that the students are carefully considering the question of our position in regard to the place of holding the Intercollegiate sports. It is no doubt the sentiment of the Board of Governors of the W. A. C., that while they may not do as much as last year, yet they will make considerable effort to have the sports held at the Oval. There are both advantages and disadvantages in holding them at those grounds.

As to the disadvantages may be mentioned the somewhat laborious method of reaching the grounds, and what is greater, the necessity of running all the spurs and middle distances in heats, and the fact that the 220 dashes cannot be straightaway.

The advantages are, the excellent condition of the track, the perfection of its dressing rooms, and the certainty that the W. P. I.
men will have the assistance of the W. A. C. men in conducting the sports.

It now remains for the students to consider both sides of the case and make their decision according to their judgment. We do not believe in formally instructing delegates, as this savor of the machine, but we do believe that a delegate should be somewhat influenced by the express will of a majority.

AN EXAMINATION EXAMPLE.
An Illustration of What Semi-Annuals Are.

As a general thing, the tendency of professors has been to make examination papers about as hard and unmanageable as possible, at least it seems so to the average student. The throes just passed, however, have shown in an unusually graphic manner the thoughtlessness in which the makers of examination papers will sometimes indulge.

One of the Senior professors in announcing his examination last week, suggested that the class bring in two blank books, as many of them would probably completely fill one book and run over on to a second. The almost unreasonableableness of the examination was demonstrated that evening by a group of Seniors. A wager was made that a page in an examination book could not be written in five minutes. One of the Seniors, a W P I man, who probably could push his pen as rapidly as most any student, sat down and wrote in ordinary size one page, using the Lord's Prayer as a subject. Writing with his utmost rapidity it took him just four minutes and ten seconds. The examination lasted four hours and in the blank book there are twenty-four pages, or an allowance of ten minutes to each. The test-writing was done at high pressure, so that the writer's hand ached when the job was completed. He did not have to think a moment regarding his language. Compare this with what was required in the examination. It was not a five-minute test but a four-hour strain. It was not the uniting of something already couched in words, but the expression of ideas upon abstract subjects, where care in the use of English, spelling and punctuation had been especially impressed upon the writers. Finally, the questions which had to be written upon were, with the exception of two out of twelve, practically new to the student at the time of writing. In addition, with those exceptions, they were nearly all questions upon which volumes have been written and upon the study of which men have spent years.

In other words only a trifle over twice as much time was allowed for the consideration and reasoning upon these questions, for the clothing of ideas upon them in words and their proper arrangement, and this on a four-hours' test, as was required for the merely mechanical work of writing the same amount at high tension, and on a ten-minutes' test. These "great expectations" become even greater, when one supposes that the student not only fills one book, but as the professor rather expected, runs over two, three, or four pages of another.

This incident of the wager shows that our instructors do not always consider carefully just what their examinations are to the student.

THE HOLYOKE WATER POWER.
Reconstruction of the Dam.

SITUATION.

"The Holyoke dam was the outcome of that spirit of enterprise for manufacturing which swept like a great wave over the New England States between the years of 1820 and 1850."

In order to fully understand why the waters of the Connecticut river are so valuable at this point it is necessary to take a glance at the lay of the land.

Holyoke lies on the western bank of the river, eight miles from Springfield. From the river up, the rise is gradual.

The great volume of water at this point and the rapid fall of 60 feet, the rocky ledge underlying the stream and flanked by walls of the same material on which to build a dam and the convenient site for the system of canals was what led Thos. H. Perkins, G. W. Lyman, and Edwin Dwight in 1848 to organize the Hadley Falls Co., with a capital of $4,000,000, to build and maintain a dam across the Connecticut river.

THE FIRST DAM.

It was at first contemplated to throw across the river a temporary dam, which, while it would serve as a protection to the erection of a more substantial one below, would answer the purpose of the company until such a permanent one should be completed. The first dam was accordingly built with less regard for strength than was prudent, as the result proved. For the water had hardly risen to the crest, when, before thousands of anxious eyes, the whole structure was swept away. This was a rather severe lesson and cost the company $358,000, which at this day would have been equivalent to about $100,000 for day labor then was only seventy-five cents.
THE SECOND AND PRESENT DAM.

The company immediately proceeded to the erection of a new dam which was to be as strong as wood and iron could make.

The summer of 1849 saw the work completed. Its length is 1019 feet and height 35 feet. At either end there are heavy stone abutments containing 13,000 perches. Between these abutments the dam is composed of heavy spruce timbers, the smallest being 12" square, which are built up in such a way as to present on the upper side a planked surface making an angle of 21° 45' with the water level. The timbers which cross the river transversely are supported on others at right angles to them and are arranged in 170 sections 6 feet apart. The timbers parallel with the course of the river are set in grooves cut in the solid rock and spiked or riveted by bolts 24" long and 14" in diameter. Over 3,000 of these bolts were used. Nearly 4,000,000 feet of lumber are contained in the structure. The foot of the dam was filled in with sand, which was well pounded down, and covered by a mass of concrete. As the timber work went up the whole foundation and all open places were filled in with stone to a level height of 10 feet.

The planking was trebled to a thickness of 18" all tennailed, spiked and strongly bound together. The rolling top was covered with boiler plates, placed side by side and extending the whole length of the dam.

