The M. A. C. Record.

Vol. 6. LANSING, MICHIGAN, TUESDAY, JUNE 18, 1901. No. 37.

Mr. Newman's Trip.

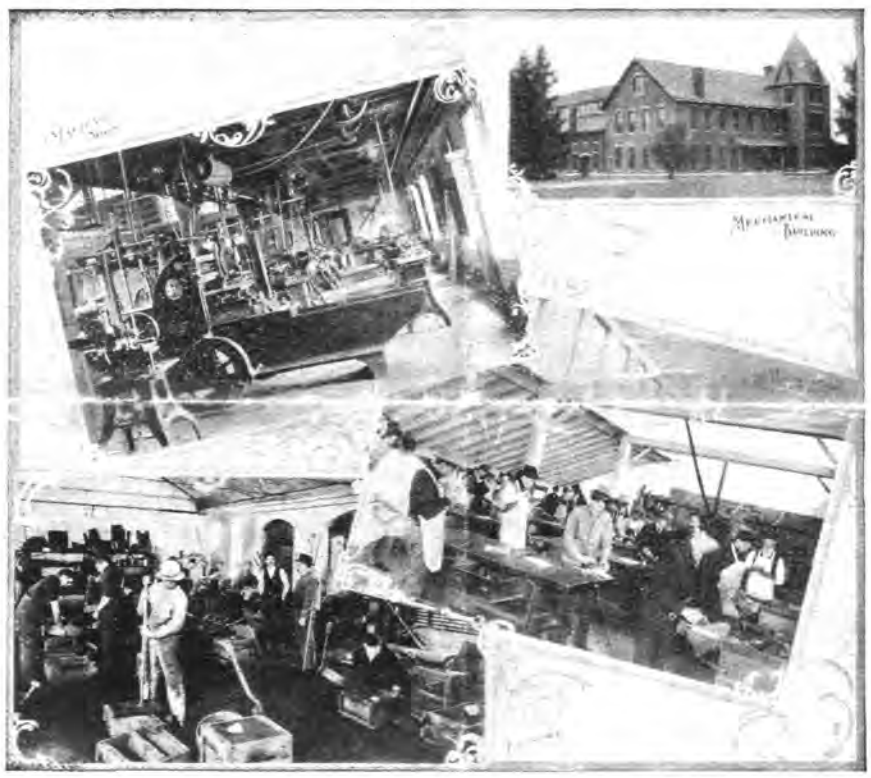
Editor of the Record:

I hope this somewhat lengthy account of my recent trip may be of some general interest, and I wish it might be a form of greeting, to your readers, from the many M. A. C. friends whom I met. My first stop was at Ann Arbor, Monday at noon, May 20. I found the first M. A. C. person at Forest avenue, Mrs. Rhoda Peck, who for so many years prepared the food for many of our stalwart "farmers" at Club B. She still carries on the same good work at Ann Arbor. At the University campus I first ran across A. J. Norman, '02*m*, who is now a second year "Dent." He very kindly assisted me in taking the "short courses" through the department of chemistry, until we sighted the ever jolly face of George Richmond, '98, at the bottom of the pit from which general chemistry is dispensed. A hearty welcome repaid my search for Richmond. We then directed our steps to the splendid library building, where we made a fruitless search for "4-man" (C. J. Foreman, '94), among the archives of history and political science, where he is said "to live." We then proceeded to the Engineering building, where I started the inspection in my line of work. After some two hours in the department of drawing, Instructor Goulding accompanied me through the shops and laboratories of the Engineering School. Ann Arbor claims one distinctive feature in the way of two bright Filipino boys,—students in engineering. With a trip to the power station, and a look into the underground conduits used for conducting power, heat and light to the various laboratories, my visit at our University ended, and I was soon speeding across country by the Ann Arbor-Detroit electric line, for the City of the Straits.

Tuesday in Detroit was a dismal day of continuous rain from daylight till dark, consequently I could not carry out my plans of shop visits. A call was made at the Bridge Department of the Michigan Central, and the engineer in charge very generously took the time to discuss various points of practice, and to show some working drawings. Later in the day an hour was spent at the Central High School, visiting a class at work in mechanical drawing. In the evening I enjoyed the hospitality of the home of Mr. Geo. A. Kinman, with '62.

Wednesday morning dawned with the promise of a fair day, and with the day dawned a season of delightfully good weather which failed not, during the hours of inspection, for the ten busy days which followed. My first visit of the morning was at the manual training department of the Tilden School. There shop work and drawing, cooking and sewing, have their parts in the training of the bright little seventh and eighth grades. A long ride out Michigan avenue, and a long walk to the south brought me to the West Detroit shops of the Michigan Central. The "I am glad to see you, Newman," from Walter Flynn, '99*m*, made me feel right at home. Mr. Flynn and Chief Engineer Parks, of the motive power department, gave me a careful explanation of the work in hand, and of the system of their draughting room. They had just completed the design for an indicator rig for locomotive testing purposes. At lunch I ran across C. H. Spring, '00*m*, and C. E. Crawford, with '95*m*, the latter is conducting the restaurant business left by his father. On the car I met P. B. Blard, with '03*m*, who is taking a business course in a Detroit school. At the Northern Engineering Works, I found E. R. Pierce, with '94*m*, and E. R. Russell, '99*m*, designing traveling cranes. At the Detroit Dry Dock Co., D. E. Hoag, with '99*m*, was designing a "salt water boat," and C. W. Bale, '00*m*, a dredging engine. At both of these institutions "the boys" took time to show me the shops and the work they are turning out.

As the day was drawing to close, I boarded the train for Toledo, and



night fall found me over the Ohio line. Thursday forenoon was well taken up in the inspection of the Toledo Manual Training School. The work done by the undergraduate High School students in the various lines is of a remarkable character. The early afternoon was spent in a ride on the trolly line, along the Maumee River, a peep at Lake Erie, and a stroll in beautiful Walbridge Park. At 3 o'clock I started on my trip across Ohio and Indiana to the quaint little city of Lafayette, the seat of Purdue University.

After miles of dusty railroad travel, and days and nights of rapidly changing scenes and monotonous hotel life,—I was well prepared to appreciate my first view of Purdue Campus, on Friday morning. I shall never forget the peaceful acres of velvety green lawn, which invited me to the engineering buildings in the distance. The same cordiality which first greeted me at the campus gate, permeated the whole institution. I must particularly mention the kindness of Dean Goss, of the engineering schools, and of Prof. J. Troop, '78, and wife. The morning hours were much too short to see all that interested me in the engineering department alone. F. E. Olsen, with '01*m*, graduates in this department this year. With a few moments in the departments to which Prof. Troop, and Prof. W. C. Latta, '77, are giving their best efforts, lunch at the home of the former, a lively drive to the railroad station where I bade good bye to Prof. Troop, and then I was away for the University of Illinois. This ride, a distance of about eighty miles proved to be an interesting experience. My train, a fast mail, was a few minutes late at the connecting point for the local train. Through the error of someone the local train had been allowed to leave this place, thus leaving me without means of reaching my destination until the following day. Thanks to the good will of the fast mail conductor who immediately took up my case, a special train following closely behind us, was given orders to take me on, and to let me off when it overtook the local. The local was held, down the line, for twenty minutes until I arrived. Here I found an exasperated conductor, but my end had been accomplished—I had caught the train for Champaign.

I arrived at the campus of the University late in the afternoon, and almost at once ran across Prof. L. P. Breckenridge. He invited me to supper at the boarding club where he is taking his meals during the absence of Mrs. Breckenridge, in the East. This seemed like a return to M. A. C. life, and all the more so, when H. E. Ward, '95, and F. R. Crane, '99, came in and took places at the table with us. The evening was passed in a most enjoyable way at Prof. Breckenridge's home, where Prof. Geo. A. Goodenough, '91*m*., and A. R. Curtis formerly of our wood shop, came in to see me.

Saturday morning Prof. Breckenridge gave liberally of his time, in making quite a detailed inspection of the departments under his direction. During the rounds I found D. T. Randall, with '96*m*., and E. D. Gagnier, '99*m*., busy in their respective lines of work. Later Randall took me to E. C. Green's, '97, department, and then to the Agricultural Building, which has just been completed at a cost of $150,000. Mr. Crane brought out all the fine points of this grand new building, and of his department in particular—that of farm mechanics. The dinner hour was spent with Randall and wife, (Myrtle Peck, with '99*w*), and then I continued my journey.

