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Students of Worcester Technical Institute

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With this issue it becomes our very pleasant duty to extend a welcome to our new President, Dr. Mendenhall. The interest in, and enthusiasm for, him was demonstrated by the reception given him on his arrival. That demonstration gave but slight insight to the deep feeling the students already have for Dr. Mendenhall. They are ready and willing to give him their whole confidence and respect, and we feel sure that he will soon demand both. We wish him a long and enjoyable administration.

In this issue we publish an article which we believe will interest every Alumnus. It is the account of the banquet given Dr. Mendenhall by the Washington Alumni Association. The men there were enterprising and were well repaid for it. They are enthusiastic over the president. We are pleased to note that the secretary of this association realizes the importance of this paper as a means of reaching Tech men. We wish him for his communication.

The W P I again desires to call the attention of the graduates to itself. It is our earnest wish that the Alumni use these columns as a means of communication one with another. We are willing, nay glad, to publish letters or notes that may be sent us. We would gladly feel that our work was appreciated, and that the graduates of this Institute felt a little interest in their Alma Mater. If this interest is felt, and we try to believe that it is, it can be shown in no better way than by subscribing to the college paper, and then sending us notes that will help make it interesting to other graduates and undergraduates.

To those of the graduates who do subscribe we extend our thanks, but we ask them not to let their good works cease with that alone. Tell us what you are doing, the experiences you have had, the experiments you have made, and also give us a little good advice. This will not take you long and it may aid some one to attain success in after life.

We have noticed in one of our exchanges that nearly a column was devoted simply to the names of students who were to be the regular correspondents of the leading newspapers of the country. Seeing this list of names recalled to our mind the fact that such
a thing as a regular newspaper correspondent was almost an unheard of thing here. Now this should not be. We frequently hear Tech men say, "Oh, one seldom hears of the Worcester Tech in the papers." Did it ever occur to these men that the fault was to be found at home? As long as the students do not care to give the papers information concerning Tech, just so long will the newspapers not publish any itemized news of Tech events. But just as soon as the students do take an interest in this subject, or, in other words, just as soon as we have regular correspondents, then will the newspapers print the news of the Tech. Every student knows that the leading dailies of our larger cities are only too glad to have a correspondent in such an institution as the Worcester Polytechnic Institute. The advantages that will accrue to the Institute from correspondence with these papers are numerous. The attention of the outside world will be drawn towards us, and from this attention benefits are sure to be derived. The Tech would be brought more before the college world. The Alumni would hear more about us and consequently would take more interest in their Alma Mater.

Then let us have certain men whose duty it shall be to see that each week at least, the newspapers are informed of events that have happened at the Tech during the week.

It has been the general custom here in the Institute for a conditioned student to tutor with the man who gave him the condition. We believe this to be a very pernicious system. The instructor is evidently unable to make out a perfectly fair examination paper by means of which the student can remove this condition; his strong or weak points are too well known, and the instructor's judgment is injured.

Many of the professors refuse to pursue this course, but while they refuse to tutor the student they do help and advise him. This is unjust to the professor as it consumes much of his valuable time, but it leaves him absolutely free in making out his paper. Why has it never occurred to the Faculty that this difficulty could be solved in a very simple manner? In other colleges there are certain instructors whose duty it is to tutor men of low rank, but who have nothing to do with making out the examination paper. This plan, we believe, should be followed in the Institute; at least let us hope that in the future the examiner will not be the tutor.

We desire to call the attention of the students, especially of the Freshmen, to the excellent facilities for physical development offered by the Worcester Y. M. C. A. gymnasium. It is in a portion of the city convenient to the Tech and, with the reduced rates to be obtained through our own association, we see no reason why a large number of men should not train for winter and spring sports. The Freshmen can not begin development too early.

Several of the students of the Institute seem to be ignorant of the fact that wearing the letter "W" is a privilege accorded only to members of the different Institute teams. These aspirants should exert themselves and make some of the teams, thereby acquiring the right to display the crimson "W."

We must apologize for the lateness of this issue, but it was unavoidable if we wished to include an account of the Washburn Mechanical Engineering Society's meeting.

ARRIVAL OF DR. MENDENHALL.

His Ideas on Some Subjects.

On October fourth Prof. George I. Alden received a telegram stating that Dr. Thomas C. Mendenhall would arrive that afternoon. A mass meeting of the students was held immediately in the chapel to take action on the arrival of our new president. Prof. Alden was chair-
man of the meeting and it was unanimously decided that the students in a body should meet the president at the Union Station.

As the result of the above-mentioned meeting, nearly every student was on hand at 4:20 P. M., when the train from New York City pulled into the station. Dr. Mendenhall held a few moments' conversation with Hon. Stephen Salisbury, Mr. Higgins and Prof. Alden, and then, at a signal from Prof. Alden, Mr. Temple, '95, called for "Three cheers for the new President." These were given with a hearty will and were immediately followed by the Tech cheers. Dr. Mendenhall gracefully responded to the cheers by raising his hat. The students then dispersed and Dr. Mendenhall was conducted in Mr. Salisbury's carriage to the Bay State House.

That the new president is not lacking in tact was shown by his registering at the hotel in a snug round hand: "T. C. Mendenhall, Worcester, Mass." The Doctor had nothing in particular to say to the representative of the WP I, except that he heartily appreciated the reception the students gave him and that he thanked them for it.