The graveling in the bed of the river begins 70 feet back above the dam and was continued over 30 feet or more of the sloping surface.

The whole cost was $150,000 which would represent at least $200,000 at the present day.

ARRANGEMENT OF CANALS.

At the western end of the dam the water is drawn out into a system of canals for the mill supply. The water is conveyed into the canals by means of 15 gateways, which are raised and lowered by special machinery. The sides of the canals are built of solid masonry. The width at the bottom is 140 feet, at the top 144 feet. The canals are designed for twenty feet of water.

The exact fall from the top of the dam to the still water below is 59.9 feet. Of this 20 feet is used by the first level 12 feet by the second and the remaining 27.9 by the third level. There are five different outlets for the water: from each of these levels directly into the river and from the first level into the second and the second into the third.

By this system the same water is used three times. In order to get direct power it is necessary to be on the east side of the canals, but in many cases the power is transmitted across the canal to the mill by means of a wire cable. It may be of interest to note the difference in cost of a H. P. as obtained by steam and by water. The annual cost of a H. P. by steam for ten hours a day is $20.65, while by water it is only $4.62.

THE APRON.

During the fall of 1849 the water rose to a height of six feet above the top of the dam and the windows in Springfield, 8 miles away, rattled at the rate of 128 vibrations a minute in consequence of this sheet of water passing over it without opportunity being afforded for the air to pass freely from one abutment to the other. One of the professors at Amherst, 14 miles away, noticed that the latch on his barn door rattled continuously. He counted the vibrations, visited the dam and found that they agreed with the vibrations there.

The following spring found 8½ ft. of water on the dam. Four years later there was 10½ ft and in April, 1862, there was 12½ ft. This immense volume of water passing over and falling at a slight angle upon the sandstone and red slate had worn out a trough varying from 20 to 25 feet in depth. This combined with the undertow was beginning to undermine the dam. Logs in going over were caught in the undertow and forced between the timbers. The great sheet of water falling on them acted like an immense lever to pry the timbers. It was evident that something must be done to prevent this, otherwise some day the dam would be a minus quantity. So in 1868 and 1869 the apron was built. The cost was $263,000.

BREAKS.

For ten years after the apron was built no trouble was in any way experienced, but in 1879 there appeared a well defined whirlpool on the surface of the water just above the crest of the dam.

Examination showed a break through the planking. This and subsequent breaks were repaired by means of cribs, as they were called. So here is another case where "cribs" have proved themselves convenient.

On July 19, 1884, a whirlpool was discovered near the center of the dam, the central air chamber of which measured 2 feet in diameter and 10 ft. in depth. A crib 20x33 was sunk, but it was too small to enclose the hole, 4,500 bushels of gravel sewed up in bags were thrown in without any apparent effect.

Meanwhile the water supply was failing fast and it was evident that something must be done to stop the leak immediately. It was decided to build a larger crib than had yet been undertaken. It was 40x45 with a weight of 100
tons and took 80 tons of stone to sink it. When the crib was sunk it was found that the hole had increased in size and even this large crib would not take it in. The small 20x55 crib was floated down and sunk beside the larger one; in this way the hole was repaired. It was now evident that the whole dam needed repairing so the following plan was adopted and carried out in the main. Two coffer-dams were placed on the dam and the ends shut off either by an end piece or by one of the abutments. Then two more coffers were set on the outside of the forward end piece and another end piece forward of these. Finally the rear end piece and two coffers were taken up and set forward of those last set and so on.

Professional divers were employed to clear away the water-soaked logs and stone which had accidently dropped on the face of the dam in building the apron. After the coffers were sunk the water would run out through the holes in the face of the dam. The divers made the contact of the coffers and the face of the dam water tight, by means of battens and caulking. When the water had all run out the planking was removed, the sheet piling was put in, decayed timbers replaced, gravel dumped in and washed down or profusely puddled until no more could be put in. Then new planking was put in and so on from one section to another.

The greatest hindrance to the work was to remove the dirt and stone from the face of the dam. Several different methods were tried but finally the following plan was adopted: The divers, 3 in number, went below with fire hose carrying a pressure of 90 lbs. A one-inch nozzle was used. In this way the earth was washed up into windrows which was removed by a clam-shaped dredger. This plan proved very successful and they were able to clear about fifty feet per day.

Gravel Filling.

Each side of the sheet piling is a mass of puddled gravel, measuring 12,300 cu. yds. all told. The method of handling the gravel is worthy of a few moments consideration. The sand pit was situated 2 miles up the river at the side of the C. R. R. A special train was employed for bringing the gravel from the pit in buckets built especially to handle the gravel. They were 4 ft. sq. and 1 ft. 3 in. deep. The bottom was arranged so that it opened by touching a spring. Each bucket was provided with a handle for lifting it. The empty buckets were sent up to the pit on flat cars which held 12 buckets each, filled and returned to the derrick which loaded them on to the scows which were used to take them to the dam. After the work was well started 330 buckets was the average day's work. As a means of hydraulicing the sand into the dam, holes were tapped in the coffers and hose attached. This gave sufficient head for the work to be done.

Clemens Herschel, the engineer of the Water Power Co., estimated that it would take 11,300 cu. yds. of gravel to do the work and as nearly 13,000 cu. yds. were used he believes that very little space is devoid of gravel within the dam. Such space as may be left is now filled with water so that no great pressure is brought to bear upon the timbers and planking of the dam. When the work was completed Mr. Herschel in his report says, that in his belief the dam will now stand even if the planking was removed or resolved itself into organic decay.