Chicago was reached at early evening, and I soon reached Austin, where Mr. Hoyt met me, and we proceeded to the Woodworth's new home. Here another M. A. C. reunion awaited me. P. M. Chamberlain, '88*m*, and wife, G. N. Eastman, '97*m*, C. E. Hoyt, and P. B. Woodworth, '86, and wife (Lucy Clute, '93) and Master Paul, made up the circle which I joined. It was my good fortune to partake of the hospitality of Prof. and Mrs. Woodworth and Mr. Hoyt, during the remainder of my stay in Chicago.

Sunday, Hoyt and I attended church, went with Eastman to see his quarters, and his laboratory, and attempted to call on several of the M. A. C. people, but were only successful in finding E. N. Thayer, '93*m*, and wife (Emma Churchill, with '97).

Monday was devoted to shop inspection at the L. Wolff Mfg. Co.'s plant—with Hoyt and his class—and to visiting the Lewis Institute, and our Institute friends Prof. A. W. Moseley, and T. H. Libbey, with '99*m*. Floyd Robison, '98, and wife (Stella Ward, *sp*. '98) came in and spent the evening with us at the Woodworth's.

Tuesday was taken up with visits at Lewis, Armour and the Chicago Manual Training School, and the trip to Madison, Wis.

Wednesday morning was spent at the University campus. Nature has prepared a remarkable place, with lakes and hills and valleys, with forest and lawn, which have been chosen as a setting for the halls of learning of this great western university. The Engineering Building and shops gave me more to see than the limited time would allow.

An early afternoon train took me to Milwaukee. A visit at the High School manual training department, a call at the headquarters of the American Society of Mechanical Engineers then in session at Milwaukee was all that I found time for in this city, and at 10 o'clock p. m. I was again in Chicago.

(Continued on second page.)

Exercises of the Week.

Wednesday, June 19, 2:00 p. m., Inspection of Battalion. 8:00 p. m., Society Reunions.

Thursday, June 20, Class Day at Grand Ledge. 8:00 p. m., President's Reception.

Friday, June 21, Commencement Day. 10:00 a. m., Address, Prof. J. B. Johnson, C. E., University of Wisconsin. Subject, "The Personal and National Benefits of Education in Applied Science."

THE M. A. C. RECORD.

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Record Staff.

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H. E. Young, of the Union Literary Society,
George Severance, of the Y. M. C. A.

Communications and other matter pertaining to the contents of the RECORD should be sent to Howard Edwards, Editor of the RECORD.

Fifty years ago a man was not a learned man unless a graduate of a classical course. Law, medicine, and theology were "*the* professions." . . . The development of the educational idea has been along broad lines. The barrier of sex has been removed, and men and women are offered the same advantages. Latin and Greek have given way to mathematics, physics, chemistry, and mechanics. Our schools and colleges now offer such courses that he who desires can enter college, and, along with the class-room work, find the forge, the anvil, and the lathe.—*Address before the Michigan Engineering Society by President Riggs, Jan. 1901.*

Progress is in the air, and like the air, it engulfs the globe. Nature does not more abhor a vacuum than she does permanence of form. What ceases to change and grow ceases to live.—*Commencement Address by Prof. J. B. Johnson, June, 1901.*

PAST AND PRESENT.

In 1894 an M. A. C. advertisement, appearing regularly on the cover of our College paper, described "the course" as including "mechanics" and mentioned an equipment of machinery and tools for the use of students in the "Department of Mechanic Arts," but made no mention of a distinct mechanical course. Today we are announcing to the people of the State that this College offers both four and five-year courses in engineering studies, with the emphasis placed upon work along the lines of mechanical engineering. We also announce that 236 students registered in our mechanical course during the College year 1900–1901.

A COLLEGE OF APPLIED SCIENCE.

The growth of the M. A. C. engineering course—in respect to number, at least—has been rapid as noted in a recent issue of THE RECORD. We predict a rapid growth in the number of students entering the new course for women. The misunderstanding that formerly existed on the part of many as to the function of this College seems to have practically ceased to exist, and the people of our State now recognize the fact that we have here a College devoted, primarily, to instruction in applied science, with special reference to agriculture, engineering, and the domestic arts.

A DEMAND OF THE TIMES.

At the present time there is a great demand for young men and young women, who have received a technical education along certain lines. The demand for young men having technical education along engineering lines is very marked, and at this College many requests are being received for young men to enter shops and drawing-rooms. We believe that this demand will not decrease in the near future. Our belief in the matter is based upon information gained through a study of industrial conditions in this country and abroad.

ENGINEERING EQUIPMENT AT M. A. C.

The equipment provided at this College to aid in giving instruction along engineering lines compares favorably with the equipment maintained in many of the colleges of this country giving similar instruction. However, we have in view increasing our floor space and equipment, as well as augmenting our teaching force. The recent generosity of our State legislature renders such a view permissible.

TO MECHANICAL COURSE CANDIDATES IN 1901.

The rapid growth in numbers in the mechanical course, makes it necessary to select our students with more than usual care, in order that we may not have with us an element that—in view of our present equipment and teaching force—shall prove to be a hindrance to the advancement of our engineering students as a whole. Young men who are contemplating entering our mechanical course in September are advised to carefully read the admission requirements, as given in our catalog. Do not attempt to enter the course without the required preparation. C. L. WEIL.

Resolutions.

Whereas, Our Heavenly Father has removed to his abode the beloved wife of Clay Tallman, Jr., an honorary member of the Union Literary Society, Bertha (Moe) Tallman, therefore be it

Resolved, That we, the Union Literary Society, extend to the sorrowing friends and the kind and devoted husband our heartfelt sympathy.

Adopted June 15, 1901.

GORDON E. TOWER,
H. C. MEEK,
F. A. BACH.

Whereas, It has pleased Our Heavenly Father to remove from earth our beloved sister, Bertha (Moe) Tallman—Be it

Resolved, That the Feronian Society extend to the sorrowing husband and friends, sincere sympathy in this their sad bereavement.

Resolved, That these resolutions be published in the M. A. C. RECORD, that they be placed upon the records of the Feronian Society.

And that a copy be sent to the husband of our deceased sister.

Signed,

CELIA A. HARRISON,
BESSIE I. BUSKIRK.

The Diemer-Hudson Wedding.

Invitations have been issued by Mr. and Mrs. Lester S. Hudson, of Lansing, for the marriage of their daughter Mabel Natalie to Professor Hugo Diemer, on June 26, at their residence, 416 Washington Avenue south.

Miss Hudson was one of the most charming and popular girls at the College, as well as one of the brightest students. Professor Diemer has accepted an offer made him some time ago by the Cutler-Hammer Manufacturing Co., of Milwaukee, builders of electrical controlling devices. His work will be in the line of shop organization, a field in which he has specialized for some years. While we all regret losing such an able member of our faculty, we can not but rejoice at his success in winning substantial promotion.

Professor and Mrs. Diemer will visit Charlevoix, other northern resorts, and Chicago previous to establishing their home in Milwaukee. The best wishes of the College community go with them.

Mr. Newman's Trip.

(Concluded from first page.)

Thursday, Memorial Day, was spent with Hoyt seeing the city and the parade.

Friday morning I bade adieu to Hoyt, and then came the homeward journey, and at last, but best of all, "home as found."

CHACE NEWMAN.

Y. M. C. A.

The union meeting was led last Sunday evening by Miss Lyford; subject, "Secret of a Strong Life," text, "For as many as are led by the spirit of God, they are the sons of God." The key note of a strong life is love. It is the predominating factor throughout Christ's life. Merely striving to be good will result in a selfish life. We must take that strongest of all lives, the life of Christ, as our guide, and cultivate that love for human beings that ruled his whole life.

The Bible classes held a union meeting in the Y. M. C. A. rooms last Sunday morning. The hour was devoted to personal testimonies and suggestions in regard to Bible study. The interest taken in Bible study during this year has been very encouraging. The average attendance for the year has probably been about treble that of any recent year. This improvement has been brought about by the efforts of the Bible study committee with Mr. Craig as chairman. This is a good object lesson to show what may be accomplished by active and aggressive work. We hope that all will cooperate in making the work for the coming year a still greater success.

The meeting next Thursday evening will be led by Mr. Craig. The seniors will be called upon to give very brief farewell speeches.

G. S.

Birds Observed at M. A. C. During Spring Migration of 1901.