Our president is about fifty years of age and of about medium height. His appearance is engaging and apparently he is a man who will quickly enlist friendship.

As is generally known, Dr. Mendenhall has just returned from Europe, where he has spent the last three months in company with his wife. Mrs. Mendenhall has not yet arrived in Worcester, but has gone to Columbus, Ohio, to visit relatives there, and will probably come soon to this city. While in Europe, the Doctor paid great attention to the technical schools, especially the noted ones of England and France. His opinion is that the foreign institutions have too much theoretical and not enough practical work. From his observations he is led to believe that the American institutions of science have laboratories more extensively and thoroughly equipped. He paid close attention to the management of the schools of technology, and he thinks that there is much to be gained for our institutions by a careful study of the methods in use abroad.

At the World's Congress of Electricians held in Chicago last year, to define the electrical units and to secure the legislation to make their decisions legal, President Mendenhall was one of the five representatives from North America. At this meeting there were present only about thirty men. While abroad he held consultations with several of the foreign delegates to the Congress, and he was of much assistance to them in securing the legislation needed. Their methods of doing electrical standardising, as it is termed, were also the objects of his attention. Perhaps it may be well to state that the last Congress adopted the recommendations made to it by this Congress of Electricians.

When he was the chief executive of the Rose Polytechnic Institute, Dr. Mendenhall was in close contact with several of our Alumni, and from this intimacy and other reasons too numerous to mention, he was led to believe it is one of the best institutions of its kind in the country. The new buildings, which are now in the course of construction, he thought would allow much more attention to be given to the various departments. Regarding the new mechanical laboratory, he believes, that when it is completed, it will be the best of its kind in the country. It is quite a coincidence that Dr. Mendenhall should have taken the presidency of the Rose Polytechnic Institute after the administration of Dr. Thompson, and that he now comes to assume the presidency of Worcester Tech over which his predecessor at Rose was the first president. The students, the people of Worcester, all who take an interest in the Institute, will be glad to know that our new president is evidently a firm believer in college athletics, provided they are kept within proper bounds, and that he regrets that the students have not a campus suitable for the practice for the various kinds of athletic sports that are participated in by the members of the Institute. It is his belief that college spirit, and plenty of it, is essential to the highest degree of success in any institution of advanced learning, and that, if an institution once places itself above its competitors in athletics, it is almost sure to remain there for several years, because it is much easier to maintain a reputation, the longer it has been established.

Dr. Mendenhall met the Faculty and instructors at noon, October fourth. It is his intention to take only a small part in the management of affairs until he has adapted himself to his new surroundings. His new house will not be completed before the end of the year and he will in all probability be located at the Bay State House till that time.

WASHINGTON ALUMNI ASSOCIATION BANQUET.

Dr. Mendenhall Present.

The Alumni of the Worcester Polytechnic Institute residing in Washington, D. C., have lately received accessions to their numbers until at present the association comprises some eighteen members.

It has been customary to hold at least one
annual dinner, and the suggestion had been made that it was about time for a banquet, when it was learned that Dr. Mendenhall, the newly elected president, was in Washington, having just returned from Europe. He was immediately seen and upon receiving an invitation agreed to remain in Washington a day longer than he had intended.

Arrangements were at once made and on Monday evening, Oct. 1, sixteen of the alumni gathered at Washington's famous hotel, "The Shoreham," to partake of a dinner in honor of the distinguished President and to give him the first welcome from an organization of the Institute.

After a short social period, in which all present had the pleasure of personally meeting Dr. Mendenhall, the company adjourned to a cosy private dining-room where the following menu was discussed around a table which was beautifully decorated with ferns and roses:

**MENU.**

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<td>Radishes</td>
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<td>Olives</td>
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<td>Santerno</td>
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<td>Consomme Royale</td>
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<td>Boiled Sea Bass, Hollandaise</td>
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<td>Cucumbers</td>
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<td>Potato Duchesse</td>
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<td>Roast Filet of Beef with Mushrooms</td>
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<td>Pontet Canot</td>
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<td>Mashed Potatoes Browned</td>
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<td>Fried Peas</td>
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<td>Apple Fritters Au Rhum</td>
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<td>Lemon Water Ice</td>
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<td>Reed Birds on Toast</td>
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<td>Lettuce Salad</td>
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<td>Neapolitan Ice Cream</td>
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<td>Mumm's Extra Dry</td>
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The president of the association, Mr. J. H. Griffin, '85, then introduced as the toast-master of the evening Mr. G. P. Tucker, '87.

Mr. Tucker in a few well chosen remarks, expressive of the fact that it was eminently fitting and proper that the Washington Branch should be the first to entertain Doctor Mendenhall, as Washington has been his home for the past five years, and expressive of the pleasure the alumni took in welcoming him, called upon him to respond to the toast "Our New President."

Dr. Mendenhall spoke in a pleasing manner, reminding the Alumni that they constituted one of the three great factors upon which an institution of learning depends for support. He said that he had noticed with pleasure in his meeting with Tech men that they were possessed of that feeling which most college-bred men have, that their alma mater is just a little better than any other. He hoped that if they considered it to be the truth that they would always speak of the W. P. I. as the only proper place for their friends to go for an education.

He also referred to the spirit of loyalty that dwells in small and enthusiastic bodies and what it can accomplish. He drew a parallel from Japan and China and spoke of what Japan was accomplishing against the mighty Chinese Empire solely through the loyalty and patriotism of her inhabitants, who to-day are giving large sums individually for the support of the war.

