The Wisconsin engineer. Vol. 30, No. 3 December 1925

Madison, Wisconsin: Wisconsin Engineering Journal Association, [s.d.]

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The Wisconsin Engineer

MEMBER OF ENGINEERING COLLEGE MAGAZINES, ASSOCIATED

December 1925

VOL. XXX

NO. 3

The College of Engineering
University of Wisconsin
Madison

The Wisconsin Engineer

25c A Copy

Published monthly from October to May, inclusive, by
THE WISCONSIN ENGINEERING JOURNAL ASSOCIATION
306a Engineering Building, Madison, Wis. — Telephone University 177

Founded 1896

$1.50 A Year

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The Wisconsin Engineer
UNIVERSITY OF WISCONSIN
VOL. XXX, No. 3 MADISON, WIS. DECEMBER, 1925

LIBRARY SEARCHES

By F. E. Volk, c '08
Librarian, Engineering Library, University of Wisconsin

When starting to work on a research problem, or other scientific or engineering investigation, the first thing to do is to become thoroughly acquainted with the present state of knowledge of the subject. Unless this is done the investigator is in great danger of wasting much time and effort in doing work which has already been done by some one else. Such a duplication adds nothing to the sum total of human knowledge and can bring little satisfaction to the person who has done the work.

An excellent way to find out what is known about a subject is to make a library search. A comparatively short time spent in this manner usually gives a person a better knowledge of a subject than could be obtained in any other way in a much longer time. A thorough study of the literature of a subject is a short cut to a good knowledge and understanding of it. This knowledge enables a person to start his investigations where his predecessors left off, and so have a fair chance to make a real contribution to the knowledge of the subject. This is equally true whether the contribution takes the form of continued experimentation, or an orderly rearrangement of the known facts from which new conclusions may be drawn.

Library Resources and Arrangement

A knowledge of the arrangement and resources of the library to be used will be helpful in making a search. Our engineering library located in the Engineering Building is in reality but a section of the University Library. In creating it, all the strictly technical engineering books and periodicals were taken from the general library. To this collection a few books on physics, mathematics, chemistry, and geology, and the necessary encyclopedias and other reference books were added to make a working library.

In many cases where the topic is purely technical a search can be satisfactorily completed in the Engineering Library alone, but where it deals with one of the above general sciences or with economic subjects such as the valuation of public utilities the search should be continued in the University and Historical libraries located in the Historical Library Building. Books on technology and manufacturing, such as paper making, lumbering, etc., and the United States government publications are also to be found in these libraries. The publications of the Bureau of Standards, the Geological Survey, the Patent Office, and the Census Bureau contain a great deal of valuable information and are very frequently referred to by engineers. The Agricultural Library in Agricultural Hall, the Chemical Library in the Chemistry Building, and the law libraries in the Law Building and the State Capitol Building will also be found useful in some cases.

Engineering students will naturally do most of their work in the Engineering Library, so we will confine this discussion chiefly to its resources. For our purpose it is convenient to divide its material into two classes, i. e. (I) Books, and (II) Periodicals.

I. Books

As a rule, books cover the more general subjects and so are very useful for getting a broad view of a field. They are also often a very satisfactory source of information on the historical side of a subject. In order to keep the books on each subject together it is necessary to have some systematic method of classifying and marking them. Most people are more or less familiar with the Dewey Decimal System of classification which is used so generally in public libraries. In this system all knowledge is divided into ten groups, and each of these may be divided and subdivided in multiples of ten to any extent desired, the books being marked with the numerals indicating the subdivision to which they belong.

In the University libraries a modification of the Cutter Expansive System is used. The principle is the same as in the Dewey System except that the letters of the alphabet are used and there are twenty-six possible divisions, each of which may be divided in multiples of twenty-six; and the books are marked

with the letters indicating the class to which they belong, instead of with numerals.

Finding Our Book

All of our books are bought and catalogued for us by the general library. In cataloguing we make one main or author card for each book or set of books, and as many subject cards as are necessary to bring out the various general subjects treated. Every book and each card belonging to it is marked with the letters indicating its classification, and also with letters and numerals indicating the author's name. The books are filed on the shelves in the alphabetic order of the class numbers, and the cards are filed in our card index to form what is known as a dictionary catalogue of authors and subjects.

It is necessary to limit the subject cards to the general subjects treated to avoid making the catalogue so voluminous that it would be unwieldy. Hence if you do not find the specific subject you want in the index look for a synonym, or failing that, for a more general subject. For example, you will not find the subject of "Erosion of steam turbine blades" listed in the index either under erosion, steam turbines, or blades. But if you select some of the books listed under the general subject "Steam turbines" and examine their indexes you will find the information sought. It is also best when using the index to look for a book under the author's name when that is known, because the main card gives complete information as to the different editions and number of copies available. The subject cards do not have all of this information.

Having found the cards in the index for the book wanted, you will notice a group of letters and figures in the upper left hand corner of the card. This is known as the "Call number" and indicates to the initiate the location of the book on the shelves, for the books are arranged on the shelves by subjects in the alphabetic order of the call numbers with the authors in alphabetic order under each class. If you are not acquainted with the system, ask the librarian to explain it to you. It is quite simple, and the convenience of being able to go directly to the books wanted at any time is well worth the trouble involved in becoming acquainted with the system.

II. Periodicals

From the standpoint of our search, books are not nearly so important as the periodicals. All new information is published in magazines and society publications long before it ever appears in books, and much of the material published in this way never does get into a book, or if it does, it cannot be given in such detail as in the original reports. Periodicals are therefore a veritable mine for the searcher.

The periodicals are listed in our card index but their contents are not indexed there. For each periodical there is a card giving the name of the magazine, its place of publication, and any changes of name which have taken place. This card also tells what volumes the library has, and the dates covered.

Example:

S .EL 2	Electrical World, . . . 1884-1924, Vols. 4-84 N. Y. 1885- date.