American Crow, March 1.
American Robin, March 12.
Bluebird, March 17.
Yellow-bellied Sapsucker, Mar. 17.
Song Sparrow, March 18.
Bronzed Grackle, March 18.
Meadow Lark, March 18.
Phœbe, March 24.
Killdeer, March 24.
Red Winged Black Bird, Mar. 26.
Red Tailed Hawk, March 26.
Canada Goose, March 27.
Mourning Dove, March 28.
Towhee, April 12.
Field Sparrow, April 14.
Chipping Sparrow, April 20.
Wood Cock, April 20.
Hermit Thrush, April 20.
Chimney Swift, April 27.
Sand Martin, April 28.
King Bird, April 28.
Baltimore Oriole, May 1.
Mud Swallow, May 2.
Rose-breasted Grosbeak, May 3.
Red-headed Woodpecker, May 4.
Purple Martin, May 4.
Catbird, May 5.
Great Crested Flycatcher, May 5.
White-throated Sparrow, May 5.
Bobolink, May 6.
Scarlet Tanager, May 7.
Cedar Waxwing, May 7.
Ruby-throated Humming Bird, May 7.
Wood Pewee, May 7.
Orchard Oriole, May 16.
American Bittern, May 30.
Cuckoo, May 30.
Virginia Rail, June 1.
Maryland Yellow-throat, June 1.
Whip-poor-will, June 3.

Birds seen in the Winter:

Blue Jay.
Cardinal.
Junco.
Goldfinch.
Highholder.
Pine Grosbeak.
Brown Creeper.
Golden-crowned Kinglet.
Tree Sparrow.
Red-breasted Nuthatch.
White-breasted Nuthatch.
Black-capped Chickadee.
Hairy Woodpecker.
Downy Woodpecker.
Red Crossbill.
Screech Owl.

D. S. B.

Dr. Beal tells the following: Two years ago the lawn mower needed sharpening and for this purpose it was intended to be turned backward using oil and emery. I helped Mr. Carnall get the machine ready for the operation, and we worked and tested, worked and tested, two or three times, occupying half an hour or more before I discovered that london purple was used in place of emery. Just the other day, the currants and gooseberries in the botanic garden, were beginning to show that the currant worms were eating the leaves. I told the new gardener to use a spoon full of london purple in a large pail full of water and pump it onto the bushes. The next morning the worms looked lively as usual, though the man said he had dosed the bushes well. He gave them a second drenching. The day after that worms were healthy and at work. I went to see a sample of what was used on the bushes. Can you believe me? It was the emery that was bought to sharpen lawn mowers.

Moral, keep drugs well labelled.

Two men were passing the orchard where large numbers of paper sacks were tied over flowers for experiments in pollination. "I wonder what those sacks are tied on the trees in that way for?" The other, more observing, said, "You fool, they have been grafting the trees and those sacks were put on to keep the sun from melting the wax."

C. D. Butterfield, with Whitehead & Hoag Co., Chicago, is visiting his parents.

MECHANICAL DEPARTMENT.

MR. CHAS. L. WEIL, PROFESSOR IN CHARGE OF DEPARTMENT.

Wood Shop,	**The Steam Engine,**
Forge Shop,	**Valve Gears,**
Machine Shop,	**Steam Boilers,**
Foundry,	**Strength of Materi-**
Machine Design,	**als,**
Engine Design,	**Mechanism,**
Theory of Design,	**Thermodynamics,**
Shop Methods,	**Engineering Meth-**
Engine Tests,	**ods, Etc.**

Experimental Laboratory.

The object of the work in the mechanical department is to give the student thorough training in certain basic principles—both theoretical and practical—that are closely involved in the correct practice of engineering, and more particularly the practice of the specific profession of mechanical engineering.

The work of the department is carried on in shops, drawing rooms, laboratories, class and lecture rooms.

The equipment in the shops and laboratories—in the way of machine tools, wood-working machinery, forges, testing machines, etc.—is quite extensive, and, we believe, compares favorably with the equipment carried in similar departments in many of our technical schools.

We present, this week, several articles intended to illustrate, in a measure, the nature of our work and methods of teaching. Our allotment of space in this issue of the RECORD does not permit of entering into an extended description of the work. For a brief description of the work of the department as a whole, telling something of what is done in the various shops, laboratories, class and lecture rooms, those interested are referred to pages 90, 91, 92, and 93 of the general catalogue. The catalogue can be secured by sending your name and address to The President, Agricultural College, Michigan. C. L. W.

Strength of Materials as Taught at M. A. C.

[*Strength of Materials constitutes a subject of great interest and importance to all engineers. The following is taken from a paper read before the instructors of the College, on May 14th, by* **Mr. Hugo Diemer,** *Assistant Professor of Mechanical Engineering.*]

This work consists of a study of the leading materials of construction, such as wood, cast iron, wrought iron, and various kinds of steel and cement. The instruction given is of two classes,—first, a discussion of the laws by which we determine the strength of materials subject to loading in various ways, and secondly, laboratory tests applying the student's theoretical work. The theoretical work involves the application of all of the mathematical subjects that the student has previously taken in the course.

For the theoretical work the students are divided into two sections of fourteen men each. All theoretical discussions involve the use of certain numerical moduli, which have been arrived at by experiment. The laboratory work consists in the student's determining, for himself and by his own observation, the value of certain of these moduli. Thus, for instance, we use as the modulus of ultimate tenacity of wrought iron 60,000 pounds per square inch; its modulus at elastic limit as 22,000 pounds per square inch. In the testing laboratory the student verifies these figures by his own experiments. For experiments in tension and compression on metals the department has a testing machine of 50,000 pounds capacity.

As it is desirous to have not more than four men working at the machine, at one time, the class of twenty-eight men has been divided into seven sections of four men each.

Taking as an example of the laboratory work, a tensile test, the forms furnished by the department to the student for a record of the results of his experiments are submitted for examination. Forms similar to those used have been recommended by the leading national and international conventions of mechanical engineers, so that observations at different institutions might be reduced to a standard of uniformity so far as possible, thus enabling comparisons of tests under similar conditions to be made. The test pieces are made in our machine shop according to the standards of the American Society of Mechanical Engineers or of the International Commission.

Cement testing is work carried on in the testing laboratory of every leading college, but is of particular interest to the people of Michigan owing to the large cement industries of this state. American commercial cements are of two classes, natural cements and artificial cements. Portland cement is the name applied to an artificial mixture of lime and clay in proper proportions, heated to a temperature of incipient fusion, when it forms clinkers, which are afterwards finely ground. It received its name in England, where it was first made, from its similarity in appearance when hardened, to the noted limestone from the Isle of Portland, long used in England for building purposes. In Michigan extensive beds of white marl are found, sometimes called shell marl, from their supposed origin from the disintegration of fresh water shells. This material, artificially mixed with clay, is largely used for the manufacture of Portland cement. The department has a portion of the balcony in the machinery hall fitted up as a cement testing room. The cement tests conducted by the student consist in a test of the cement for fineness, time of setting of cement and tensile strength. For the testing of the cement as to its tensile strength, the department has Riehle and Fairbanks' cement testing machines in which the standard briquettes, as specified by the American Society of Civil Engineers, are used. The student reports the exact percentage by weight, of water and cement in the neat briquettes, and of cement, sand and water in the mortar briquettes.

The entire test is made in accordance with the specifications of the American Society of Civil Engineers, briquettes being tested one day, seven days, and twenty-eight days, after making.

In all of the tests the importance of extreme accuracy is emphasized. Due stress is also laid upon the necessity of truthful observations; that is, the student is discouraged from any attempts to produce results which he might be led to believe, by his knowledge of previous experiments, are the ones that he should have obtained. If discrepancies exist he must account for them. The work in the testing laboratory unquestionably develops the unprejudiced and cautious judgment so essential to a successful engineer, as well as also a tendency to systematic and business-like records and comparisons of observations.

Practical Machine Design.