He said that it was not a pleasant duty to say farewell to his many friends in Washington, but that he had now turned his face toward Worcester and was anticipating with great pleasure the assuming of his new labors in a few days.

He closed by speaking of the advancement made in the past and which he hoped to see made by the Institute in the future, promising his ready attention and interest to any call that might come to him from an alumnus.

Dr. Mendenhall was received with much enthusiasm and took his seat amid long continued applause.

The remainder of the evening was spent in listening to the following:

- The Washington Alumni Association,
- L. H. Harriman, '89
- The Tech As It Was, J. H. Griffin, '85
- Our Alma Mater, or The Tech As It Is, A. C. Higgins, '93
- Our Capital City, J. A. Chamberlain, '87
- Our Honored "Uncle Sam" or The Advantages of the Service to Alumni, J. T. McNab, '87
- First Impressions of Washington, M. J. Lyden, '93
- The Ladies, Nathan Heard, '93
- The Benedicts, H. C. Armstrong, '89

At the close of the program the speaking, in an informal manner, was continued, and many old stories of Tech life were told. Bartlett, '92, was called upon for a song but was unable to respond on account of the condition of his throat.

After electing Mr. G. P. Tucker, '87, as President, and Mr. Aldus C. Higgins as Secretary and Treasurer of the Association, the party broke up at a late hour, feeling that the most successful dinner of the Association had taken place.

The Alumni present were as follows:

DR. MENDENHALL'S LIFE.

A Short Sketch.

Thomas Corwin Mendenhall, LL.D., Ph.D., was born in Hanoverton, Ohio, October 4th, 1841. He received a common school education and displayed a special aptitude for physics, in which science he has become one of the leaders of the world. He first began to teach as Professor of Physics and Mechanics at Ohio State University, at its opening in 1873. In a few years he left this position to become Professor of Physics at the Imperial University, Tokio, Japan; and in 1881 he returned to the Ohio State University. From 1882 to 1884 he established and organized a State weather service in Ohio and instituted a scheme for displaying weather signals on railroad trains. This system is now used throughout the United States and Canada. In 1884 he was Professor in the United States Signal Service, and in 1886 he accepted the presidency of Rose Polytechnic Institute. He was then appointed on the Coast Survey. The University of Ohio in 1878 conferred on him the degree of Ph.D., and in 1887 he received the degree of LL.D. from the University of Michigan. He was elected a member of the National Academy of Science in 1887. While in Japan Dr. Mendenhall performed some experiments in discovering the value for the specific gravity, by which he ascertained the value for the mass of the earth, agreeing with that found by Francis Bailey in England by another method. He measured specific gravities at the sea level and at the top of the extinct volcano Fujiyama, and by this got his results. He has written a number of books and pamphlets, among them "The Century of Electricity," published in 1887.

W. M. E. S.

The Washburn Mechanical Engineering Society held its first meeting for the Institute year in the Salisbury Laboratories, Tuesday evening, Oct. 9. The meeting was well attended, the capacity of the Mechanical Model-room being taxed to its utmost. There was a large attendance from the Alumni, especially '93 and '94; '95 and '96 were also well represented. The following members of the Faculty were noticed among the audience: Dr. Mendenhall, Prof. Sinclair, Supt. Higgins, Prof. Alden, and Prof. Bird.

The meeting was called to order by President Burdick, '94. Secretary Alden then read the minutes of the last meeting, after which the amendments proposed by the committee appointed for that purpose at the last meeting were discussed. The amendments accepted were: That the word "mechanical" be omitted in the name of the society, so that the name read, "The Washburn Engineering Society"; that any instructor, alumnus, or student of the Institute be eligible for membership, instead of a two years' connection with the Institute being required as formerly; and that the board of managers may cause the publication of any papers read before the society each year in such form as they shall deem expedient, and they shall send one copy of such publication free to each member.


The nomination committee then nominated the officers for the ensuing year, who were duly elected by the society: President, A. W. Clement, '95; 1st Vice-Pres., Prof. W. W. Bird; 2nd Vice-Pres., P. B. Morgan, '90; 3rd Vice-Pres., A. D. Butterfield, '93; 4th Vice-Pres., C. D. Parker, '97; 5th Vice-Pres., R. H. Taylor, '95; Secretary, Prof. G. I. Alden; Treasurer, Mr. W. F. Cole, '83; Counsellors, Dr. E. H. Bigelow, '75, Framingham, Mass.; E. H. Whitney, '71, Providence, R. I.; S. M. Green, '85, Holyoke, Mass.; W. V. Lowe, '81, Fitchburg, Mass.; W. T. Hatch, '73, Providence, R. I.

The first paper was read by Mr. Paul B. Morgan, '90, entitled, "Modern Types of the Reheating Furnace." The paper proved to be very interesting and carefully worked out in detail.

At the conclusion of this paper, Prof. Alden read a paper by Mr. E. E. Johnson, '84, of Chicago, subject, "An Ailing Engine." It was a short, interesting paper describing the "truing up" of an old engine, and accompanied by diagrams and indicator cards, which were commented upon by Prof. Alden, Prof. Bird, G. I. Rockwood, '88, and Instructor A. L. Rice.