Each periodical has a card under the general subject treated, but this, like all subject cards, does not contain complete information; so when you are looking up a magazine, always look for the main card which is under the name of the publication. The periodicals are arranged in the stacks in the alphabetic order of their titles. Those from "Aera" to "Engineering Record" are in the steel cases on the first floor of the stack room; all the others are in the wooden cases on the second floor.

The articles in the periodicals are not indexed in our card index because that is both expensive and unnecessary. There are several published indexes which catalogue this material much better than we could, and the printed indexes are relatively inexpensive. These general indexes, which are kept in the reading room on shelves near the card index, are listed below with a brief statement of their individual characteristics.

Industrial Arts Index

This index covers the period from 1913 to date. The current numbers appear eight times during the year, and are cumulated over periods of three months. The July issue covers a six months period and each annual volume covers a whole year. Since 1918 a cumulated volume covering the two year period has been issued every other year. Practically all of the important American technical publications are indexed, together with about a dozen from Great Britain and half a dozen each from France and Germany. These periodicals are indexed quite completely and the material is arranged in alphabetic order like a dictionary. A descriptive title is given for each reference, with the author's name, and the name, volume number, page, and date of issue of the publication in which the article appeared. It is the most satisfactory index for the period covered.

Engineering Index

This index, which was the first of its kind, was started in 1884, and published in the monthly issues of the Journal of the Association of Engineering Societies from that time until the end of 1895. Prof. J. B. Johnson, the former dean of our college was chairman of the committee which prepared the index. In 1896 the work was taken over by the Engineering Magazine and continued under its management until taken over by the American Society of Mechanical Engineers in 1918. Part of it now appears currently on alternate pages of the advertising section of the society's monthly publication, Mechanical Engineering, and part in the Engineering Journal, a monthly publication of the Engi-

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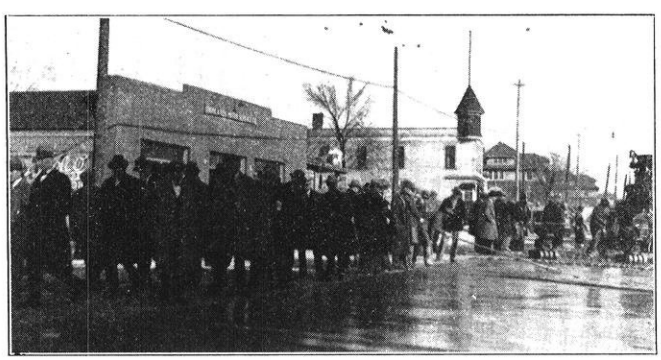
THE SENIOR CIVILS TAKE A TRIP

By R. A. NELSON, *Senior Civil*

Nothing much happened in the lives of the senior Civils during the first week in November, except that for three days they tramped the wilds of Milwaukee under the careful chaperonage of "Bill" Kinne and "Charlie" Corp. That week would have gone down in history as the uneventful companion of many other weeks had it not been destined to be a great week for Wisconsin. For it was that same week that Polaski and his cohorts conquered the Hawkeyes in a snow fight. It was also that week that the senior Civils gained a masterful knowledge of the intricacies of Milwaukee's sewer and water supply system and of a few other minor details, such as the bright lights of Grand Avenue.

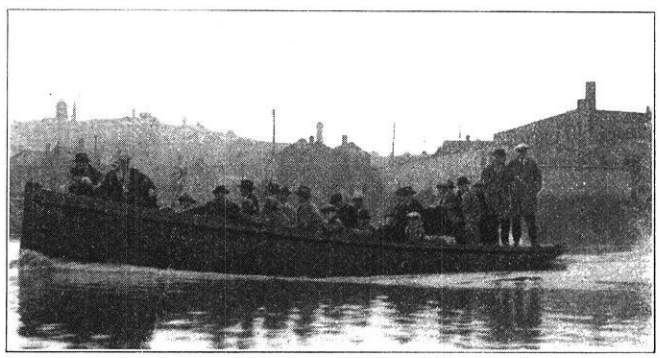
The minor details, however, seemed to be in predominance. It is rumored that "Spike" Carlson and "Pancho" Hebda saw "Jud" Smith at the Gayety "Real Burlesque" on Tuesday evening. The rumor also has it that he had a front row seat. Jud refuses to comment, and careful investigation has not been able to confirm or deny the report. Perhaps the incident is doomed to pass on with the unsolved mysteries of A. Conan Doyle and who stole the Chicago tickets. Further rumors have it that "Sheik" Cahill on that night began the first of a series of nightly dates. By midnight all the boys had reached the country town, most of them registering at the Gilpatrick Hotel, "Always Worth While" (Paid Adv.)

Wednesday morning saw the beginning of the three-day endurance hike known as an inspection trip. Bill



"Lenny" Smith shows the boys how pavements are laid

Kinne led the procession of forty students to the environs of the city hall, where a guide was obtained. The morning was spent in viewing various and sundry bridges over Milwaukee's open sewer — they call it a river. The most interesting and important bridge inspected was the imaginary one that Moe tried to cross. It appears that he had taken the third light off a match, and in his excitement he stepped onto his imaginary bridge. The only difficulty was that there wasn't any bridge. According to Moe, the temperature of the water was "too damn" cold. Immediately after the incident, Moe swore that he would never again take a third light. He did manage to get his trousers damp enough to be excused from further participation in



The ship to which there wasn't any bridge

the morning's activities; so the ill fortune was not without its amenities.

Moe, you know, is a man who never does things half way. "All or nothing" is his motto. That afternoon he lived up to it. While passing through the rivet-making department of the Milwaukee Bridge Works, Moe thought that he would help Charlie Corp collect a few samples, after the manner of "Sparky" at Gary. He intended to deposit the samples in Corp's pocket without too much disturbance. Moe began by picking up a red hot rivet, but for some reason or other ceased his activities very suddenly to the accompaniment of language unfit for print. The incident reminds one of the old adage, "He that sitteth on a red hot stove shall rise again." "Jim" Whiteside, not to be outdone by Moe, stepped into a can of red paint and beautifully decorated the lower portion of his trousers. He didn't fuss that night.