[*The work in Machine Design at the M. A. C. is, we believe, as practical in nature as it is possible to make such work in a college drawing room. We invite engineers and draughtsmen to inspect the working drawings made in this department. The following article is taken from a paper read before the instructors' meeting on May 14th, by* **Mr. W. S. Leonard,** *Instructor in Practical Design.*]

This work has, in the past few years, been confined to shop machinery. There are no regular text books on this subject, and in preparing for the work the instructor must supplement his own experience by such material as may be found in technical journals, in manufacturers' catalogs, etc. Weeks or months previous to the beginning of the class work the type of machine to be designed is determined upon, and, generally, the machine selected is such as may be needed in the College shops. All the time that can be spared from other duties is given to the study of this machine, and the instructor comes to the class with specifications and general proportions settled. Before starting the work a talk is given to the class respecting the machine to be designed. The proportions of the machine, the principles involved in its construction, the cutting speeds and feeds to be assumed, etc., are discussed and the student takes notes of all the important data, including the specifications. Special emphasis is placed upon the proposition that the machine is to be designed with the intention of its being built in the shops. This year the class was informed, not only that it was the intention to build the machine, but that it must be in process of construction during the spring term, so that the class might have the opportunity of seeing the work begin to materialize. As a matter of fact, most of the detail drawings are now in the pattern shop, and some of the patterns have been started. This has a decided moral effect upon the spirit in which the student attacks the problem, and greatly increases his interest. It has also the effect of giving the student a sense of responsibility which tends to due caution and accuracy in executing the details.

In designing the milling machine represented by the blue prints the technical journals consulted by the instructor, together with other material from his private collection, were brought before the class and a convenient index was made to facilitate ready reference. The class was given some time to study and discuss this material before commencing work on the drawing board. They were thus brought into contact with a variety of designs, methods and practical considerations, which were of great value in connection with the work, and which presented a broader and more comprehensive view than could have been obtained in the given time from a text-book, had such a text-book been available.

Inasmuch as detail drawing is about the first work a student is likely to be called upon to do in a drawing office we now aim to select machines of such character as will permit the class to finish the assembly and detail drawings complete. We expect to succeed in this with the present class.

It is the purpose of this department in this work to follow as closely as possible the methods of the practical designer. Every detail of the machine must be designed with reference to its economical construction in all the processes to which it may be subjected. A student must imagine himself, molding, forging or machining the parts, and in doubtful cases in which the foundry is concerned, the foreman of that department is consulted. In practice it is sometimes necessary to modify frame work and other parts, to suit the equipment of the shop. This important consideration, which is likely to be overlooked by the inexperienced designer, receives careful attention in the class.

The unnecessary multiplication of sizes is not permitted. If, for instance, a shaft or screw which has been designed for a certain part can be used fairly well in another connection, it is so used rather than have another slightly different piece made. The importance of using stock sizes and easy dimensions is emphasized, and, if the use of any formula results in an inconvenient fraction the nearest standard size is taken.

As indicated above, the student is taught to make correct and reliable detailed drawings. Whenever an error is discovered in the pattern shop the student responsible for such error, is sent to the pattern shop to investigate and make corrections. This furnishes an object lesson which he is not likely to forget, and makes him more pains-taking in the future.

A system of machine nomenclature is also used in connection with this work. The machine to be designed is given its distinguishing smybol, and every part its number and machine symbol. The patterns for any machine may thus be found among a miscellaneous collection, and in commercial work duplicate parts may be ordered by the symbol instead of giving a tedious description which might be misunderstood.

Thesis Work.

[*Thesis work is taken by senior students and is intended to be in the nature of an original research, and as far as possible must be done without aid from instructors. A written report of all work done is required, accompanied by drawings when necessary. The work is under the immediate charge of the professor in charge of the department. The following article was taken from a paper read before a meeting of instructors of the College on May 14, by* **Mr. Herman W. Reynolds,** *instructor in Mechanical engineering.*]

There are ten men taking the work, and following the quite usual custom, two men work on the same thesis.

A number of suggestions having been made, the matter of choice of thesis is left—in a measure—with the men. The subject of the work chosen is then handed in for approval, and if found practical, and requiring good research work, is accepted.

The men are then required to do all the reading they can conveniently find time for on their respective subjects, and to hand in an outline of the proposed course of procedure before beginning any of the practical work. A few suggestions are given that may be of help in the outline, but as a rule these are only suggestions, for, as those who have done thesis work of this kind know, the outline course of procedure can

but rarely be strictly adhered to, since points will arise which cannot be known and discussed at the beginning. The object of the "outline of procedure" is more to make the men familiar with the object of the thesis than to give them laws to follow.

The erection of experimental apparatus is then begun and this may require weeks, in case the thesis subject has not been taken up by any member of a previous class.

This, then, is a brief sketch of the work in general.

I will now take up each thesis separately, describing the work and telling what has been accomplished in the line of results, if any such have been obtained. Results can scarcely be expected at this early period, for the theses are all of such character, this year, that many weeks have been required in erecting apparatus and getting same in proper shape.

The subjects of thesis work, this year, are given below, together with names of the men carrying on the work:

Tests of a 12 H. P. Gasoline Engine, Aldrich and Thomas.

Power Developed by Wind Mill, Bailey and Lickly.

Determination of H. P. Required to Drive a Blower, Wells and Littell.

Tests of Steam Packings, Radford and Hayes.

Swinging Joints in Pipe Lines, Norton and Ireland.

The engine used in the work of Aldrich and Thomas was furnished by the Lansing Engine & Boiler Works, and is, I believe, a design of engine not before tested. It will, therefore, be of much interest to the manufacturers to know the results of these tests in regard to efficiency. The engine has been very carefully fitted up for testing, and it is thought good final results may be expected. In a few preliminary runs made with the engine it was not found possible to develop the horsepower claimed by the manufacturers, under the conditions.

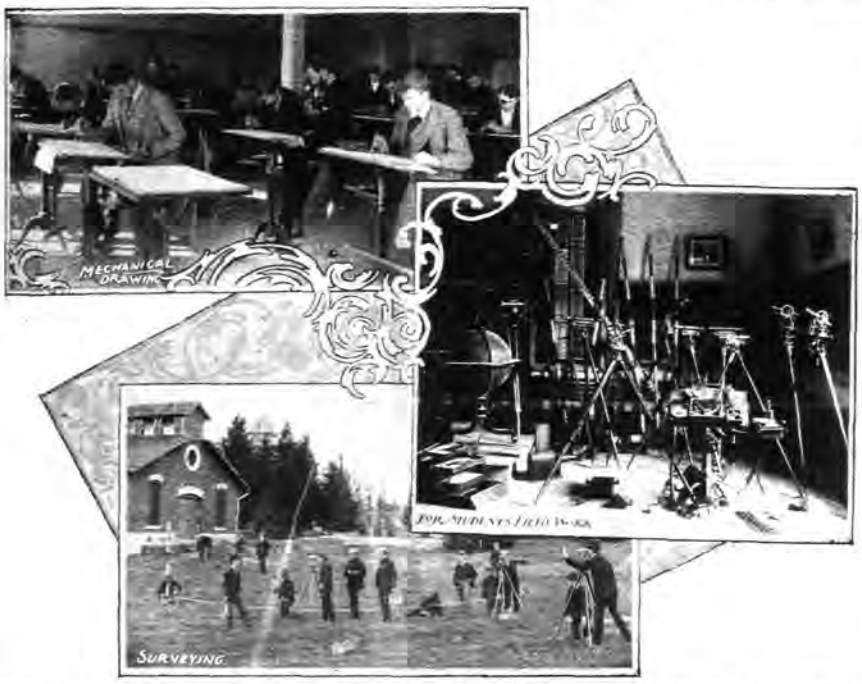
Bailey and Lickly have very interesting work before them in determining the horsepower developed by a power wind mill in different velocities of wind. The mill used in the experiments was furnished and erected by the Maud S Wind Mill and Pump Company of Lansing, and without expense to the College. The mill has a fourteen-foot wheel with adjustable sails and is mounted on an eighty-foot tower. A novel feature of this work is the manner in which the power of the mill is absorbed. It is desirable, and in fact, absolutely essential, that the mill should be kept constantly loaded to such a degree that the governor is inoperative, and this is a condition, owing to varying velocities of wind, which it is very difficult to maintain. The blower method of loading overcomes this difficulty and is giving good results. It is also the intention to make tests on the horsepower developed with sails in various positions. Shapes of the sails and their proper angle of inclination to the axis of the wheel are matters much discussed by manufacturers of different types of wheels. Up to the present time readings have been taken for velocities of wind ranging from 8 to 35 miles per hour. For obtaining velocities of the wind an anemometer, loaned by the U. S. Weather Bureau is used.

[NOTE:—A full account of all thesis work done in the Mechanical Department in 1901 will appear in a later issue of the RECORD.]

Mathematics.

It hardly needs to be said that the engineer must have a tolerably intimate acquaintance with the science of mathematics. A very large part of a young man's preparation for usefulness in engineering must, of necessity, consist of effort to acquire familiarity with mathematical truths. This is partly because of the unlimited utility of the truths themselves and partly because other engineering studies belong so generally to the group of sciences known as applied mathematics.