The Buckeye Engine Co. sent a model of one of their engines. It was placed on exhibition in the room and attracted considerable attention. Their agent, Mr. Hoffman, had intended to be present to discuss the valve-motion of the same, but owing to the postponement of the meeting, he was unable to be present.

At this point, Prof. Alden invited Dr. Mendenhall to address the Society of which he had so recently become a member. Dr. Mendenhall responded in very fitting terms, expressing the
pleasure he had experienced during the evening, and complimenting the Society upon its strength and the interest evinced in the subjects under discussion.

He related an incident in connection with the Buckeye Engine Co. illustrating the fact that the man was superior to his environments. In conclusion, he stated that the Institute aimed to turn out well-finished men, and signified his intention of doing all in his power to forward the interests of the Society and the Institute with which it was connected.

The dates of the meetings for the ensuing year, as arranged by Secretary Alden, are as follows:—

Feb. 11th, 1895. June 19th, 1895.
Mar. 25th, 1895.

MODERN TYPES OF THE REHEATING FURNACE.
Mr. Paul B. Morgan's Paper.

This subject, although not wholly mechanical in its nature, is certainly one with which the mechanical engineer, in charge of any of our iron and steel works, should be thoroughly familiar. Nearly every marketable product of iron or steel is reheated in some form of furnace preparatory to hammering or rolling.

The mere problem of raising the temperature of a metal to the proper degree for convenient working is not a difficult one;—it can be accomplished in contact with the fuel, in an open fire, as in a blacksmith's forge;—but with the end in view of reducing the consumption of fuel and the loss of metal by oxidation, much study and thought has been given in years past and is still being put into the design of this class of furnace. Thirty years ago reheating was almost wholly done in a very simple, direct-fired reverberatory furnace. The furnace consists of a fire-box, heating chamber and proper stack to produce sufficient draft for rapid combustion of the fuel. All operations in a steel works, excepting possibly steam making, require very high temperatures. Only the region immediately adjoining the source of heat can be utilized, for at a distance of only a few feet from the fireplace the flame is cooled down below the degree of temperature to which it is desired to raise the metal under treatment. The waste of heat therefore, in any simple reverberatory furnace is enormous, and yet we still find them in use in many places.

Attempts have been made in this type of furnace to warm up the metal in a chamber placed between the hearth and the stack, and afterwards remove it to the hearth, where it is subjected to the higher temperature. The extent under any circumstances to which this system is applicable in a steel works is very limited, and practically it was confined to the puddling process. In more recent times, a portion of the waste heat has been recovered by passing the products of combustion through the flues of a steam boiler, the steam thus generated being used for various purposes about the works.

This application is sound in principle, for so far as mere question of heat is concerned, there is no reason why products of combustion should not be cooled down to say 300 degrees C., at which temperature a maximum intensity of draft is commanded. When, however, the temperature of the flame is reduced to 700 or 850 C. the rate at which sensible heat is imparted to another body is so slow that there is no commercial advantage in preventing the loss occasioned by their escape, as the size and number of boilers is greatly increased over that when fuel is applied direct, for generating steam.

The working of the direct-fired reverberatory is very irregular. As is well known when fresh coal is supplied to a hot fire the temperature is not immediately increased, on the contrary, the coal absorbs large quantities of heat, which become the source of the volatilization of the bituminous portion of the coal, and volatilization is one of the most cooling processes existing, on account of the large amounts of heat converted directly from the sensible to the latent state. This cooling effect, due to the evaporation of the volatile constituents of the coal, is greatly increased by the necessary, periodical opening of the fire-door in order to renew the fuel, which is accompanied by the in-rush of a large volume of cold air. This affects economy of the combustible and the intensity of heat very seriously and causes as well rapid oxidization of the coal. Furnaces of this type consume from 1440 lbs. to 720 lbs. of coal per gross ton of steel heated, or only a small portion of the heat generated by the perfect combustion of the coal is absorbed by the metal. The oxidation is usually in the neighborhood of 10 per cent.

The experiments and inventions of the Messrs. Siemens, between the years 1846 and 1870, mark a milestone in the history of the metalurgical processes. There were two distinctly new principles involved in the furnace designed by the Siemens brothers: first, the application of gaseous fuel; and second, the use of regenerators to collect the waste heat.

The Siemens gas producer consists of a rectangular fire-brick chamber, one side of which is inclined at an angle of 60 degrees from 45 to 60, the upper portion being solid, while the lower half is constructed as a grate having horizontal bars. Coal is introduced from the top of the producer. Other openings are provided through which an iron bar can be introduced, for breaking up masses of fuel which "cake up," and become pasty. The opening under lower step of the grate is made larger than the others to admit of the withdrawal of ashes and large clinkers. The fuel supplied at the top of the producer is gradually heated, as it descends on the inclined plane, by the heat of combustion, which takes place lower down, near the grate, and the hydrocarbons, ammonia, water, and other volatile matter, are separated in a gaseous form from the 60 to 70 per cent. of the purely carbonaceous matter, which descends to the grate. This meets the incoming air and regular combustion takes place, causing acid being formed, which is almost instantly converted into carbon mon-oxide on coming in contact with the incandescent fuel. The ash pit is always kept wet, and considerable steam is formed, which finds its way to the grate with the draft of air, and is there decomposed, the oxygen taking up carbon and eventually forming carbon mon-oxide, while the hydrogen, remaining for the most part in the free state, passes upwards through the fuel with the other gases into the chamber above and from thence into the furnace. This producer is difficult to keep in repair, owing to the cracking and breaking up of the brickwork due to expansion and contraction.