Preservation of the Timbers.

When the dam was completed in 1849 the constructing engineers remarked: "It leaks just enough to preserve it." However, Mr. Herschel does not believe this, for he says. "Wooden dams don't seem to act that way." In taking off the old planking it was found to be so rotten that it could be punctured by the thrust of a shovel. It was also noticed that the decay started on the underside of the planking. Quoting from Mr. Herschel: "I am confident that the timbers have been indefinitely preserved by the work of 1885. They have been put exactly in the same condition as a timber buried in the foundation of a bridge pier or in similar structures, of which we have examples in bridges built by the Romans and which are in a perfect state of preservation after 2,000 years of service."

[Much of the material for this paper was taken from the report of Mr. Herschel, chief engineer of the Holyoke Water Power Co. at the time of the reconstruction.]

C. W. D. Dyer, '93.

The Course in Physical and Political Science.

The work in all the courses at the Institute except that of the so-called "New Course" is very well understood by all the students. About this course, however, some uncertainty seems to exist and it may not be out of place to state what has been and is being done in this department so that all may be informed about it.

The work in the first half of the Junior year is alike in the courses in Civil Engineering, Chemistry and Physical and Political Science. In the second half the special work is along the line of chemistry. The subject of Qualitative Analysis is taken up and pursued with the members of the chemical course. With the beginning of the Middle Year Physics begins to occupy a more prominent place in the work.
Indeed, it is intended that, in the first part of the course, chemistry shall be more important, while in the latter portion more time shall be devoted to physics. In chemistry, quantitative analysis was taken up and the regular mineral analysis performed. In physics, special work in light was undertaken. This consisted of lectures by Prof. Kimball on refraction, gratings, prisms and determination of wave length of light by their means. The work was continued in the second half under the personal direction of Prof. Kimball. Experiments were performed on the large spectroscope in the Salisbury Laboratories. This is one of the finest instruments of its kind in the country and the most accurate measurements can be made upon it. In addition to this there was some very interesting work in polarized light using the polariscope with a large number of different substances. There was also projection work with the oxy-hydrogen lamp, in which the students did all the work necessary to operate a lamp, from making the oxygen to focussing the lenses. In chemistry, quantitative analysis was still further pursued, and toward the close of the year analysis of samples of milk and beer were made.

The special work in English literature was extremely interesting and valuable. Two of Shakespeare’s plays, Macbeth and King Lear, were very minutely studied under Prof. Smith and a very complete knowledge of them obtained. French was also studied under the same professor.

Advance work was also done in geology including at the end of the year a number of excursions to points of interest in Worcester. But at the beginning of the Senior year the most delightful excursions were taken, under Doctor Fuller. In the first, Milford and its granite quarries were visited. It is here that Norcross Brothers have two large quarries and near by the Milford pink granite is obtained. Next day the men in the “New Course” went to Fitchburg to see the granite quarries there and then back through Sterling to Worcester. But the crowning triumph came on the following day when the party visited Mt. Holyoke and the Connecticut valley. A number of bird tracks in sandstone were seen and two of them dug up and brought home to the Institute as memorials of the day’s trip. In these three excursions a splendid idea of geology as it actually has to be studied was obtained. Anyone having a spark of love for the natural sciences would have enjoyed them intensely.

The course in the Senior year turns attention especially to electricity. The men this year have made standard ohms and determined the coefficient of resistance for German silver wire and also made some standard Clark cells. During the last half of the Senior year, still further work will be done in electrical measurements. Analyses of butter will be made in the first half and lectures taken in oils, water and sewage disposal.

Under Prof. MacDonald in the first half of the Senior year a very fine course in general history is offered, and in the second a course in Constitutional History in the United States. In this work some conception of the real meaning and purpose of history is gotten at by the men. The work here is especially instructive and valuable.

The course is intended for the man who wants, not a special technical training, but a thorough general scientific education. It is in line with the modern tendency to emphasize the sciences and give less time to strictly classical study. It is the course for the man who does not feel adapted to any special line of work, but who wants a scientific education. It fits a man admirably for business, for teaching or for work in higher institutions of learning.

**WHICH COURSE TO TAKE.**

Under this heading it is the intention of the W P I to publish a series of letters from eminent electricians and mechanical engineers, in answer to the question, “which course do you advise?” Two are published in this issue.

In writing to the gentlemen the editor used as a brief and convenient method of reference the letters A, B, C and D, to denote respectively the mechanical engineering course, the electrical engineering course, the mixed course where both kinds of practice are taken, and the post-graduate electrical course; these letters are used by the gentlemen in their communications.

January, 13, 1893.

Editor W P I—Dear Sir:

In replying to your favor I would prefer to limit myself to discussing the course in electrical engineering only.