In preparing the list of mathematical studies for a course such as ours, no great difficulties arise in the selection of the subjects, but there are however other serious questions to decide. Of these the most important are the extent of ground to be covered and the manner of presentation of the subject. The limits of newspaper space forbid great detail but it is possible to outline one or two general principles which are applied in this connection. First, the amount of subject studied shall be only so much as shall be of useful application in future work. That is, utility outranks considerations of mental discipline in determining the amount to be studied, as indeed it does also in deciding how a subject should be taught. Second, the presentation shall be such as shall lead to the greatest facility of application to future needs. In particular, the teacher should keep continually before the student the probable future relations and uses of the subject in hand and illustrate these by exercises and problems drawn from experience.



It will be seen that the successful application of the foregoing principles requires that mathematics for engineering students be taught by men of practical experience in engineering. In this respect the M. A. C. does not claim to be unique, but it has been among the first to provide the desired character of instruction.

The mathematical subjects taught to all engineering students are algebra, geometry, trigonometry, analytic geometry, differential and integral calculus and differential equations. For the four-year course entrance examinations must be passed in arithmetic, algebra through quadratics and plane geometry. The only examination in mathematics required of five-year students is that in arithmetic; and they are given a term's work in mensuration and numerical computation in addition to the above list.

The department entrusted with the above work is also charged with instruction in mechanics of engineering, graphic statics, surveying and hydraulics, all of which except the last are required subjects for students of engineering. Hydraulics is an elective of the senior year.

H. K. VEDDER.

Drawing.

A number of considerations enter into the arranging of subjects and apportioning of time to each in that part of the course in mechanic arts devoted to drawing. It is needless to say that we aim to have the work lead up properly to the related subjects. There are few technical schools in which the students have so little work in drawing before entering as ours. For some reasons it is desirable to start such men on instrumental drawing. At once arises the question of the purchase of instruments. If we were to prescribe a certain standard outfit, as is the inclination of the department, the matter would be very much simplified. But heretofore we have allowed considerable latitude in the selection of instruments, and this means time. So we start our men off with a few weeks of free-hand drawing.

We make no pretence at artistic training at all in this. By the study of a few of the simple geometrical solids, notably rectangular forms, pyramids and cylinders, we try to work out and understand the fundamental principles of perspective.

We practice drawing the simple solids from the models and from dictation, in a variety of positions, and then show how a great majority of machine forms are based on comparatively simple geometric forms, and give training in drawing these in perspective. At the same time the student gets free-hand lettering and dimensioning. Most of the drawing is done from geometric solids, patterns from the pattern shop and simple machine parts.

After this the student is taken into the draughting room and given work in instrumental drawing. First a few simple limbering up exercises to acquire somewhat the use of the instruments, then a few useful geometrical constructions, followed by a sufficiently comprehensive course in projective drawing, intersections and developments.

A large part of one term is devoted to machine sketching and drawing. This is prefaced by work in the proportioning of screw threads and bolts and nuts. We assign to each student a machine to sketch entire or in part, the sketches to be properly dimensioned, and from these he makes a working drawing, or a series to various scales. From this working drawing he makes a tracing, finishing with blue-prints from the same. In all the work emphasis is placed upon accuracy, and simplicity and clearness in lettering and dimensioning.

The next work taken up is Descriptive Geometry, which is treated entirely as a drawing-room subject. The first term, which by the present arrangement of schedule is brief, is devoted to the study of the fundamental problems relating to the point, line and plane. But few finished drawings are required.

The second term takes in the usual series of problems in descriptive, and a number of carefully finished drawings are required. For several years it was the custom to offer the student the choice of making a model of some assigned problem or taking a written examination, and in this way we have acquired some good illustrative material.

The constant aim of the drawing department is to have its work thoroughly in unison with the other work in the course in Mechanical Engineering.

W. S. H.

Physics.

GENERAL PURPOSE.

While the same general purpose may be said to govern the direction taken by the work in physics done by the mechanical students, as has already been set forth as governing that done by agricultural students, viz: the development of the true scientific spirit; yet the subject touches the other lines of work done by the former students in this College at so many points, that specialization in certain directions becomes inevitable, as the courses develop. This specialization may easily become the dominant factor in some phases of the work and properly so. Yet the underlying thought of all courses; the purpose which breathes into them the breath of life; which should be their inspiration and chiefest good, is to build sturdiness of character. Honesty of research; readiness to accept conclusions, because they *are*, rather than because they "come out" in accordance with the "theory," or some preconceived idea of the student's own as to what they should be; these are vastly more valuable results, even of the somewhat necessarily technical work done in this subject by mechanical students, than any large harvesting of facts concerning physical laws, even in their commercial applications, could possibly be. The nineteenth century has exploded many fables of the ninth; some it has made fact; but the Midas touch has not been among the latter. Not everything a student touches in his college course can turn to gold;—it is even a question with some whether anything ought so to do—and surely we should feel well satisfied, if in the conduct of our work, only a very small number of the things the student does in his work in physics can be proven to add directly to his power of getting money. The best citizen is something besides a money-getter and it is the ideal citizen we owe the State.

The spending of money rather than the getting of it, is the dangerous factor in our social problems, calling for integrity, discernment, firmness of will, self-reliance, and humility; all fabrics to be used in character building. It is with such building that the courses given below, in common with all given in other departments, should be chiefly concerned. Turn out such a product, into whatsoever sphere of activity, and the result will justify the outlay.

METHODS OF INSTRUCTION.

Instruction is given in all courses by the usual method of lecture demonstration combined with personal work done by the student in the laboratory. It is in the laboratory that the greatest departure from the stereotyped methods has been made. Because of the large number of subjects carried by our students, economy of time demands the application of every possible device for reducing to a minimum the time for doing any specific task. All such devices as do not impair the end in view are welcomed in the arts; and should not, a priori, be condemned in education. To meet this need the work has gradually been reduced, both in subjects treated at length in lecture, and in problems assigned in the laboratory; it being felt that eight problems, well done, have more value than twice that number less carefully worked out. It will be found upon comparing the manuals for laboratory instruction — not few in number — published during the last ten years, that this tendency to a smaller number of problems marks the advance in method as experience has come to the aid of theory. And it would not be a hazardous criticism to say that these manuals now will be found, ten too prolix, where one is too brief. Instead then of attempting to cover the whole field of general physics with students in the mechanical courses, we are coming gradually to devote most time to such subjects as bear close relations to their work in other departments, *e. g.*, Mechanics, heat, and electricity with magnetism, will occupy most of the year's work, with a few problems only in light, and fewer still in sound.

Coupled with the treatment of fewer subjects and fewer problems for laboratory work, a plan has been adopted for conducting the latter work, having for its purpose the same end *i. e.*, to economize the student's time. The problems for laboratory work have been prepared in printed forms; with blanks to hold individual records and observed data; in their proper places, spaces for sketches of apparatus, and ruled spaces for plotting of curves; together with references to several texts where the principles involved, method, etc., may be found. Thus, when the student has completed his laboratory hour, he has in most cases a complete problem ready to become part of his permanent record. When passed upon by the instructor, and bound together these sheets form the note-book for the term's work.

COURSES.

Three courses are given in the department for mechanical students, as follows:

Course I.—An elementary course for students who come to the College with no previous training in the subject. The work done is based upon Carhart and Chutes "Elements of Physics," with about ten laboratory exercises to accompany the test. This course is given in the spring term of each year, and usually includes the subject of Mechanics, Heat and Electricity; although the ground covered varies with the class.

Course II.—General Physics is taken up by students in the regular four-year course, in the Winter of their first year's residence, and continues through three terms. The test used is Hastings and Beach, and the work presupposes a good year's work in elementary physics and laboratory before entering College. The subjects treated will usually be, as indicated above: Mechanics, Heat, Magnetism and Electricity.

Course III.—Electrical Measurements and Elementary Electrical Engineering—A course of one term in the senior year. Until the facilities for instruction in this department have developed farther, but little more than a knowledge of the underlying principles of this all-important subject can be attempted. The work this year has been based upon Sheldon's "Dynamo Electric Machinery and Jackson's "Alternating Current-Machinery." There is at present a large gap between the first term of the sophomore year when the student completes Course II, and the winter term of his senior year when he enters Course III. This gap is to be filled (we trust) in the near future. An opportunity for students desiring to specialize along electrical lines will then be given. A course in Practical Electrical Measurements will then prepare the student for courses in Electrical Engineering, thus broadening the work of the department in a much needed direction.