A modern form of the gas producer is shown in connection with the Ekman-Allen furnace. This is
brought out his reheating furnace which has been and is still largely used in Sweden and other countries. The producer was made square, coal being fed through a hopper on the top. Blast is introduced through a number of tuyers placed at intervals in sides of producer, the gas generated escaping down through the a-1, into the hearth proper. Just before it reaches the fire-bridge it is met by a downward current of air, which is introduced through the arch. Combustion instantly takes place, and a high temperature is produced on the hearth. The bed of the furnace is extended about 12 ft. beyond the hearth, at which point the stack is reached. In the stack are placed a number of cast-iron tubes through which the air to supply blast for tuyers in producer and blast for the consumption of gas, is passed and heated to a fairly high temperature. The metal to be heated is introduced through a door constructed for the purpose in the cool end of the furnace. The billets are gradually worked back, being rolled over by means of bars and tongs introduced and operated through small doors in the sides of the furnace, until they reach the hottest point of the furnace, and after remaining there for a few minutes are brought to a welding heat.

A furnace of this type can be constructed at very much less cost than a Siemens furnace of equal capacity, and is nearly if not quite as economical. Instead of expensive regenerators filled with checker work, Mr. Ekman passes the hot gases over the cooler metal and air tubes, which absorb a greater portion of the heat. This furnace is entirely successful where light billets are used, and when bed is inclined ten or twelve degrees, heavier sections have been heated. Difficulty is experienced in making a bottom which will stand. An ordinary bottom of ganister sometimes has to be repaired frequently, as when under high temperature and soft it is often broken up when billets are constantly turned over and pushed upon it. Cast-iron plates were used in the cooler portions of the furnace, but these are apt to warp out of shape, and will eventually burn out.

A Mr. Allen of Sheffield, England, conceived the idea of pushing the billets, by means of a hydraulic cylinder, into a furnace on water-cooled ways formed of heavy water-pipe, which are mounted on longitudinal walls, raised above the bed of the furnace, allowing the flame to be kept in the under side of the metal, as well as the top. The water pipes formed a durable surface on which the billet could be placed, and the surface thus exposed to a cooling action is very small. This principle, although not put into extensive practice till recently, has proved very successful, and by its use in an Ekman furnace of improved design we are able, not only to compete with the Siemens furnace, but to actually excel it in economy of fuel, and at the same time to obtain equally good results in regard to small percentage of oxidation.

The endeavor has been made in designing the improved Ekman-Allen furnace to combine all the good qualities of the existing types, and to make additional improvements, as in the gas producer, method of introducing the blast, construction of pusher, general proportions, etc. Billets are introduced two or three at a time, through the door in the cool end of the furnace, by means of a hydraulic pusher, and fill the incline solid. A few are allowed to roll off the water pipes into the hearth, where they are brought to a welding heat. The gas producer is placed close up to the furnace in order that the gas may enter at a high temperature, and the heavier hydrocarbon gases
are not allowed to condense and be lost, as is often the case when gas is conducted through long flues. The air is admitted under pressure of two or three ounces, over a baffle arch so that the current of air is directed toward the hearth before it comes in contact with the gas from the producer. Combustion instantly ensues and a very high temperature is produced in the hearth. The flame passes under and over the billets on the incline, rapidly parting with its heat, and finally escaping to the stack at a temperature of about 500 C.

In a pair of furnaces, constructed by the company with which the writer is connected, for a firm in the vicinity of Pittsburg, each having a heating capacity of about 11,500 lbs. per hour, a gross ton of steel has been heated repeatedly with as low a coal consumption as 196 lbs. This is the lowest record which has come to our attention. A furnace of this design, used by a well known firm in Connecticut, for heating copper bars preparatory to rolling, has recently been equipped to burn petroleum oil instead of producer gas. A burner similar to those used under a steam boiler is employed, the oil being atomized by a steam jet. In a furnace having a heating capacity of about 10,000 lbs. per hour, they show an average record of 100,000 lbs. of copper heated by the consumption of 350 gallons of crude oil, which means a saving of nearly one-half the cost of coal previously required to make gas for the same furnace.

In operating gas producers when using bituminous coal, the fuel bed should be kept four or five feet deep. Sufficient blast must be maintained under the grates to keep a very low red heat on the surface of the coal. If too much blast be present, the coal will burn rapidly on the sides while the centre will remain black.

In operating the furnace, care must be taken to always have a pressure in the furnace slightly above that of the atmosphere, in order that air may not enter through cracks around the doors, and cause rapid oxidation of the metal. This pressure is controlled by a damper placed close to the stack. The amounts of gas and air admitted must be so proportioned as to produce perfect combustion. An excess of gas will cause a sooty flame, and large volumes of smoke will be emitted from the stack. This is, of course, caused by imperfect combustion, and economy of the furnace is at once reduced. Too much air cools down the furnace, and causes rapid oxidation of the metal. When working under proper conditions, the interior of the furnace should appear clear and white, and entirely free from a smoky flame. The furnace, if cold, should be heated up gradually, first, by a small fire built in the hearth, and after a few hours, gas from the generator may be admitted. The furnace should not be brought to a full heat for about four hours after firing is commenced. In the furnace already spoken of, in which crude petroleum is used, in the case of an emergency, copper was heated ready for rolling in two hours after the oil was lighted in a cold furnace. Such rapid heating of the brickwork is bad practice and is sure to cause rapid deterioration of the furnace.