For a course in electrical engineering I do not think any of those you give are sufficient. Until lately electrical engineering was generally taught at colleges, either by physicists or mechanical engineers, or both. This may have been sufficient at that time, but now, since it has become such a large and important branch in engineering, it cannot possibly be taught thoroughly and properly as a mere branch of physics or mechanical engineering. The portion to be included under the head of physics should be treated precisely like the branch of mechanical engineering known as mechanics, which is generally taught under
the head of physics. Just as mechanics forms only a small portion of a course in mechanical engineering, so electricity and magnetism, as taught under the head of physics, is only a small portion of a course in electrical engineering. The electrical engineer should have a general idea of mechanical engineering and the mechanical engineer should have a general idea of electrical engineering, but in my opinion, it is a great mistake to imagine that at the present time either can include the other. There are many branches of electrical engineering which have absolutely no connection with mechanical engineering. It is a great mistake in my opinion to attempt to make a mechanical engineer of every electrical engineer; the result would naturally be that the electrical engineer is not as well up in his branch as he ought to be.

Three and a half years is scarcely enough for a proper course, unless the entrance examinations cover a considerable portion of what is usually taught in the first year.

Course "d" could be made a very good one, and would doubtless be appreciated by many graduates, provided it does not consist of an advanced course in physics and mechanical engineering.

Very truly yours,

CARL HERING.

January 18, 1893.

Editor W P I—Dear Sir:

I am in receipt of yours of December 24th in relation to the courses that are open in the Worcester Polytechnic Institute. I should have written you in reply earlier than this were it not for the fact that innumerable matters have filled up the time and prevented my giving your letter the attention it deserved.

I do not know that I am possessed of sufficient information in regard to the courses you mentioned to be able to advise young men who desire to know what is best for them to take up. I think that the fact that there are a number of courses open is in itself, probably, an indication of the condition that some will be better served by taking one course than by taking another. It depends very much upon the kind of work which it is proposed the young men will pursue, and to what extent they intend to devote themselves to any particular branch of engineering. In this latter respect most young men must become, as it were, their own guides, and must study to discover their peculiarities, their own bent of mind, and follow with earnestness that direction in which they seem to be led. An electrical engineer would necessarily require to study mechanical engineering in conjunction with its development or extent into the electrical field.

I am a great believer in the idea that shop practice or training, which is in a large measure practical, and brings into play the skill of the hand as well as trained observation, should be the starting point for any engineering career.

Your courses B and C seem to be quite desirable ones, which may be supplemented by the post-graduate courses, as you state in your letter to me. I am well aware of the good work which the Worcester Polytechnic Institute is doing, and feel sure that it will continue in the future.

Very truly,

ELIHU THOMSON.

HISTORICAL SOCIETY.

The Society held its regular meeting on Friday evening, Jan. 13th, in the Library of Boynton Hall. It being the occasion of the semi-annual election of officers, the nominating committee brought forward the following candidates, all of whom were unanimously elected: President, Charles Baker, Jr, ’93; Vice-President, R. B. Farwell, ’93; Executive Committee, the officers, Prof. William MacDonald and George W. Bishop, ’94.

The subject for the meeting was “The States General and the Constituent Assembly.” Mr. A. L. Rice, ’91, read a paper on “The History of Popular Representation in France.” A reading entitled “Scene at the opening of the States General on May 5th, 1789,” by Nathan Heard, ’93, followed, after which A. D. Butterfield, ’93, read a paper on “The States General up to June 23d, 1789.” Prof. MacDonald also read a paper entitled “The Constitution of the National Assembly,” and A. D. Flinn, ’93, one entitled “The Economic Condition of France, 1789-91.”

President Baker announced that the Society would hold a public meeting Friday evening, January 27th, in the Physical Lecture Room. Rev. Daniel Merriman, D. D., will at that time lecture upon “Algeria.” Dr. Merriman has recently spent a year in travel abroad and has devoted some time to the study of this subject. He also has had prepared an excellent collection of stereoptican views which will be used to illustrate the lecture.

All the faculty, students and friends are cordially invited to be present and share with the society the privilege of enjoying this intellectual treat, and it is hoped that many will avail themselves of the opportunity. To Worcester people, at least, nothing need be said concerning the speaker of the evening, for all know that a subject taken up by him is sure of being treated in a most thorough and careful way and in a manner interesting to an audience.
### Scheme for Four Years' Courses of Study

#### I. Department of Mechanical Engineering

**Freshman Year**

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<tr>
<td>Practice, 10 hours per week</td>
<td>Practice, 15 hours per week</td>
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<td>Chemistry: Lectures, 2</td>
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<td>Chemical Laboratory</td>
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<td>Algebra, 3</td>
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<tr>
<td>Rhetoric, 2</td>
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<tr>
<td>French, 3</td>
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<tr>
<td>Free Drawing, 3</td>
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<tr>
<td>Algebra or Ethics, 1</td>
<td>Algebra or Ethics, 1</td>
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Summer Practice, 168 hours.

**Sophomore Year**

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<th>Second Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics: Lectures, 3</td>
<td>Physics: Lectures, 3</td>
</tr>
<tr>
<td>Descriptive Geometry, 6 p.</td>
<td>Descriptive Geometry, 6 p.</td>
</tr>
<tr>
<td>German, 4 p.</td>
<td>German, 4 p.</td>
</tr>
<tr>
<td>Mechanical Drawing, 4</td>
<td>Mechanical Drawing, 4</td>
</tr>
<tr>
<td>Practice, 10</td>
<td>Practice, 10</td>
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</tbody>
</table>

Summer Practice, 168 hours.