MARTIN D. ATKINS.

Chemistry.

The course in general elementary chemistry is given during the Fall term to the agricultural, mechanical and women students together. A knowledge of the characteristics of the more important elements, and the laws which govern their mode of combination; this we endeavor to make as clear as possible.

Lectures fully illustrated by experiments are used as a basis for showing the facts which each student *individually* must *verify* in the laboratory.

This work is the foundation upon which that of the two succeeding terms rests. The students do not gain their ideas of the properties and occurrence of any element by reading some carefully written description of it but gain it from the element itself. As an example brine rich in Bromin, the product of Michigan wells, is given to the student who separates it out and learns from the brine itself, the source from which Bromin is obtained and what are its characteristics.

The second term is devoted to the study of the inorganic chemical compounds of nature, minerals.

By the use of the blow pipe, and a few reagents, guided by one of the modern works on determinative mineralogy the student soon has the power to determine and classify the most of the common and more important minerals. Each student saves specimens of minerals which he has determined so that at the end of the term he has a little nucleus for a mineralogical collection, and has also trained himself to easily recognize by their appearance the ores of the common metals.

The third and last term in the chemistry for engineering students is devoted to a line of quantitative work which will impart some analytical skill and also teach something of the applications of chemistry to practical life. During the term just closing the class has worked on the determination of:

Copper in brass, and copper ores. Iron in low grade and high grade (Bessemer) ores. Silicon in cast iron. Carbon in several varieties of steel. Coal analysis. Analysis of flue gases from boiler house. Test of coal with Parr Calorimeter. Analysis of water to determine suitability for boiler use. Sanitary analysis of water. With the assay furnaces lead, silver and gold have been determined. F. S. K.

Physical Geography.

To those who have never had any instruction in this line in the lower schools Physical Geography opens a new and interesting field and helps to lay a broader foundation for all subsequent work in physical science.

A text-book is followed somewhat closely, it is true, but the student has opportunity to become personally acquainted with the more common meteorological instruments — the barometer, thermometer, wind-gauge, rain-gauge, etc., and has access to weather maps, charts, models, and photographs, besides handling the commoner minerals and rocks and learning something of their composition and the manner of their decay into soil and other products.

An effort is made to get the student to realize for himself the dependence of all life—plant and animal—on its surroundings, and to show how largely the physical environment has determined the present life and industries of the human inhabitants of the globe.

The subject is taught during the first winter term of the five-year course. W. B. B.

English and Modern Languages.

The purpose of teaching English, no matter what the school or student, is patent to all. We are born into society, into a human relationship whose existence depends on, and the measure of whose success is in proportion to, its ability to communicate ideas accurately, with no waste of time. English interpreted as composition, and English interpreted as oratory and elocution, represent the fundamentals of the work done in this department, as, indeed, they underlie the work of the whole college. Our purpose, then, is to teach students the value of speaking and writing with accuracy and effectiveness, to point out the means of accomplishing this for themselves, and to encourage their perseverance in the pursuit of this end which, like the infinity of mathematics, is never more than in process of attainment. And this encouragement is a more important factor than the uninitiated are likely to suppose. A mediocre supply of purpose will carry a student safely through a study whose aim is accomplished with a definite fact or class of facts at the end of a term, but who can calculate the amount of energy sometimes stored up in a modest ability for expressing thought?

To speak like a rational being is to think like a ratinal being. It is a poor rule that doesn't work both ways. The ulterior purpose of English is not different from just that which mathematics, physics, chemistry and the natural sciences would like to accomplish—the development of self-reliance, modesty, and the power, by the independent solution of certain problems with which life is sure to bring each one face to face.

COURSE OF STUDY.

Sub-freshmen (*grammar and composition.*)

During the fall term, in a class meeting five times a week, the student is taught the distinction between the principles of grammar based on logic, and the facts of our language due to tradition, chance, and other moulding and controlling influences. He is taught that grammar is not a rigid fact for all time, but is always in process of change; and he learns where he must conform to, where it is wise to conform to, and where he may be independent of, the dictates of grammarians. One essay a week is required in this course, as, in fact, throughout the first two years. In the fall term everything is written in the letter-form, and the subjects are chosen from their own experiences, home-scenes, and the novel in College-life. The strictest attention is here paid to the mere matter of form, spelling, punctuation, capitalization, and grammatical structure.

Narration.

The second term is concerned with the theory and practice of

story-making. The object, I need scarcely say, is not to make writers of fiction. It is believed that a definite object in view gives the student a guide, a map and compass if you please, so that he knows always where he is and what he is trying to do; meanwhile, if he can write narration well, it is altogether likely that he has learned some things applicable to all departments of composition. The subjects of the essays are found for the most part in his college experiences, and the student soon learns that he can write best on what he knows most about. So he avoids subjects with which he is unfitted to deal, or acquaints himself with them by careful study and preparation.

The criticism in this course still concerns itself with the forms mentioned above. In addition the teacher marks the strong points in a narrative style, simple and natural language, ease of expression, and the matters of plot and unity of action. It is expected that this course will react on the student's appreciation of literature, and that a new interest will be taken in fiction —that the story will no longer be read merely for the story's sake, but because it shows a certain degree of art on the part of the writer.

Description.

In the third term, objects, persons, places, natural scenery, are taken out of their supposed story-relations, and regarded in themselves. This course proposes to emphasize the value of observation, to develop the ability of seeing a thing as a whole and in detail at the same time, and to teach the close relationship binding everything together.

Freshmen—*Exposition.*

The study of exposition and the writing of weekly essays continues throughout the year. The outline, the paragraph, the sentence, the choice of words, and matters of style are special subjects under consideration.

FOUR-YEAR COURSE.

Freshmen—*Narration, Description and Exposition.*

As the entrance requirements in English are higher for this than for the five-year course, the subjects of narration, description and exposition are passed over more hurriedly.

BOTH COURSES.

Sophomores.—One term of the Sophomore year is spent in the study of logic and argumentation. The methods to be used in debate are considered. One essay is required every week. Many of the subjects are chosen from topics of present interest in the engineering world.

English Literature.

In the last term of the senior year a study is made of isolated masterpieces. This is the only English literature offered in the mechanical course and students are therefore seriously handicapped. With no work in history, and no idea of a literary past except that gained in the high school, they come to a study of the best thought has produced with no standard of judgment or appreciation beyond their own undisciplined taste. Historical criticism has, for the most part, to be left out of the question. The purpose is to make the humanity of the writer appeal to the humanity of the reader, and to persuade into some more or less definite standard of taste. While in the end we know that this course can be nothing but popular, we do not at all consider the time misspent, for contact with greatness must have a moral influence at least; of æsthetic influence each student will absorb in measure as he is able.

Modern languages.

In the junior year of the mechanical course either French or German is required. One year of a foreign language can accomplish very little. Consequently we are forced to choose as our object only one of the several valuable ends to be attained in this study. These ends are: the "at-homeness" with a language gained by mastering a conversational vocabulary; the scientific vocabulary of special value to the technical student; the mental discipline derived from an intelligent study of forms and grammatical structure; and the culture arising from acquaintance with a foreign literature.

The circumstances of the case force our choice. Whatever is or is not done, the student must gain enough knowledge of either language to read with moderate ease the valuable scientific treatises written in that language and having a bearing on the work in which he expects to interest himself. We hope great improvement in this department with the coming of the new order. Instead of three terms to which the study of French and German is now limited, we shall have five. The present freshman class will be the first to enjoy this advantage.

G. C. B.

Public Speaking.

The subject of public speaking was introduced into the courses of instruction given at this College, only about two years ago. True, certain principles relating to the science of vocal expression had been taught year after year, but no attention had been given to the art side of the subject, prior to that time. As now presented, the subject is treated both as a science and as an art.

Each year the demands made upon college young men and young women in matters pertaining to spoken English, especially with reference to those who go into public work, are becoming more stringent; and college authorities, generally, have come to realize that there is a difference between the ability one inherits for the expression of one's thoughts and ideas, and the ability one is able to acquire for their expression. Moreover, to accumulate knowledge under our present systems of education, is generally regarded as being very much less difficult than it is to impart the knowledge after it has been accumulated; hence, no doubt, the special attention which is everywhere being given to the subject of public speaking.