Speaking of fussing, next to Cahill, Pancho Hebda and Jud Smith hold the trip championship. The first night in town these two boys wandered into Child's and introduced themselves (to put it politely) to a couple of the sirens of Grand Avenue. Rumor has it that along toward midnight the boys bought a part interest in the Yellow Cab Company of Milwaukee and enjoyed the dividends on a moonlight ride through the suburbs. Hebda later said, "It was worth the four bucks." Later, at the Allis-Chalmers plant, Hedba

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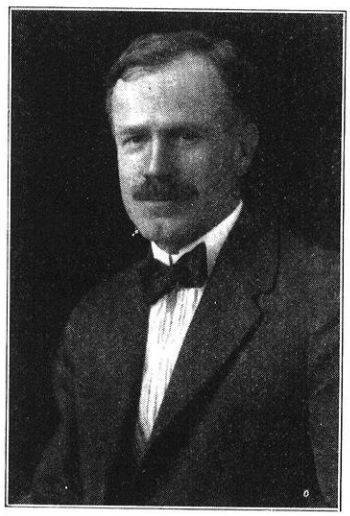
WHY DO RESEARCH

By W. E. FORSYTHE
Director of Nela Park Research Laboratory

THERE are any number of reasons for research. Some people give their time to this because they cannot help themselves. Dr. Comstock, Professor Emeritus of Astronomy at the University of Wisconsin, once said that after he had received his degree in law and had been admitted to the bar, he could not get his mind off astronomy, and that he found himself time and again taking up his books on that subject. The result was that he gave up law, returned to the university, and took a post-graduate course in astronomy. Dr. Comstock became Professor of Astronomy at the University of Wisconsin and finally Dean of the Graduate School, and a member of the National Academy of Science. When I heard him talk a few years ago, he said he had never regretted giving up law and devoting his life to the study of the stars. Due to a love for science, the world probably lost a great judge but gained a great example and teacher.



DR. W. E. FORSYTHE

Research must be done by the people and also by the industries, if either expects to keep pace with the increasing knowledge of the world. Of course, if the whole world would agree to stop where it is now, we could get along for a time; no progress, however, means in the end a backward movement. It is hard to think of men as we know them not getting curious. Research, in one form or other, has been carried on ever since man has been on the earth. It is pretty hard for us to imagine the conditions as they must have existed before the many things that contribute to our well being were worked out. When the type of man who inhabited the world ages ago found out that he could outwit the animals and could plan for his advancement in a manner different from what he did yesterday, and then again make a new plan for tomorrow, it must have given him a great thrill. At that instant he knew and could prove that he was superior to the animals. When he found that he could pick up a stone or club, and thereby gain a great advantage over all animals, his real progress began.

The First Research

We are inclined to laugh at the early attempts at making weapons, but is it certain that we should? The first sharp stone that was fixed onto the end of a stick was relatively a greater achievement than some of our present day discoveries. Think of the work required to find the best stone and then to get it into the best shape. The best method of fastening the stone to the handle was no small accomplishment.

The need for such investigation was real for these ancient men; their lives depended upon it. They not only had to struggle with the wild animals, but their neighbors were none too friendly. Even in those dangerous days, now and then some man must have been interested in finding out why and how things happened just for the fun of it. If he ever took a walk through the woods with a small boy, there is not much doubt but that he had his attention called to several things he did not fully understand.

Very rapid advancement could not be expected under the conditions that then existed. After the earth had been made a more safe and comfortable place in which to live, more time was available for investigating some of the things taking place in the world. Unless the man interested in research has time to think and study over his problems without interruptions, the best work will not result. Dr. Moulton, Professor of Cellestial Mechanics at the University of Chicago, says the reason he has been able to get some interesting results in that troublesome field is because he has had time to sit at his desk and think about such things. It is not to be expected that the best work in any field can be done by a man who is busy with his regular job and can spend only a small amount of time on research. A man, not long ago, gave a report of some research he had done. His results were apparently very good, but he showed such a poor knowledge of the very basis of his work that he did not convince many of his hearers of the value of his research. This man's regular work is supposed to take about 75 to 80% of his time, and his investigating is only a bit of a sideline. Someone working under these conditions may discover a very important fact, but in general he would not expect results such as are obtained by Professor Wood of Johns Hopkins, Professor Michelson of Chicago, or Professor Millikan of the California Institute of Technology. These men all have plenty of time to think about their problems.

It has been said that formerly a very long time elapsed between the announcement of the results of an investigation and the practical application of the results. Sometimes many years and even centuries elapsed before results were put to use. Indeed, some of the most important results, when first announced, were thought to be very trivial. When Faraday first showed the Royal Society of London his dynamo, that is, a machine that would rotate as a result of electric current going through it, many of the men at that meeting questioned what advantage could be expected from such a contrivance.

Ramsey made a number of experiments on methods of separating a number of gases because he wanted to study the properties of these various gases. Later, when it became necessary to make pure nitrogen the methods were known and it required only a practical way of doing it on a large scale. The same thing is true of argon. Today there is no trouble in getting an argon-nitrogen mixture that is about 85% or more argon. If need comes for practically pure argon in quantities, there is not much doubt but that it can be met.

The Need For Research

The need for research is very pressing today. The great accumulation of facts has been well used up in various practical ways. Thus, if one wants to introduce new facts or processes, it is necessary to get the facts and work out relations first hand. Tungsten, and also many of its properties, was well known many years before it was used as lamp material. This is true of a number of investigations in past years, where many years have elapsed between the publication of the results and their being put to use. Today the work is hardly completed before plans are made for the use of the results. Hafnium has now been known for a short time, however, the possibilities of its use for practical purposes are well known.

The effect of constant research on the development of an industry is shown by the advance in the art of communication. Think for a moment of the great changes in the telegraph and telephone since they were first introduced. Except for the many improvements, the telegraph and telephone companies could not transmit their growing business with anything like their present success. This great advance can be traced directly to the research work that has been done in this field. Today the Bell Telephone Company has some 1500 men working on this very problem.