**Junior Year**

<table>
<thead>
<tr>
<th>First Term</th>
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<tbody>
<tr>
<td>Mechanics, 2 p.</td>
<td>Steam Engineering, 3</td>
</tr>
<tr>
<td>Theoretical Hydraulics, 2 p.</td>
<td>Engineering Laboratory, 5</td>
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<td>Engineering Laboratory, 5</td>
<td>Mechanical Drawing, 4</td>
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<tr>
<td>Eng. Literature, 2 p.</td>
<td>Model Drawing, 3</td>
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<tr>
<td>Lect. on Lab. Work</td>
<td>Practice, 10</td>
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<tr>
<td>Machine Design</td>
<td>Machine Design, 5</td>
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<tr>
<td>Practice, 10</td>
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</table>

Summer Practice, 168 hours.

#### II. Department of Civil Engineering

**Freshman Year**

<table>
<thead>
<tr>
<th>First Term</th>
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</thead>
<tbody>
<tr>
<td>Practice, 15 hours per week</td>
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<td>Chemistry: Lectures, 2</td>
<td>Chemistry: Lectures, 2</td>
</tr>
<tr>
<td>Chemical Laboratory</td>
<td>Chemical Laboratory</td>
</tr>
<tr>
<td>Algebra, 3</td>
<td>Algebra, 3</td>
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<tr>
<td>Rhetoric, 2</td>
<td>Rhetoric, 2</td>
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<tr>
<td>French, 3</td>
<td>French, 3</td>
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<tr>
<td>Free Hand Drawing, 3</td>
<td>Free Hand Drawing, 3</td>
</tr>
<tr>
<td>Algebra or Ethics, 1</td>
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</table>

Summer Practice, 168 hours.

**Sophomore Year**

<table>
<thead>
<tr>
<th>First Term</th>
<th>Second Term</th>
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</thead>
<tbody>
<tr>
<td>Physics: Lectures, 3</td>
<td>Physics: Lectures, 3</td>
</tr>
<tr>
<td>Descriptive Geometry, 6 p.</td>
<td>Descriptive Geometry, 6 p.</td>
</tr>
<tr>
<td>German, 4 p.</td>
<td>German, 4 p.</td>
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<tr>
<td>Mechanical Drawing, 4</td>
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#### III. Chemistry

**Freshman Year**

<table>
<thead>
<tr>
<th>First Term</th>
<th>Second Term</th>
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<tbody>
<tr>
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<tr>
<td>German, 5</td>
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<tr>
<td>Free Drawing, 3</td>
<td>Free Drawing, 3</td>
</tr>
<tr>
<td>Algebra or Ethics, 1</td>
<td>Algebra or Ethics, 1</td>
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Summer Practice, 168 hours.

**Sophomore Year**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Physics: Lectures, 3</td>
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<tr>
<td>Descriptive Geometry, 6 p.</td>
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<tr>
<td>German, 4 p.</td>
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<tr>
<td>Mechanical Drawing, 4</td>
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<tr>
<td>Practice, 10</td>
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Summer Practice, 168 hours.

**Junior Year**

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<tbody>
<tr>
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<tr>
<td>Chemistry: Lectures, 2</td>
<td>Chemistry: Lectures, 2</td>
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<tr>
<td>Chemical Laboratory</td>
<td>Chemical Laboratory</td>
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<tr>
<td>German, 5</td>
<td>German, 5</td>
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<tr>
<td>Rhetoric, 2</td>
<td>Rhetoric, 2</td>
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<tr>
<td>French, 3</td>
<td>French, 3</td>
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<tr>
<td>Free Drawing, 3</td>
<td>Free Drawing, 3</td>
</tr>
<tr>
<td>Algebra or Ethics, 1</td>
<td>Algebra or Ethics, 1</td>
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</table>

Summer Practice, 168 hours.

**Senior Year**

<table>
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<tbody>
<tr>
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<tr>
<td>Chemistry: Lectures, 2</td>
<td>Chemistry: Lectures, 2</td>
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<td>Chemical Laboratory</td>
<td>Chemical Laboratory</td>
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<tr>
<td>German, 5</td>
<td>German, 5</td>
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<tr>
<td>Rhetoric, 2</td>
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<td>Free Drawing, 3</td>
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<tr>
<td>Algebra or Ethics, 1</td>
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</table>

Summer Practice, 168 hours.

### IV. Department of Electrical Engineering

**Freshman Year**

<table>
<thead>
<tr>
<th>First Term</th>
<th>Second Term</th>
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<tbody>
<tr>
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<tr>
<td>Chemistry: Lectures, 2</td>
<td>Chemistry: Lectures, 2</td>
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<tr>
<td>German, 5</td>
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<tr>
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<td>French, 3</td>
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<tr>
<td>Algebra or Ethics, 1</td>
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</table>

Summer Practice, 168 hours.

**Sophomore Year**

<table>
<thead>
<tr>
<th>First Term</th>
<th>Second Term</th>
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<tbody>
<tr>
<td>Practice, 15 hours per week</td>
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<tr>
<td>Rhetoric, 2</td>
<td>Rhetoric, 2</td>
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<tr>
<td>French, 3</td>
<td>French, 3</td>
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<tr>
<td>Free Drawing, 3</td>
<td>Free Drawing, 3</td>
</tr>
<tr>
<td>Algebra or Ethics, 1</td>
<td>Algebra or Ethics, 1</td>
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</table>

Summer Practice, 168 hours.
**ComparISON OF THE PRESENT AND PROPOSED OUTLINES OF STUDY.**

**Dept. of Mechanical Engineering.**

<table>
<thead>
<tr>
<th>Course</th>
<th>Present</th>
<th>Proposed</th>
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V. GENERAL SCIENTIFIC COURSE.