And the wisdom of those, who consider the ability to express one's self, important, need not necessarily be questioned, when it is understood that no one can be said to have a thought of any real value either to himself or to anyone else, until he has it so clearly and so firmly in mind that he can put it into speech form. Applying this principle to College work, a student, for example, who is learning to express his own ideas, is, at the same time, really supplying himself with ideas to express. Surely a man, under normal conditions, who is obliged to say, (as hundreds of men are), "I know, but I cannot tell what I know," is put to a great disadvantage, unless the indications of the twentieth century requirements are not what they now appear to be.

It ought to be plain from the foregoing remarks that the idea in teaching public speaking at M. A. C., is, above all things else, to give the student something that will be of daily, practical use to him; for that is the real idea. No attempt is made to turn out orators; on the other hand an effort is made to produce, in the first place, good thinkers; and such clear, practical thinkers withal that they shall be able to put their thoughts into good, plain English.

COURSES.

In the fall term of the Freshman year (mechanical course) the subject of English orthoepy is taken up in the regular way; and in addition to this, as much time is devoted to the subject of voice culture as can be spared out of the two hours a week allowed for this work. The results expected for this term's work are: (1) a thorough knowledge of the principles of pronunciation; (2) an ability to articulate words distinctly; and (3) such an appreciation of the fundamental laws of speech production in general, as will enable the student to take up the subjects of reading and of speaking in an intelligent and profitable manner.

The subject, proper, of vocal expression is taken up in the fall term of the Sophomore year and continued throughout the entire three terms. In the fall term a careful study is made of the science side of the subject; in the winter term the art side is considered; and for the spring term, such exercises in reading and in speaking are chosen as will best combine, in concrete form, the principles already gone over, and at the same time impart to the student a genuine appreciation of vocal expression as an art.

The work with the Juniors and the Seniors is given over to Oratory, pure and simple. The principles and the exercises, which constituted the work of the previous two years, are now reviewed and made use of constantly. But an effort is made in the last two years, to develop, as fully as possible, whatever of oratorical ability the student may have. To this end some of the very best models of oratory are put before him, which he in turn commits thoroughly to memory. Then, as part of the regular class-room work, the student gives his models, paragraph by paragraph, and a criticism of the work is made, in each case. At the end of the term he gives one of these models, complete, before the class, which he is able to do with the utmost freedom, since he has long ago become used to speaking before his class, under the stress of criticism.

The main purpose of this class-room drill and practice upon the scores of models used, is not only to enable the student to acquire a correct pronunciation and a clear enunciation of English words; not only to put him in possession of the principles of vocal expression, in order that he may use them intelligently; not only to give him experience and skill in the art of public speaking; but also to develop in him individuality and a genuine manliness, without which the aims and objects of an education are largely defeated.

E. S. KING.

Some Important Questions Fully Answered.

1. What is the Michigan Agricultural College?

It is a high grade technical college. It gives first, a broad general education in English, mathematics and science to all of its students; secondly, a thorough technical training in agriculture and related sciences to students in the agricultural course, in shop work and mechanical engineering to students in the mechanical courses, in cookery and domestic economy to students in the women's courses.

2. What are its methods?

Wherever possible the college follows the laboratory method. Students learn by doing. They handle and judge stock, prune and graft trees, make gardens, etc., on the farm; use the simple and the compound microscope in botany and in zoology; analyze soils, fertilizers, food stuffs, etc., in the chemical laboratory; use the transit, compass and chain in surveying; make patterns and molds and finish pieces of machinery in the shops; cook, sew, make dresses and trim hats in the women's course.

3. What courses are given?

There are four full courses. Three of these—the agricultural course and the four-year mechanical course for men, and the domestic economy course for women—require four years for graduation; and one—the five-year mechanical course for men not qualified to pass the examinations for entrance to the four-year mechanical course—requires five years. Each full course leads to the degree of Bachelor of Science. Besides these the College offers seven special short courses of from four to eight weeks, viz: Dairy husbandry, creamery, cheese making, live stock husbandry, fruit culture, floriculture and winter vegetable gardening, sugar production.

4. What is the scope of the education given in these courses?

In the long courses above specified, the aim is to take the student from the high school or from the end of the ideal eighth grade school year and carry him or her through four years of general and technical training, making science the main feature of the college work, and applying it to practical use at the earliest possible moment along the lines of technical training essential to each course, at the same time introducing such general culture studies as will make of such material, self-poised, self-governed, characterful men and women, and patriotic, unselfish citizens, faithful to the call of every duty. There is nothing fanciful about the courses. They are intended to serve the plain, practical purposes of plain, practical, every-day men and women. Yet there is included, as far as may be, all that tends really to enlarge, dignify, and ennoble the life of the toiler.

In the special winter courses the aim is to impart in the shortest possible time a certain amount of definite information. They are designed for minds already fully developed. The idea of general training is entirely lost sight of, and the effort is solely and simply to teach methods of procedure that can be applied at once to bread-winning.

5. What are the requirements for admission to the College?

The entrance examinations for the agricultural course, for the five-year mechanical course and for the women's course cover the following subjects: Arithmetic, geography, grammar, reading, spelling, penmanship and history of the United States. For admission to the four-year mechanical course, students must hold diplomas from high schools on the accredited list of the university, or must, in addition to the requirements named above, pass examination in algebra through quadratic equations, in plane geometry, in elementary physics and in English. Candidates for admission must bring testimonials of good character and must be not less than fifteen years of age. The entrance examinations for the three courses first named may be taken at the College, or with the commissioner of schools of any county in March or in August. Candidates over eighteen years of age may be admitted without examination at the opening of the fall term to any but the four-year mechanical course, provided that they make arrangements to pass off the entrance examinations within one year.

6. How much credit can I get for my high school work?

We will examine you over the work you have pursued in the high school, and will give you credits for all the work in our courses in which we find you fairly proficient.

7. What is the labor system?

The labor system is to the technical courses of the M. A. C. what the clinical work is to a medical school. It is the induction into the practical part of the technical training. It is the learning to do by doing. It is the training of hand and eye in all the skilled processes of handwork involved in farming, in mechanical engineering, or in household economy. The manual-training idea is gaining ground in all our best schools.

8. When does the school year begin?

The College opens Monday, September 16, 1901, and closes June 20, 1902, with a vacation of two weeks at the holidays and

another vacation of one week about the first of April.

9. Do the students room at the College?

Yes; the College owns four handsome dormitories. One of these is for young women, the other three for the young men. Lodging can also be had in Lansing or just outside the College grounds. It is perfectly feasible, by means of the street car line, to live in Lansing and attend the College. Street car fare to the College by tickets, is five cents.

10. What is the cost of board at the College?

Board at the college is in the hands of the Students' Club Boarding Association, and is managed by the students. There are six clubs and each club fixes its own rate of living. The price now runs from $1.60 to $2.40 per week for young men, and $1.55 per week for young women.

An independent boarding club is run for young men at an expense of about $1.50 per week.

11. Can a student earn enough from his labor to pay his way?

No; only productive labor is paid for. Labor that is merely for the purpose of developing skill is not paid for. On the other hand, on so large a farm and plant, there is much work of a productive kind to be done. All students get a part of this labor, and those who especially desire it can get, probably, as much as they can find time for and do their regular college work. By working thus at odd hours on school days and ten hours on Saturday, students may earn as high as two dollars per week, or about enough to pay board. By hard work, self-denial and economy, with good vacation wages, a few have paid all their expenses at this college from their own earnings. These things can be done, however, only by those who are exceptionally capable. We advise you to have at least $100 in reach, exclusive of wages at the college, before entering.

12. What are the expenses for a four years' course at the College?

The following table shows what the four years' agricultural course actually cost a certain member of the class of 1901. This student was a prominent member of his class, and it is believed that his expense account is a fair average. It is possible, however, by economy to get through on less. Of course some spend more. Above a certain sum for fixed expenses the matter of cost is largely a question of personal choice.

	First Year.	Second Year.	Third Year.	Fourth Year.	Total.
Board, room and school fees..	$101 19	$97 59	$87 05	$125 92	$411 75
Stationery.....	12 31	11 81	11 25	11 53	46 90
Laundry.....	4 08	5 99	5 34	8 05	23 46
Incidentals.....	34 62	21 81	32 87	83 98*	173 28
Clothing.....	33 03	24 35	17 14	23 61	98 13
Total.....	$185 23	$161 55	$153 65	$253 09	$753 52
Earned.....	17 98	79 41	36 55	71 88	205 82
Net cost.....	$167 25	$82 14	$117 10	$181 21	$547 70

* Includes about $80.00 for expenses in visiting stock breeders.