On the other hand, consider the condition of the railroads. They have not maintained any large research laboratories for a study of their own problems. Advancements have been made in a haphazard way by various employees getting an idea and passing this on to the manufacturers. Also many of their improvements have come from the outside. They have many problems that could be attacked much better in a laboratory of their own than can be worked upon by someone outside their industry. Today the railroads are not in a very satisfactory condition. It is conceivable that, if fifteen or twenty years ago the railroads (the electric railways should be included) had established a laboratory to study their problems, they would now be equipped to meet modern demands. It is almost a crime that so many of the electric railways are being torn up. It is within the realm of possibility that the public will some day regret this. It is almost certain that this condition could have been avoided by a study of various conditions and problems.

Several years ago, in Cleveland, Mr. J. D. Cox started making twist drills. He worked out a method of cutting the drills and also had, as he thought, a very good method of tempering them. One day he received an order for quite a number of drills but with the specification that they were not to be tempered. He thought this strange, but sent the drills. This was repeated a time or two and Mr. Cox got curious as to what it was all about. He asked his customer why he was buying untempered drills when he could have them tempered at the same price. His customer, Mr. Morris, the inventor of the disappearing filament optical pyrometer, told him it was because he knew how to temper the drills better than Mr. Cox could do the job. Mr. Cox looked into the matter and found out that, while he had been heating his drills in a bed of coals and tempering them by dipping them in water, Mr. Morris had found that he got much more uniform results if the drills were heated to a definite temperature before they were dipped in water. Mr. Morris was heating the drills in a lead bath which was held at a constant temperature by the use of his optical pyrometer. Mr. Cox made arrangements to install this method, and if you will visit the Cleveland Twist Drill Company you will find them very carefully measuring the temperature of the lead bath for tempering their drills.

Reasons For Research

Research work may have a definite purpose in view, or it may be conducted to find some interesting fact. Thus, the research may be carried on for the fun of the thing or it may be because there is real need for a certain product. The large part of such work that is done by the leading men in our great universities is done because they like to do it. I once heard Professor Michelson discussing the reasons why he undertook a certain problem, and he said that the main reason was because it was good sport, but since he had to satisfy other practical people he had to think up a practical reason. Judging from Professor Michelson's talk he was much more interested in the fun of the thing than in any practical applications.

The satisfactory carrying on of any line of research is dependent upon three factors. First, able men who are well trained; second, good equipment to work with; and, third, good conditions under which to work. The first, of course, is most important. If the proper man is found some results will be obtained under almost any conditions, but it is certain that the best results will be obtained if some attention is paid to the other two conditions. Too often either a poor man or one with insufficient training is put upon an important problem with very unsatisfactory results. A particular investigation has been carried on recently in two different laboratories that illustrates this principle very well. In the first laboratory a very able young man, who was not at all well trained, was put on the problem which was not a simple one, and for this reason more care should have been taken in selecting the man to

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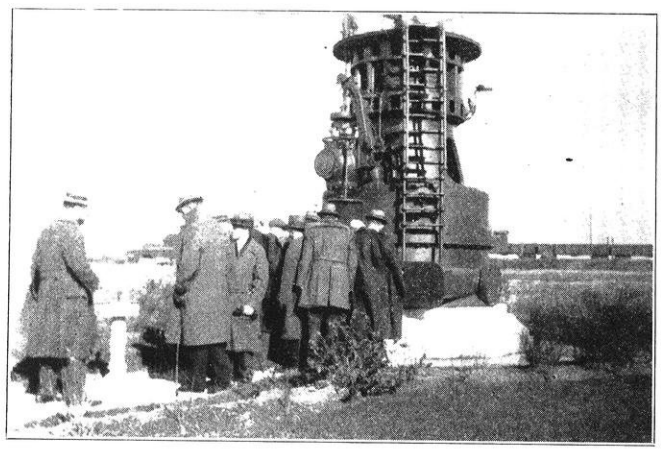
THE MECHANICAL-ELECTRICAL INSPECTION TRIP

By R. H. SOGARD, *Senior Mechanical*

ACCORDING to custom, the senior mechanicals and electricals vacated the class rooms for a week this fall to ramble about the country and make sure that our more important industries were being correctly operated.



One of Lakeside's first turbines is now the center of a flower bed

The tribe assembled at the Public Service Building in Milwaukee on Monday morning, November 16. Contrary to posted warnings in Room 312, Joe Hanzel had his fur coat along. The mechanicals went to Falk's first, where there were enough gears and shafts to satisfy even "Pat" Hyland, while the electricals took their special car to The Allis-Chalmers Company, where they feasted their eyes on big stuff in the making. After the morning inspection the Allis-Chalmers Company treated the electricals to a luncheon that was done credit to by all concerned. It was whispered that Ralph Brooks was seen flirting with one of the waitresses. After taking on a few pounds of molding sand under their collars the, M. E.'s took the special to Nordbergs. The car made a return trip back across the viaduct to pick up the lost sheep, who proved "Gus" Larson's prophecy that someone would always be left behind. At Nordberg's everyone gazed in wonder at the 4000 h. p. Diesels built for work in the Panama Canal zone.

In the afternoon, the M. E.'s first visited the A. O. Smith plant. The automatic plant drew from one of the faculty members the remark that he wished students could at times be as accurate and regular. From A. O. Smith's, the yellow hearse headed for the Riverside Pumping Station. On arrival, the pilots of the party became a trifle mixed, and landed most of the bunch in the rear of the pumping station. The hill was descended with much glee by all save Pat Hyland, who gravely and carefully made his way down, meanwhile puffing his stogie. The few who went in the front door found a sign "Welcome, Engineers" overhead. Mr. Krieger, chief of city power plants, had everything labelled, and the thorough trip thru the station showed it to be neat, clean, and efficient. The electricals, in the meantime, had left the Allis-Chalmers Company for the Westinghouse Lamp Works, where all the complex processes in the manufacture of lamps were disclosed. About seventy-five per cent of the people employed at these works are girls; the guides had quite a time keeping their respective groups together.