**FRESHMAN YEAR.**

<table>
<thead>
<tr>
<th>Course</th>
<th>First Term</th>
<th>Second Term</th>
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<tbody>
<tr>
<td>General Chemistry, 2 Lect. 2</td>
<td>6</td>
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<tr>
<td>Mechanical Drawing, 2p.</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Mechanical Drawing</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Mechanical Drawing</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Electrical Engineering, 2p.</td>
<td>10</td>
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<tr>
<td>Summer Practice, 168 hours</td>
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**SOPHOMORE YEAR.**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Physics, 3 Lectures, 3 Quiz 1 p.</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Analytical Geometry, 2p.</td>
<td>15</td>
<td>15</td>
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<tr>
<td>Scientific German, 2p.</td>
<td>12</td>
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<tr>
<td>Mechanical Drawing</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Quantitative Analysis</td>
<td>10</td>
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<tr>
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**JUNIOR YEAR.**

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Physics, 3 Lectures, 3 Quiz 1 p.</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Analytical Geometry, 2p.</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Scientific German, 2p.</td>
<td>12</td>
<td>12</td>
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<tr>
<td>Mechanical Drawing</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Quantitative Analysis</td>
<td>10</td>
<td>10</td>
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<tr>
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**SENIOR YEAR.**

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>History of Eng. Lit., 2 p.</td>
<td>6</td>
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</tr>
<tr>
<td>Physical Laboratory, 2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Political Economy, 3p.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>History of England, 3p.</td>
<td>15</td>
<td>15</td>
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<tr>
<td>Science German, 2p.</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Mechanical Drawing</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Reading and Reports</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Summer Practice, 168 hours</td>
<td></td>
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</tbody>
</table>

**DEPARTMENT OF CIVIL ENGINEERING.**

The course corresponds exactly with the present in the number of hours devoted to Algebra, Solid Geometry, Descriptive Geometry, Analytical Geometry, Calculus, Free Drawing, German, Mineralogy, Metallurgy, Chemistry. The changes are as follows: Inv. Geometry, Trigonometry, Physics, English Studies, Mechanical Drawing, Hydraulics Theor., Hydraulic Motors, Stereotomy, Eng. Lab., Thesis Work, Least Squares, Elements of Geodesy.

No comparison can be tabulated between the two courses in the remaining work of the department, except that to say that under the present course practice, including in the Senior year graphical methods of finding stresses, was 1186, while under the proposed course there are 34 hours given especially to Graphics and practice time has been lengthened to 1524 hours.

*Includes Hydraulics.
AWAY FROM HOME.

Notes From Other Colleges.

The Polytechnic has the following in its editorial column which is not only interesting, but to some extent applicable here. "We must again remind the members of the Institute that the various notices on the bulletin board are not posted for their convenience in demonstrating the theorem of three moments, or in solving the different problems in railroad curves, nor are these notices supposed to furnish blank paper upon which to work problems in descriptive, projections, or algebra. Their legibility is certainly not increased by having superposed upon their faces either the paraboloid of revolution, or the diagram of a compound curve."

The National Horse and Cattle Show Society of New York is trying to push through a scheme for the largest athletic grounds in the world. It is proposed to throw the Polo grounds and Manhattan Field into an immense park. The University Athletic Club has already offered the society $6,000 for the use of the grounds for one day in each of the next five years, thus ensuring the annual Thanksgiving Day game.

At a meeting of representatives of the big universities last week, it was decided to hereafter debar post-graduates and special students from playing on 'varsity elevens. This decision falls especially hard on the University of Pennsylvania, as most of her eleven are post-graduates.

The Princeton Faculty have adopted the following:

WHEREAS, It appears that there has been a strong growing student sentiment against the practice of cheating at examinations, and further that the students desire to have the examinations so conducted as to be put upon their honor as gentlemen.

Resolved, That until due notice is given to the contrary, there shall be no supervision at examinations, each student simply at the end of his paper subscribing to the following declaration: "I pledge my honor as a gentleman that during this examination I have neither given nor received assistance."

The editors of journals similar to the W P I, published by schools of technology, are often reminded that they are lacking in ability to use English well; that they are not "literary" and that only those having the advantages of the more classical colleges are entitled to be heard attentively concerning anything outside of Calculus and Mechanics. This we realize, and just now have had our attention called to the subject more forcibly than ever by recent editorials in the Brunonian. Anglo-Saxon and United States have been dropped from the list of studies at Brown and other languages of which the following are brief samples, have evidently been substituted:

"Unremitting zeal and feminine brightness are wont to surpass the easy-going methods of the masculine students. The admission is unpalatable but true. * * * The men should be credited with the diversity of their responsibility which often causes superficial work. * * * Indeed the whole curriculum of elective work assumes new susceptibilities when such a course is contemplated. * * * But the symmetrical inception of courses * * * The diffusion of knowledge from universities as centers in some way suited to the convenience and needs of the people has long been a great desideratum."