We have followed briefly the evolution of the reheating furnace from the direct-fired reverberatory, consuming 1440 lbs. to 720 lbs. of coal per gross ton of metal heated, to the Ekman-Allen furnace with a record of a gross ton of steel heated by the combustion of only 196 lbs. The advantages of the Ekman-Allen over other types is, briefly, simplicity of design, ease of operation, absence of valves, economy of fuel, reduced cost of labor, and low cost of original plant and repairs. This furnace is undoubtedly the best and highest type of the reheating furnace to-day.

What the next step in the direction of improvement may be, we are unable to say. Perhaps the electric current may be utilized. Experiments along that line have been conducted, but the results are thus far unpromising.

THE GAME AT AMHERST.

On Saturday, Sept. 29, the football team took the 9.50 train at Union Station, and about noon arrived in Amherst. While no one for a minute thought Tech could win from Amherst, still all were full of hope and expected a close contest, inasmuch as rumor had it that Amherst's team was light, and inferior to their eleven of last year.

After taking dinner at the Amherst House, a barge conveyed the team to Pratt Field, where the game was to be called at 3 P.M. They soon caught sight of some twenty-five Amherst men donning football uniforms, and then it was that spirits began to sink, for it was plainly evident that the rumor, as far as the team being light was concerned, was utterly false. The three centre men each weighed over 200 lbs. In fact, Capt. Pratt, who played quarter-back, was, to all appearances, the smallest man on the team, and he weighs something over 160 lbs. The short story of the game is that Amherst's men were heavy enough to go through or around our team when they wished, and to break up our interference without much trouble. At times the Tech team would brace together and hold for one or two downs, but at all times there was lack of team work.

At 3.05 P.M. the teams lined up, Amherst winning the toss, choosing the field, and giving the ball to Tech. Killam made a poor kick-off and Amherst secured the ball 10 yds. from the centre of the field. Amherst's right half now carried the ball around the end to the 20-yd. line. By steady gains they forced the ball to the line, Johnston making a touch-down.

Time 3 minutes. Pratt kicked goal.

Amherst 6. Tech 0.

On kick-off by Tech, Amherst carried the ball 10 yds. beyond centre, and worked the ball down to the 3-yd. line. Here Tech made a good stand, and with the ball 3 yds. from the line the call was, "Third down, line to gain!" Johnston took the ball and carried it through the line, scoring a touch-down.

Time 4 minutes. No goal.

Amherst 10. Tech 0.

Killam retired in favor of Mayo. Mayo made a good kick-off but the men were slow to get down the field and Amherst made a good gain. They forced the ball steadily down the field,
mostly through Tech line, and scored in 5 minutes. Kicked goal.

Amherst 16. Tech 0.

Tech kicked the ball outside twice, and it went to Amherst. Cunningham caught the ball on the 15-yd. line and was tackled without making any gain. Worcester played well for a while, and carried the ball to the centre of the field. Here the ball was lost on fourth down, and Amherst made a run of 30 yds. Tech held here for two downs and secured the ball on a fumble. The men played hard and shoved the ball along by short, but steady, gains. At this time Tyler was doing some fine tackling. “Third down, two yards to gain, half a minute to play,” and before the ball was put in play time was up.

Amherst 16. Tech 0.

Second half opened with everything Amherst’s way. Pratt made a good kick-off, the men downed the ball almost where it was caught, held for four downs, securing the ball, and after working the line several times carried the ball around right end for a touch-down. Goal kicked.

Amherst 22. Tech 0.

Tech twice kicked outside and the ball went to Amherst. On the kick-off they made an off-side play, and after some discussion of the rules, the ball was again given to Amherst at the centre of the field. Allen made a good gain of 25 yds. around the end. Tech lost ground twice, and Mayo was sent back for a punt, Deering making a fair catch. It was the same story of Amherst driving through Tech line and around ends till they scored again. Pratt kicked goal.

Amherst 28. Tech 0.

Tech kicked off, the ball rolling over Amherst’s goal line. This brought the ball out to the 25-yd. line. Amherst was slowly shoving the ball up the field when time was called.

Amherst 28. Tech 0.

The teams lined up as follows:—

Rosa  left-end-right  Harris
Tyler  left-tackle-right  Booth
Warner  left-guard-right  Leland
Bishop  centre  Riley
Cawthers  right-guard-left  Davis
Fosdick  right-tackle-left  Smith
Tyler  right-end-left  Capt. Ware
Whitney  right-half-back-left  Allen
Johnston  left-half-back-right  Cunningham
Deering  full-back  Killam
Pratt, Capt.  quarter-back  Mayo
Umpire, Langlois; referee, Davis; lineman, Barnes, Time, two twenty-minute halves.

TECH MEETS TECH.

M. I. T. vs. W. P. I.

On Saturday, Oct. 6, the W. P. I. football team met the strong eleven of the M. I. T. and were defeated by the small score of 6—0.

The Worcester team showed up in much better form than it has before this season, and prospects for the future look much brighter.