Tuesday morning came, but Hanzel's fur coat came not with it. Joe had resigned himself to a topcoat. So in peace of mind, the outfit went to the Lakeside plant of the T. M. E. R. & L. Co. Mr. Anderson, the chief engineer, explained things in advance, assisted by Drewry, '21, and Schubert, '24, both T. M. E. R. & L. men. After the plant had been inspected, Mr. Anderson conducted a question and answer talk; it certainly was not his fault if the plant was not well understood, for he was most painstaking to clear things up. The electricals, on this same morning, retraced the footsteps of the mechanicals and visited the Falk Corporation, collecting under their collars what few pounds of molding sand was left. Feeling assured that everything at the Falk Corporation was running smoothly, the electricals took their car back to the 36th Street sub-station of T. M. E. R. & L. Company, where everyone was glad to meet "Tiny" Kwasigroch as one of the guides. The intricate details of automatic control work was explained to all and actual tests made to illustrate them.

At noon, the mechanicals went to Allis-Chalmers where the Company served lunch to the hungry in-

The Electricals catch a few minutes rest

spectors as the Company's guests. Frieden was heard to ask who this Alice Chalmers might be, and why wasn't she around. After warbling a couple of songs, the afternoon was spent in looking over the plant. Herb

Lange, who was staying in Milwaukee with a friend, had left the house Monday morning and was unable to find it again Monday evening. He finally had to call Watertown to find where the place might be. Therefore Herb's friend took no chances on Tuesday, but pursued his weary way all afternoon thru the plant (Allis-Chalmers) with the rest, thus making sure of leading Herb safely home at night. In the afternoon the electricals found things most to their liking when they visited the Lakeside Power Station, first being treated to an illustrated lecture at T. M. E. R. & L. Company offices. The inspection of Lakeside was one of the greatest sources of interest to the electricals.

About Wednesday morning, everyone decided they had had enough of Milwaukee; so at 7:30 a special on the North Shore carried Wisconsin's best (or worst) to Kenosha. There the Nash plant and American Brass Company were looked over. Seastone expected to be presented with a Nash when he left the factory, but the guide stated that the custom of giving samples to unimportant visitors had been dropped. On the way to the American Brass, the electricals became lost, and were found sitting on the curb in despair (and weariness) when Mr. Rood came along and rescued them; however, the electricals are not to be blamed, for the route to the American Brass took them through the town of Kenosha. Witnesses testify that at this point of the trip Slama bought three rings of Bologna for his morning's lunch. Lunch was had at the Nash plant at noon, and then the Nash office girls danced with the bolder members of the party. Some of the affianced men danced with more or less fear of having their act broadcasted on their return to school.

Next the special took the bunch to Waukegan, where they investigated the American Steel and Wire Company. It's worthy of note that five straggling electricals (no names mentioned) became separated from the flock at Kenosha; it was announced that the special would leave Kenosha at 1:30 instead of 1:15 as scheduled; the five woebegone E. E.'s returned to the meeting place just in time to see the tail end of the special in th distance; however, they took the next regular train and caught up with the gang someplace in the plant of the American Steel and Wire Company. Clark spent most of that trip leaning on someone else. The nail machines and barbed wire machines in this plant were especially interesting. At 4:30, the special navigated off for Chicago, arriving downtown shortly before six. A couple of the inspectors took a cab to the Morrison, but the ones who trusted to their feet beat them to it.

Bright and early Thursday morning, the gang departed for Buffington, Indiana, and saw the plant of the Universal Portland Cement Company. The worthy inspectors were clad in long coats and hunting caps for the trip thru the plant. The air around the plant was unusually free from dust that day, it being a damp day with a wind toward the lake. Simeplaar tried to explain to his guide that Portland cement (according to the famous Mechanics 53 definition) was an "intimate and properly proportioned mixture of argillaceous and calcareous materials, etc.", but the guide seemed not at all impressed. After the inspection while waiting for the train, a penny pitching match was held on the station platform. Although many showed proficiency, Arnold was the best, and managed to collect railroad fare in about fifteen minutes. When the train came (and saved Slama from bankruptcy), it took the crew to Gary, where, after lunch, they invaded the steel works of the United States Steel Corporation. Breitenbach, to his great glee, discovered a huge pile of *flux* in front of an open hearth furnace, whereat the mechanicals immediately seized a sample to prove to the E. E. department back home that there *is* flux. Shoemaker, after the inspection, piloted several to the electric line. The several finally arrived at Chicago at a quarter of six, while those who were wise enough to take the New York Central, got back at 4:30. On this return trip all sorts of plans were discussed for entertainment that evening; it's said that the Hay-

Somebody gets his lunch by pitching pennies

market theatre was well filled that night — "write your own ticket".

On Friday morning, the Hawthorne plant of the Western Electric received the wanderers. The Western Electric (b'ess 'em) had only five men to a guide, so that all had a chance to hear the explanations. The trip, although long, was very interesting, because telephone construction is not as simple as a student in physics might think. Most of the guides were Wisconsin grads. At noon, as Company guests, the bunch was served a most excellent lunch. After the feed a group picture was taken. All in all, the Western Electric treated the bunch as though they had been famous men in the profession, and their hospitality and consideration will not be forgotten.

That afternoon, the Crawford Avenue Power Plant of the Commonwealth Edison was scheduled for the once-over. The Edison Company had chartered North Shore busses for the foot-sore inspectors, and said busses scooped up their loads at the Western Electric plant, and took them to the power plant. Here most

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THE ENGINEERING CURRICULUM

As Seen By Some Alumni

A RECENT attempt was made by Dean Turneaure to determine the opinions of alumni regarding the engineering curriculum. Questionaires were sent to alumni who have been out for several years, and the replies were treated confidentially. The committee has not yet reached definite conclusions which can be published, but some statements made in letters accompanying the returned questionaires were pertinent and may prove of interest to readers of *The Wisconsin Engineer.*

An alumnus, who is now in patent-law work writes, "In general, I think my engineering training was very valuable and quite satisfactory, but there are certain points in which I think it was deficient. In particular, too much emphasis was placed on technical training intended to place the student in a position to be of some use to his employer immediately after graduation. I doubt whether many graduates of engineering schools are of much value immediately after graduation even when they have had extended training in technical work such as drafting, designing, laboratory work and the like, and I believe that the time in college would be much better spent if many of these purely technical courses were eliminated and others reduced in scope so that more time could be devoted to courses which are purely cultural in character. In my opinion, the purpose of an engineering education should be to give the student a broad cultural background as well as a general knowledge of engineering industry, and the effort to make the engineering school a trade school should be carefully avoided. It is time enough for the student to learn the details of a particular job after he has graduated, and my observation leads me to believe that it is necessary for him to do this anyway, even where he has had extensive training in purely technical courses in an engineering school.