About thirty men are intending to train for the Brown athletic team. The Herald says, "the principal idea of the present method is to get the men in good general condition for hard spring work. The dumb-bell practice is for all round development, the practice of starting is to make men quick."

A new testing machine with a capacity of 300,000 lbs. has been added to the equipment of Boston Tech.

Hopkins, captain of the Andover eleven, is about to enter the class of '96 at Brown.

An item in the M. I. T. foot-ball treasurer's report is, Doctor's bills, $118.50.

All of Yale's last year's base-ball nine have returned to college.

The Harvard Faculty have voted that students not in the examination rooms for semi-annuals within five minutes of the appointed hour shall not be admitted without special permission.

Recent catalogues give Williams as having 388 students, Brown, 549 including 39 women.

ATHLETIC ASSOCIATION MEETING.

On Monday, Jan. 16, was held the semi-annual meeting of the Athletic Association. There were about forty members present, who proceeded to elect the following officers: President, C. W. D. Dyer, '93; Vice-President, G. W. Heald, '94; Secretary, F. W. Parks, '95; Treasurer, N. B. Hale, '94; Keeper, E. W. Peck, '94. Messrs. Comins and Gallagher were elected delegates to the N. E. I. A. A. convention. There was a desire on the part of some of the members to instruct the delegates to vote for Worcester as the seat of war for the next field day, but as it was unknown what offer the Worcester Athletic Club would make, or whether they would make any at all, the delegates were
not instructed. Then a committee was appointed by the chair, consisting of W. H. Parker, '93, H. M. Southgate, Elec., and E. B. Whipple, '94, to consult the Board of Governors of the W. A. C., and report to the Association what inducements would be made to bring the sports to Worcester. The matter of a minstrel show was then brought up and it was the unanimous desire of the meeting to hold one. It was voted that a committee consisting of two from the middle class, and one each from the senior, junior and prep, that is to be, classes, be appointed by the president, which committee's duties shall be to make preliminary arrangements, such as hunting up talent, etc., and report to the Association within two weeks. The president was given time to appoint the committee in order to select the best men. The meeting then adjourned after a session of forty minutes.

**ATHLETES AND THEIR DOINGS.**

It is encouraging to see at least a few men ready to do some good training for the benefit of W. P. I. athletics. A rather small number have entered their names to compete for places on the team which enters the W. A. C. games to be held at the Rink on Feb. 4th. We will be represented amongst others by several men who were on the Springfield athletic team.

The open events are the mile run, half-mile run, forty yards run, mile walk, standing high jump and pole vault besides the team race with M. I. T.

The following entries have been received by the manager:


There is also a strong probability that Brigham, '95, will enter for the standing high jump.

It is plain to be seen that the manager and men who act with him are much interested, being present at the place of training every night when the competitors are running.

We think that it would not be out of place to express our thanks to the W. A. C. for allowing W. P. I. men the use of the hall.

**THE RINK TOURNAMENT.**

Last week Thursday the representatives of the High School and Tech met and talked over the plan for a joint tournament. Holy Cross declined some time ago to take part, and the Academy Athletic Association, although written to twice by Secretary Denny, did not acknowledge his letters until last Saturday. Messrs. Bigelow and Barton represented the High School, and Denny and Comins the Institute.

The committee decided to recommend to the two associations, as follows: that the tournament be held about the 27th of February in the Rink; that the admission be 25 cents and 15 cents for reserved seats; that events number about twelve and that they include a team-race between the two schools; and finally that the entire arrangement of the affair be left to a joint committee of two from each school. A careful estimate of expenses placed the maximum at $100. The High School students are extremely enthusiastic over the plan, and if it can be carried through will be a splendid success, affording excellent practice to the athletes and contributing to the treasuries.

**THE MINSTREL SHOW.**

At the meeting of the Athletic Association last week, it was voted to hold another "Show." The President of the Association, Dyer, '93, ex-endman, was authorized to appoint a committee consisting of two Middlers, one Junior, one Apprentice and himself. Since then he has appointed Messrs. Burdick and Harris, '94, and A. H. Warren, '95. The '96 man will be appointed later. Burdick was in the ring last year and sung a solo, Harris was one of the ballet dancers and is now manager of the Banjo Club, Warren was one of the Japs. The committee has taken no definite action as yet.

**LIBRARY ADDITIONS.**

Since the last list was published in the W P I nearly three hundred and fifty volumes have been added to the Institute library. Over two hundred of these are government documents and about a hundred and twenty are State reports. Besides these are the following:—

CLEVELAND ALUMNI.

The Cleveland Alumni Association held its semi-annual meeting and dinner upon the evening of December 31st. at the Hollenden in that city. Full justice was done to an elaborate menu, and after a general loosening of waistbands, and lighting of "Perfectos" introduced by Pres. Aborn, an enjoyable evening was spent in reminiscences of Tech days and a discussion of the needs of the Institute. The preceding six months were reviewed as portrayed bi-weekly in the W P I., the action of the Trustees in extending the course to four years, and of the eleven in defeating Brown being especially commended. Resolutions to be laid before the Alumni Association at Worcester, in June, urging efficient action to secure a representative from the Alumni upon the Board of Trustees, so uniformly given and preferred in most institutions were unanimously voted.