From expense accounts carefully kept by a number of representative students it is found that for agricultural students the average yearly expenditure runs from $150 to $200; and for mechanical students from $175 to $250. Mechanical students do not have as many opportunities for earning money as do agricultural students.

13. What is the equipment of the College?

Fifty-four buildings on the College campus, not reckoning barns and outhouses. The whole plant inventories about $650,000.

There are twelve laboratories all of which are equipped in thorough going, modern style. For thoroughness of equipment, taking into consideration the number of students using each, these laboratories are not surpassed anywhere in the State. Here the best class of work for agriculture and for science is being done, and the report of the character of this work extends far beyond the bounds of this country.

It has a farm of 683 acres, including about 400 acres of cultivated land, large orchards, gardens of various kinds, and two large bodies of original forest; barns for horses, sheep and cattle; agricultural machinery of every kind; herds of pure bred cattle, sheep and swine, and a host of other appliances more fully described in our large catalogue of more than a hundred pages.

The equipment of the Mechanical Department has already been partly accounted for in the twelve laboratories already mentioned. There are large and commodious drawing rooms fitted up with the best appliances for work, a testing room, a small experimental laboratory, engine room, lavatory, machine shop, wood shop, foundry and blacksmith shop. Each of these is equipped with a full complement of machines of all kinds, so that the very best class of work can be, and is, done here.

Our library contains 22,000 volumes and 5,000 pamphlets. It is thoroughly up to date in all the departments. No library in the State excels it for practical work.

14. What advance paymemts are required of a new student?

The following table answers this question:

Item of expense.	Lowest.	Highest.
Matriculation fee, to be paid but once for the whole course.....	$5 00	$5 00
Advance payment on account of board	20 00	20 00
Fee for incidental expenses, advance for one term.....	2 50	2 50
Room rent, advance for one term	4 75	8 00
Deposit required on issuing key to room.....	1 00	1 00
Amount necessary to furnish room.....	5 00	25 00
Text books and laboratory fees.....	3 50	14 50
Total advance.....	$41 75	$76 00

In addition to this, students taking the mechanical course must purchase a complete set of drawing instruments, costing not less than $16.00, and those taking military drill must purchase a uniform costing $14.50.

15. What is the size of the teaching force at the College?

Our faculty numbers about sixty-five officers, professors, and instructors (including, in part, Experiment Station workers), each a specialist in his own line.

16. What social advantages exist at the College?

The community around us is cultivated, intelligent, refined, and on the campus itself there is a little colony of some twenty-five refined Christian homes. Among the students there are eight literary societies, one mechanical fraternity, a natural history society, a botanical club, a farmers' club, an athletic association, etc., which exert a benignant social, educational and moral influence. Everywhere one finds kindly feeling and helpful interest.

17. What are the moral and religious advantages?

There are handsome churches of almost every denomination immediately at hand. The Lansing pastors hold services every Sunday morning at the College. Our College Young Men's Christian Association and Young Women's Christian Association are powers for good among the students. There are a number of voluntary Bible classes. Chapel exercises begin the work of each school day. When you come, join the Y. M. C. A. or Y. W. C. A.; unite with your church at Lansing; attend chapel exercises.

18. Shall I purchase text books before coming to College?

No; bring what text books you have for reference books. The students' Co-operative Book-buying Association will furnish new books at an advance of only 5 or 6 per cent. on publishers' wholesale prices.

(Concluded on eighth page.)

Old Students.

Mr. H. E. Rupert, '00*m*, is working for Mill's Novelty Company of Chicago. His address is No. 287 West Monroe street.

W. C. Stebbins, '94, who has been principal of the Coloma schools for the past two years will teach science in the Petoskey high school next year.

W. A. Cannon with '93, now the holder of a fellowship in botany at Columbia University, is spending his vacation with his parents at Washington, Macomb county.

Mr. C. A. Warren, with '00, now a teacher at Tuskegee, Ala., stopped at the college for a few hours on a short vacation. He is greatly pleased with his work and very kindly took part of his time to write for us the description printed last week.

About the Campus.

Mr. C. Locke Etheridge, of Chicago, visited Professor Vedder last week.

Mrs. B. I. Preston, of Rochester, N. Y., is visiting her sister, Mrs. Barrows.

Miss Kate Nichols is visiting Mr. and Mrs. B. O. Longyear for commencement.

Mr. and Mrs. H. M. Vedder, of St. Johnsville, N. Y., are visiting their son, Professor Vedder.

Fred W. Herbert, with '96, now with Wickes Bros., Saginaw, called on friends at the College on Sunday.

Miss Bess K. Paddock, of Three Oaks, Mich., is visiting her cousin, Miss Fleta Paddock for commencement.

Dr. Beal will deliver the commencement address at Grandville high school, Thursday, June 20, on the subject, "Education, the Old and the New."

Miss Bessie Lee Gaylord gave a delightful little dance in the women's gymnasium on Saturday evening in honor of Miss Mabel Ryland Keller of Wellesley, Mass.

Malcolm McIntyre, '05*m*, of Mt. Clemens, has received from Congressman Weeks an appointment to the Naval Academy at Annapolis. He has accepted the appointment, and will spend the summer at Annapolis studying for the entrance examinations in September.

A union meeting of all the young men's bible classes was held in the Y. M. C. A. rooms on Sunday morning at eight o'clock. The object of the meeting was to discuss the work done by the several classes, and in this way get some idea as to the manner of carrying on bible-study work to the best advantage next year. A. F.

The Adelphic Literary Society elected the following officers for next fall term: President, Wm. Krieger; Vice President, A. B. Rogers; Secretary, E. F. Smith; Treasurer, H. L. Brunger; Marshal, L. L. Drake; Record Reporter, O. L. Ayrs. A. F.

The Columbian Literary Society has elected the following officers for the fall term of 1901: President, B. Wermuth; vice president, B. T. Hesse; secretary, W. F. Millar; treasurer, W. M. Brown; marshall, J. F. Loop; Record staff, J. G. Moore. W. S. MERICK.

Prohibition Club.

At the meeting of the Prohibition Club last Friday evening, Mr. E. A. Seelye gave a paper on "The Prohibition Party."

Before the Civil War several states were enjoying themselves without the saloon curse. This struggle stopped temporarily the anti-saloon agitation, but in 1867 the "Brewers' Congress" held in Chicago, passed a resolution pledging themselves "to use all possible means to stay the progress of this fanatical party, * * * and that we will sustain no candidate, of whatever party, in any election, who is in any way disposed toward total abstinence." This brought the question of prohibition into politics, and in 1869 a new party was organiz d.

Their first ticket put in the field in 1872 received 5,607 votes in six states. From that time until 1896 the party made constant growth, but in that year the division of the party on the money question cost them many votes. The party today, however, is stronger than ever before.

The Prohibition party is an organization of men who believe that the saloon is a curse to the country, that it is the enemy of labor, of capital, of morals, of the home, of good government, of pure politics, and in fact of everything that is good, and that there is but one method by which we can inform the government that we are opposed to it, and that is through the ballot-box. The Prohibition party is not a temperance society, it is not an organization to interfere with personal rights, it is not a "balance of power" party ready to attach itself to anything that will help it, it does not intend to make men good by law or to carry on a moral suasion campaign; but its aim is to make the saloon in the eyes of the law what it really is to society, *an outlaw*, and then enforce the law against it the same as is done against robbers, thieves, and murderers.

Mrs. Mary L. Doe, of Bay City, who is an enthusiastic temperance worker, then gave a very interesting talk to the club.

The following officers were elected for next term: President D. S. Bullock; vice-president, A. C. Miller; secretary-treasurer, G. W. White.

D. S. B.

Some Important Questions Fully Answered.

(Concluded from seventh page.)

19. Are living rooms provided with furniture?

For young men, no. For young women, each room is furnished with bedsteads, mattresses, pillows, dresser, two chairs, washbowl and pitcher.

20. At what time can I visit the College?

At any time.

All the leading railroads of the State run excursions to the College about the middle of August. From five to ten thousand people visit the College annually on these excursions. The museum, library, laboratories, and other buildings are open for inspection, and guides in uniform show visitors about the campus, which is of almost ideal beauty. All excursion trains run direct to the College campus. Inquire of your station agent as to date of M. A. C. excursion.

The City Federation of Women's Clubs of Lansing, will hold their picnic at the College on Tuesday, June 25, instead of Wednesday as previously announced. A most cordial invitation is extended to all of the College ladies and their guests, to join with them. By order of the committee.

MRS. B. F. HALL, Chairman.