"Moreover I am convinced that a large proportion of the graduates of engineering schools do not follow the profession of engineering, in a technical sense, after graduation. Their duties are usually along the line of business management, salesmanship, and so forth, for which the technical engineering course gives no training. I think it would be well to abolish, for undergraduates, all distinctions between the engineering courses as now organized, and give one course in general engineering, including in that course a generous allotment of courses in English, Economics, Logic, Political Science, Public Speaking, Money and Banking, and so forth, thereby producing a broader and more cultured graduate who could then, if he wishes to, specialize in one of the several branches of engineering.

"Another way in which the engineering training might be improved is the giving of more advice and general information to engineering students, particularly when they are freshmen. Most freshmen students in engineering schools do not know why they are there. They have taken up the study of engineering merely because they have been advised to do so by their parents, or their school teachers, or others who are not in a position to advise them correctly. It naturally follows that many of them are misfits and, if not dropped because of low scholarship, they often do not find it out until they graduate. The test of scholarship is not the only one of fitness for the engineering profession. I suggest that an organized effort be made by the engineering faculty to give to all freshmen, as soon as they enter the school, advice and instruction concerning the nature, purposes, and ideals of the engineering profession, as well as information concerning the kind of work the graduate may expect to do when he leaves school, thereby exciting the ambition of those who have a taste for engineering and disillusioning those who have not."

Suggests Business Training

Another alumnus suggests some business training. He says, "It has been my experience with engineers just out of college and also with most of the older ones, that they were not at all familiar with the principles underlying modern business methods, which fact handicapped them severely and retarded their progress. They do not seem to appreciate that the human element in an organization is more important than the material.

"A knowledge of Office Administration, Business Organization, Accounting Principles, Finance, etc., would be of inestimable value. A study of the principles of Scientific Management would accelerate the engineer's progress in both the office, field and plant. Of course only the high spots could be touched, but they would know the importance of these things and it would give them the correct attitude. Personally I do not think that the four year undergraduate course is long enough to give the engineer the broad education that would best serve his interests."

Still another alumnus, who has had considerable experience with graduates of engineering schools, writes, "There is another feature, which I see at some of the engineering schools but do not know whether it is general or not, a feature that, it seems to me, is very destructive of initiative and self-reliance. That is the practise of attempting to maintain high school discipline in a technical school. I believe in the English system, where a man's attendance on lectures is entirely voluntary. I can see no reason for refusing to give credit, so long as a man can pass the examinations, if he has a certain number of "cuts" charged against him. I

(Continued on page 96)

Engineering Review

J. P. SMITH AND R. A. MILLERMASTER

NEW ENGINEERING EXPERIMENT STATION BULLETIN

Comparative tests of button head and countersunk riveted joints, is the title of a recent bulletin by Professor J. B. Kommers. The investigation on which this bulletin is based was begun by two engineering students. During the school year 1922-23, Frank L. Bumer and Ora C. Rabbitt, civil engineering seniors, carried on a series of tests on button head and countersunk riveted joints as a project for a senior thesis. Further tests were made in the summer of 1923 by Professor Kommers, and in 1924 by Carl L. Neumeister and Rufus S. Phillips, instructors in the Mechanics Department. The need for the investigation and the results obtained are shown by the following quotations from the bulletin:

"From these quotations it will be noted that engineers concerned with bridges and buildings believe that countersunk rivets are not as strong as button head rivets. The statements of the ship constructors, previously quoted, show that these men believe that countersunk rivets are stronger than button head rivets. While the test results given above show that there is not much experimental information available on the comparative strength of countersunk and button head rivets, yet the majority of the results seem to show that there is little basis for the prejudice of the engineer of bridges and buildings against countersunk rivets."

"From the results of all the tests, including tension and bending, the following general conclusions may be drawn:

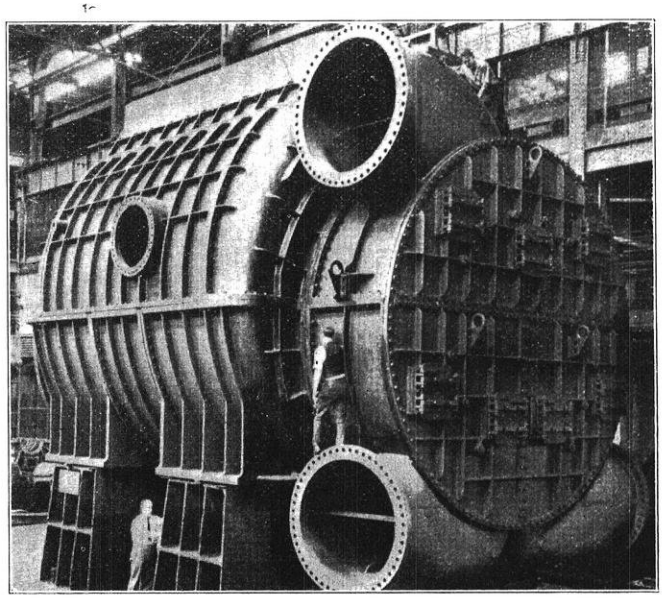
1. For riveted joints in which strength is the primary consideration, either button head or countersunk rivets may be used.
2. For riveted joints in which great rigidity is desired, button head rivets should be used rather than countersunk.
3. Because joints with countersunk rivets showed high strength and very considerable deformation, the indication is that for joints which may be subject to impact or collision, and in which a high capacity for the absorption of energy is desirable, countersunk rivets should be used rather than button head."