Those present were Chas. F. Treadway, '90, Thurlow, Penn.; Chas. H. Stearns, '91, Indiana, Penn.; and from the city, Frank Aborn, '72, John G. Oliver, '82, Willard Fuller, '84, Jang Landsing, '87, Windsor T. White, '90, and Francis W. Treadway, '90.

TECHNICALITIES.

Flinn, '93, says that when he thinks of the work to be done on a thesis it makes him weirry.

Prof. A. S. Kimball is lecturing at Mt. Holyoke.

Entrance exams are being held at Winnipeg, Manitoba, and Pittsburgh. Two candidates are frozen in at Nantucket.

The Y. M. C. A. topic cards containing the usual blank hour plans will be ready at the beginning of the term for distribution among the students.

Dr. Fuller has sent a box of minerals, most of which he himself collected in this vicinity, to the Chicago Exposition. He also sent a box of duplicates to Cushing Academy just in time for them to be destroyed in the fire.

The shops have nearly finished an elevator for E. T. Smith & Co.'s new building on Summer Street and two for Rodney Wallace at Fitchburg. Boring for the Y. W. C. A. elevator has progressed to a depth of 40 feet.

Prof. Gladwin is now thoroughly settled in his new room in the Washburn Shops. The main room is 56 x 22 and in addition there are rooms for blue printing and the keeping of models. The new room is very good in regard to heat, light and ventilation.

Mr. John C. Woodbury, '76, conducted the Y. M. C. A. meeting Wednesday noon, January 18th, and spoke especially of the need of Faith in one's self. His remarks, into which he introduced an illustration of the experience of a young civil engineer, were very interesting and were much enjoyed by those present.

ALUMNI NOTES.

'72. S. C. Heald's address is 48 Congress street, Boston, Mass.

S. E. Mann now lives at Methuen, Mass.

K. M. Smith is superintendent and partner of the Aldin Coal Company, Aldin, Pa., and director of the Mt. Jessup Coal Company, Winton, Pa.

M. B. Smith is partner of Smith & Brooks, civil engineers and surveyors, 26 and 27 Hildreth building, Lowell, Mass.

'73. A. C. Aldrich is office engineer for the Arrowhead Reservoir Company, San Bernardino, Cal.

J. W. Kendrick, chief engineer of the N. P. R. R., has his residence at Minneapolis.

A. M. Morse is a partner of A. M. Morse & Co., steam engines, boilers, etc., 511 Commercial building, St. Louis.

'74. H. L. Kinsley is salesman for the Hopedale Machine Screw Company.

C. A. Chandler is assistant superintendent of the Connecticut Cotton Gin Company's works, East Bridgewater, Mass.

S. H. Leonard is inspector of machinery for harbor defense. Address, Bath Iron Works, Bath, Me.

Warren S. Locke is superintendent of the American Zinc and Lead Company, Canaan City, Col.

'75. C. G. Washburn is counsellor-at-law in the Bank building, 314 Main street, Worcester.

C. G. Whitney is a milk dealer in Waltham, Mass.

Charles E. Davis is chief engineer of the Webster Manufacturing Company, No. 1075 to 1097 West 15th street, Chicago, Ill.

C. F. White is consulting engineer, Society for the Prevention of Smoke, 1614 Monadnock building, Chicago. This society is a corporate body, organized to assist the Board of Health in enforcing the smoke ordinance, gives advice as to means of prevention, and secures evidence in case of complaint.

'76. B. S. Crocker is of the firm of Ralder, Coffin & Crocker, Insurance Exchange building, Chicago.
E. Gerber is civil engineer, room 300, 184 La Salle street, Chicago.

H. V. Hinckley is office engineer, A., T. & S. F. R. R., Topeka, Kansas.

B. T. Booker, '77, and J. Fred Temple, '88, are locating engineer and civil engineer for the same road.

N. E. Kelley is engineer at Washburn & Moen's.


'77. H. H. Browning is now with Crafts & Green, Manchester, N. H.

W. L. Darling is assistant engineer of the N. P. R. R.

Rev. Wm. W. Locke is superintendent of the Barnard Memorial, 10 Warrenton street, Boston.

Wm. M. Towle is instructor in practical mechanics, Pennsylvania State College.

'78. E. S. Mathews is salesman for the Crane Elevator Company.

F. S. Clark is of O. F. Douglass & Co., Lafayette, Ind.

J. A. Vail is manager of the St. Louis office, Hamilton-Corliss Engine Company.

'79. W. W. Abbott is superintendent of schools for five towns, with residence at Sheffield, Mass.

C. L. Allen is superintendent of the Holyoke Hydrant and Iron Works.

H. D. Bush is civil engineer and contractor, room 53, Worcester block, Portland, Ore.

F. L. Dudley is assistant engineer of the Edge Moor Bridge Works, Edge Moor, Del.

Wm. L. Tobey is mechanical engineer with the Lockwood Manufacturing Company, East Boston.

'80. T. Howard is working for the Fall Creek Electric Light Company, Gilman, Col.


W. Hill is with Fairbanks & Co., valve manufacturers, 311 Broadway.

'82. F. A. Foster is mechanical engineer and draughtsman, Providence, room 442, Butler Exchange.

C. C. Hall is general manager of the Belleville Steel Company, Belleville, Ill.

H. C. Hastings is superintendent of the Talcott Axle Works, Brightwood, Mass.

A. H. Washburn is student and tutor at Leland Stanford University.

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