The teams lined up on the South End grounds, Boston, at 1.45. Following is the outline of the game:—

Boston won the toss, and as a strong wind was blowing down the field, chose the goal, giving the ball to Worcester. Allen makes a good kick-off, and Harris, getting down the field in fine shape, tackles Underwood before he can gain an inch with the ball. Boston fumbles, but secures the ball. Rockwell gains 20 yds. around Worcester’s left end. They now work Worcester’s line for small gains. Harris, at this stage of the game, is doing some fine tackling. Boston makes 10 yds. around each end, fails to make any gain around Worcester’s left end, fumbles the ball on the next pass, and Worcester secures the ball.

Off-side play by Van Horn gives Worcester 10 yds. Allen goes around Boston’s left end for 20 yds. Worcester fails to make more than 3 yds. in four downs, and the ball goes to Boston, Ames doing good tackling for Boston. Underwood goes at Worcester’s right tackle and gains 3 yds. Rockwell, having injured his arm, retires. Mansfield comes in to quarter, Thomas going to half-back. Hayden gains 20 yds. around Worcester’s right end. Thomas fails to gain around W. P. I.’s left end. Boston goes through Worcester’s left tackle, right tackle, and centre, for 4, 3 and 4 yds. respectively. Hayden fumbles the ball, and Ware falls on it. Allen is tackled by Rawson with a loss of 4 yds. Leland tries Boston’s right tackle and gains a yard.

Mayo makes gains of 5 and 2 yds. through Boston’s right tackle. Brigham takes the ball and makes the necessary 2 yds. gain. Mayo twice fails to make any gain, and Cunningham is sent back to punt. Boston gets the ball, and in three plays through Worcester’s right end and tackle gains 30 yds. Try right tackle but fail to gain, Smith making a pretty tackle. Boston fumbles the ball and Worcester secures it on her 10-yd. line. Worcester gains through both tackles, fails at left end and centre, and again makes required gain through tackles. Boston gets ball on fourth down. Hayden gains 5 yds. around Worcester’s right end, and fails to gain through right tackle, and time is called for the first half.

M. I. T., 0. W. P. I., 0.

Boston has the ball on the kick-off. Allen catches the ball at Worcester’s 15-yd. line, and runs 10 yds. before tackled. Mayo fails to gain ground, and Rawson tackles Allen with loss of 2 yds. Cunningham punts to centre of field, and
Thomas makes 10 yds. In four downs Boston only gains 6 yds., hitting Worcester's centre twice without gaining an inch. Hayden fails to gain around right end and Underwood then fumbles the ball, which is secured by Cunningham. Hayden gets through and tackles Mayo with a loss of 3 yds. Brigham gains 2 yds. With the ball 7 yds. from the goal line, Cunningham is sent back for a punt, but is slow, Mansfield getting through the centre, and taking the ball from Cunningham's hands. Hayden takes the ball through Worcester's right tackle, and scores a touch-down.

Underwood kicks goal.

M. I. T., 6. W. P. I., 0.

Worcester kicks off, and Harris, getting down the field, tackles Underwood on the 16-yd. line. Boston makes three small gains, when Harris gets a man by the ankle, and Boston, claiming foul tackle, is given 25 yds. Rawson retires in favor of Swift. Hayden gains 20 yds. around Worcester's right end. Underwood, Thomas and Hayden, in three plays, make only 5 yds. With the ball 7 yds. from Worcester's goal, the referee's whistle blows, and the game is over.

M. I. T., 6. W. P. I., 0.

The teams lined up as follows:—

M. I. T. W. P. I.
Rawson, } left-end-right Harris
Swift, } Leland
Van Horn, left-tackle-right Davis
McCormick, centre Riley
Manahan, right-guard-right Brigham
Le Moyen, right-tackle-left Smith
Coburn, right-end-left Ware (Capt.)
Hayden, right-half-back-left Allen
Rockwell, } left-half-back-right Mayo
Underwood, full-back Cunningham
Thomas (Capt.), quarter-back Warren

Notes on the Game.

Tech's defensive play is still very weak. Boston gained through tackles and ends almost at will, their fumbling alone keeping the score down. Worcester Tech should use her end plays less, and should buck the opposing tackles, more especially when they are weak, as they were in this game.

The tackles were not run often enough. Both are good ground gainers and should be used. The tackles are hard workers, but are too easily fooled and drawn inside. The line halves should be up to fill holes thus caused, but were not in evidence last Saturday.

Tennis Tournament.

The Annual Tournament of the Tennis Association, which is now being held, has been more interesting than for some years past. The players have been fairly well matched, much more nearly so than the score shows. The surprise of the tournament was the defeat of Goodrich, '96, the first place winner last year, by Sanford, '95. Goodrich evidently had an off day. No new men of note have appeared, with the possible exception of Hayes, '98, who has played the game for many years, and is a careful and steady player. He ought to come near the top rank of Tech players soon. Sanford wins the first prize, a racquet donated by Mr. Davis of the Lovell Arms Co. He will play Coburn, '95, the present champion for the Landsing cup soon, but will hardly be able to defeat him, as Coburn is easily the best player in the city.

In the preliminary round, Fish, '97, defeated Whitemore, '98, 6-1, 6-3. Goodrich, '96, won from Fay, '95, 6-1, 6-0. Elliot, '97, beat Walker, '97, 6-0, 11-9. Walker was unable to handle Elliot's left hand strokes the first set, but in the second set did much better and played the longest set of the tournament.