HIGH SPEED MOTORS

In the endeavor to reach high speeds of rotation, friction and the difficulty of getting perfect centering, generally intervene to veto success. E. Henriot and E. Huguenard of France have devised a motor operated by compressed air in which the rotating part is supported upon the escaping gas. This avoids friction and at the same time makes it possible for the rotor to chose its axis of rotation for itself. Such a rotor, 11.7 m.m in diameter was maintained for hours at a speed of 4,000 rev. per second, and could be speeded up to 11,000 rev. per second.

WORLD'S LARGEST SINGLE CONDENSER COMPLETED

The largest single steam condenser ever built was completed July 24 at the South Philadelphia Works of The Westinghouse Electric Company. It will be installed at the new Richmond Station of the Philadelphia Electric Company, which will, upon its completion, be the largest simple steam power unit ever built. The condenser will circulate 150,000,000 gallons of water daily, which is one-half of the daily water consumption of the City of Philadelphia. The condenser, together



The World's largest single steam condenser

with the auxiliary equipment, will weigh 985,000 pounds and will have a total cooling surface of 70,000 square feet.

A METHOD OF DETERMINING A. C. FREQUENCY

A method recently developed involves the use of a vibrating bar. A thin steel rod is held in a clamp so that one end projects free. The end distant from the clamp is not supported. An electromagnet traversed by the alternating current is brought near the rod, and the length of the latter adjusted until by resonance it is brought into vibration by the electro magnet. The rod may either be used alone or with a magnetizing coil coaxial with it. By adjustments, the rod can be made to respond to magnetically applied forces of either once or twice the frequency of the current.

—*Journal of the Franklin Institute.*

Editorials

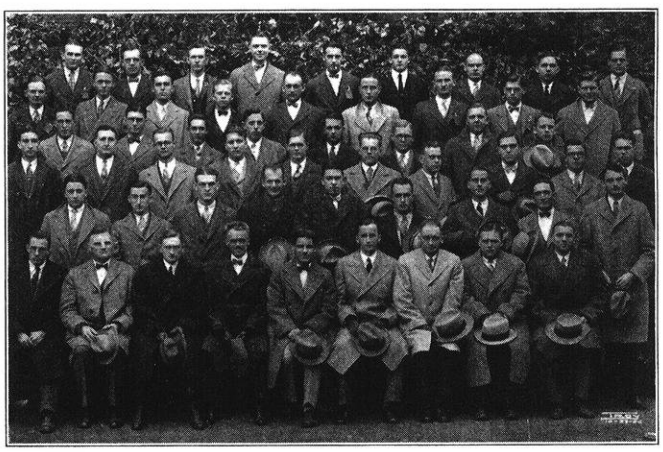
PHYSICALLY FIT Everyone of normal mentality values his health, next to his honor, as his most important asset. But the common opinion nowadays seems to be that to be physically fit one must be able to lift the front end of a Cadillac twelve inches off the ground. Business men who become exhausted from mental labor add to that exhaustion by playing 36 holes of golf on Sundays or off days.

From practice and common sense, one can see that it is impossible for the average person to do hard mental labor and hard physical labor. Good health means resistance to disease and fatigue, the ability to work all of the neeessary time, and the possibility of enjoying play. It is far easier to maintain that health by moderate living habits than by excessive habits. Overeating is bound to slow one up, no matter how much physical exercise he may take, as is too little sleep, and too much smoking. It is better and easier to keep poisons out of the system than to get them in and then work hard to throw them out. Hard work is fine, but rest and relaxation are necessary. Between being as hard as a prize-fighter and fat and soft as a pillow, is the happy medium of a clean and well ordered physical system. Overtraining is as bad as undertraining, and athletes who do not taper off a strenuous physical existence with shrinking amounts of exercise are bound to suffer for it. One may point to Chauncey M. Depew, ex-senator and financier, who is over 90 and physically fit, as a well balanced man. Continuous performance is what is required nowadays.

"To select well among old things is almost equal to inventing new ones." —*Trublet.*

AGE AND YOUTH During the past week an editor of *Engineering News-Record* had occasion to attend two meetings. At one, a number of practicing engineers, all at least twenty years out of college, asserted that engineering education is becoming mechanized, that the recent graduates are too technical and absorbed too greatly in the details of engineering minutiae, that they all stand in need of wider outlook and broader background. The other meeting was a group of the editors and business managers of a score of the magazines published by the undergraduates of engineering schools. Throughout a busy day's session these young men discussed the problems of their avocations. And from a long experience in attending technical meetings this editor can say that never has he heard more direct, confident, precise and clear speech than these same undergraduates used. What each had to say, he said explicitly and stopped; repetition was rare, hesitation was non-existent. Can as much be said of the average engineering meeting? Emphatically, no! And since the ability to think clearly and to express that thought succinctly is one of the best outward evidences of those qualities the engineers in the mature meeting found lacking in their younger brethren, the thought became inescapable that these gentlemen — who, indeed, were voicing a common enough thought among engineers — are attacking a straw man. * * * *

The above editorial appeared in the *Engineering News-Record* for October 29, 1925. The writer refers to the Engineering College Magazines, Associated, convention held at Cornell this fall. *The Wisconsin Engineer* believes that the staff of an engineering college publication is made up of men who are representative of engineering students.



The E. C. M. A. Group at Cornell

THEY FAIL TO PROFIT BY THEIR OWN MISTAKES A rather stupid fellow was put to work in a woodyard, cutting up stove wood with a power-saw. Fascinated by the hazy circle at the outer edge of the circular saw, he put his finger over it; the finger came off. As he stood gazing at the bleeding stump, the foreman came up and demanded, "How did that happen?" "Blest if I know," answered the victim, "I just put my finger over the saw like that — My Gawd! There goes another one!"

A certain instructor gave a quiz which was flunked by the usual number of men. Within a week, the identical quiz was given again, and almost to a man the flunkers repeated. Two weeks later, the quiz was given for the third time — going the saw victim one better — and for the third time the flunkers did their stuff. Any instructor who is curious about the matter can readily convince himself by making the experiment.