Sanford, '95, beat Brown, '98, 6-3, 6-0.
Fuller, '95, beat Brooks, '95, 6-1, 3-6, 6-3.
Howe, '95, beat Dana, '97, 6-4, 7-5.
Hayes, '98, and Storer, '97, byes.

In the second round Goodrich defeated Fish, 6-3, 6-4, and Sanford defeated Elliot by exactly the same score. Hayes first showed up in this round, easily defeating Fuller, 6-3, 6-0. Fuller showed lack of practice, being inaccurate in his placing. Hayes has a very deceptive "chop" that he used to good advantage.

Howe played one of the most exciting matches with Storer, but his longer experience stood him in good stead and he won, 4-6, 6-3, 9-7.

In the semi-finals Sanford won easily from Goodrich, who continually knocked the balls into the net and out of court. The score was 6-2, 6-2. Hayes defeated Howe, 6-4, 6-3.

In the finals Sanford took three straight sets from Hayes, 6-2, 6-4, 6-3, and won the tournament.

The doubles have not been played yet, but will be as soon as the Sanford-Coburn match is over. Coburn and Goodrich will undoubtedly win them if nothing unforeseen prevents.

DISTINGUISHED VISITORS.

Hon. John A. Roche, ex-mayor of Chicago, Judge Christian Kolstadt of the Probate Court, and Hon. John McLaren, president of the Hide and Leather Bank, also of Chicago, paid a visit to the Tech on October 3d. They have been making a tour of the leading technical institutions of the country to obtain ideas and plans for a new technical institute in Chicago.
They are the trustees of a fund of about $1,500,000 to be used for this purpose. The fund was left by a Mr. Lewis ten years ago, and then amounted to $500,000, but it has now reached a million and a half. About $170,000 has been spent in the purchase of land in the centre of the west side of Chicago, surrounded by a population of between 800,000 and 1,000,000 people.

The gentlemen were met by Prof. George I. Alden, then acting president. Prof. Alden turned them over to Supt. Higgins of the Shops, who showed them through the several buildings, and, with Prof. Alden, talked over the plans, aims and scope of the new institution. The party left the same day on the 3.06 P. M. train for New Haven.

SHOP NOTES.

An order has been received from the Ohio State University at Columbus, O., for three pattern lathes. These lathes are to be of the same style as the older lathes in use in the Apprentice room. Several lathes of this pattern were sent to this Institution a year ago.

A new forge is to be placed in the blacksmith shop to accommodate the large number in the Junior class.

The following men from '94 are taking a post graduate course at the Salisbury Laboratories:

MARRIED.

Child—Knowles.

At 7:30 o'clock, on the evening of October 1st, occurred a very pretty wedding, in which Miss Alice C. Knowles was united to Jonathan H. Child, '93. The wedding took place at the bride's home, 4 Melville Street, the ceremony being performed by Dr. Elijah Horr.

Mr. Matthew Gault was best man, and Miss Mamie L. Knowles was maid of honor. The ushers were, Mr. Harry Boardman, Mr. Henry L. Bancroft, Mr. H. Allan Smith, of Newark, N. J., and Mr. Frank E. Wellington.

Mr. and Mrs. Child left on the 8.55 train for a short wedding trip. They will reside in Woonsocket, R. I., where Mr. Child is Assistant City Engineer.

A Freshman revelled with his chums.
And drank full many a drop;
Next morn he cut off both his thumbs,
So now he cuts the Shop.

NOTICE FOR FRESHMEN.

For the benefit of those of the entering class who may not know the yells of our Institute, the W P I prints the three most important. Every one should know them and be ready to use them in cheering our teams on to victory.

P. I.—P. I.—Rah, Rah—Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah, Rah.

Hoorah—Hoorah!


Rah, Rah, Rah—Worcester Polytech.

Poly—wolly—olly—wolly—polly—wolly—tech!

Rah, Rah, Rah, T—E—C—H.

Rah, Rah, Rah, Worcester.

The Seniors have just obtained their Thompson's Dynamo Design. A committee appointed by the division of electricians received bids, and the contract was given to Mr. Somerville, '95. The work comes in two volumes this year, a considerable improvement when the cumbersome size of former editions is considered.

The Seniors have elected A. D. King captain of the football team. H. S. Davis resigned and G. C. Gordon was elected treasurer of the class. Three men were appointed to the Conference Committee: Killam, Stone and Martin.

TECHNICALITIES.

There are a good many of the Alumni who have not paid their subscription to the W P I for the past year. This is a double oversight in nearly all cases, and we hope that the delinquent ones will see that this matter is attended to at once.

One of Junior B's professors has almost reached his limit in cuts. Twice the division has been cut “dead,” much to its (dis)pleasure.

The stonecutters and masons working on the new buildings are nearly all baseball enthusiasts, to judge from the interest shown in the games between 12 and 1 o'clock on Bliss's Field.

Division B, '96, contains the seven “Varsity” baseball men of '96. On Friday afternoon, Sept. 28, the division divided up under captains Zaeder and Knowles, and enjoyed a very interesting and scientific (?) game on Bliss's Field.

It has been rumored that the Freshmen had voted to carry canes. The Sophomores have decided that if such is the case, the Freshmen will have difficulty in carrying out their plans, for those canes would help amazingly in solving problems in Descriptive, to represent lines in space.

It is hard to admit, but it was a troupe of Sophs who were about the bulletin-board reading the drawings for Tennis, when one, more curious than the rest, wanted to know who Bye was.
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