It is difficult to understand the mental processes of a student engineer who fails to make himself master of the things which down him in a quiz.

Campus Notes

J. Levin

HOW TO STUDY

By Will I. Passe

1. Sleep about four hours a day — mostly during classes.
2. Indulge in no physical exercise whatsoever.
3. Allow your room to be the general council chamber wherein all the fellows in the house may meet to smoke and "swap" funny stories.
4. Have your materials scattered all over the room.
5. Sit down, open your book, and forwith begin dreaming of the little girl you danced with last Friday night.
6. After a while — when you think you have put in the *required* amount of time, close the book, yawn, stretch yourself, and call it a day.
7. Don your pajamas, hop into bed, and settle down in comfort with the last issue of College Humor or Whiz Bang.

Wm. Steuber, c '27, well known authority on hydraulics, performs a difficult experiment.

JUST A SAMPLE OF ENGINEERING INGENUITY

That the engineer's ingenuity in worming his way out of tight places has long been a matter of tradition is well borne out by this Canterbury Tale of an eighteenth century surveyor who, when he had lost his bearings in the Dismal Swamp and had wandered about for several days without catching a glimpse of the sun, reminded himself "of a secret his Countrymen make use of to pilot themselves on a dark day".

"He took a fat louse out of his collar, and exposed it to the open day on a piece of white paper which he had brought along with him. . . The poor insect having no eyelids, turned himself about till he found the darkest part of the heavens; and so the surveyor made the best of his way to the North."

Loose automobile nuts are more dangerous when one of them is driving. —*Exchange*

THE ENGINEERS' DANCE

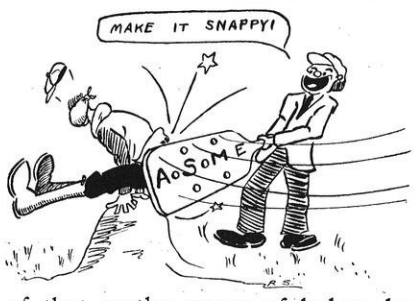
All monkey wrenches, slide-rules, and log tables were laid adise on the evening of November 28, while the engineers stepped forth with their ladies at the annual Engineers' Dance held at the Women's Building under the auspices of Polygon, the all-college steering committee. Prof. and Mrs. E. R. Shorey and Prof. and Mrs. G. J. Barker chaperoned the party.

Last year, it will be recalled, the engineers and the lawyers checked their wrenches, canes, and other

weapones of slaughter, at the door, forgot their petty differences, and joined in the "whirl". By some of our far-seeing sages it was foretold that engineers and lawyers would soon learn to tolerate each other; but there still were a few rebels among us who declared in no very uncertain terms that "We'd as lief trust a fox as a lawyer". And by the emerald robe of St. Patrick, those shysters proved themselves guilty of betraying the trust reposed in them!

A. S. M. E. STAGES UNIQUE INITIATION

If our memory serves us faithfully, we are willing to wager dollars to doughnuts that the members of the A. S. M. E. who were paddled into society, the evening of November 12, will remember that initiation for many a moon to come. Our old friend, Chaucer, would have climbed to the seventh heaven of delight to have witnessed the initiation of that motley array of hobos, bozos, or what not, clad in overalls which were several sizes too big, and blindfolded with huge red bandanas. With the theory that after the brawl comes the feast, the new members were refreshed with a generous supply of cider and doughnuts. Suffice it to say that the initiates were still in a state of mental and physical disorder when the meeting broke up.



CAMPUS NOTES

(Continued from page 78)

A. S. C. E. INITIATES

"Well done, me byes!" would have been St. Patrick's exclamation had he been at the A. S. C. E. initiation, November 12. The theatre of operations included the whole campus. Initiates, numbering a score or more, were posted all the way from behind the Hydraulics Laboratory and on top of the ski jump to the steps of Barnard and Chadbourne. It was a rare night, for most of the potential members were wind-swept before they received that tap which decided their fate. After all of the new members had been rounded up in the Engineering Building, a goodly gathering settled down to a healthy "feed" of cider and doughnuts — the proverbial sign of good cheer when the sons of St. Pat are in town.

PI TAU SIGMA INITIATES

Nine men were initiated by Pi Tau Sigma, honorary mechanical engineering fraternity, on Thursday, December 3, 1925. There were five seniors: A. B. Arnold, O. H. Meili, R. W. McCauley, C. S. Schowalter, and R. L. Perry. The four juniors were: G. M. Little, C. W. Jahn, M. J. Williams, and C. W. Johnson.

Professor "Pat" Hyland was toastmaster at the banquet following the initiation, and he called on Professors C. I. Corp and G. L. Larson as the principal speakers. Professor Larson is the vice president of the national fraternity. Henry Clark welcomed the initiates into the fraternity, and Russell Perry responded for the new men. Pat called on several others to speak informally, as well as the regular speakers. The ceremonies were held at the University Club.

R. E. Puerner, assistant professor of machine design, announces the arrival of a baby daughter, Sarah May, November 19.

Speaking of practical illustrations of engineering principles by faculty members, we recall the three-dimensional rotation of one of our mechanics instructors who gave a realistic demonstration of an Essex coupe rotating 180° in the xy plane and 90° in the yx plane, simultaneously. Unfortunately, the class was not present at the demonstration, and considering the present condition of the car, it is highly improbable that the experiment will be repeated.

Lisle S. Zodtner, ch '26, captain of the varsity wrestling team, was the innocent cause of a sudden splotch of gray hair on Coach Hitchcock's head a few weeks ago. For three days in succession Lisle had not appeared at the gym, nor had any of his friends seen him; consequently, the coach almost lost his head worrying about "Zoddie". Who was it that said something to the effect that great joy is akin to deep grief, or vice versa? Well, anxiety quickly turned to joy when the maid at Zodtner's fraternity discovered the blameless one in the basement hard at work trying to develop a method for repairing broken test tubes for some frosh Chemicals.

Tau Beta Pi, honorary engineering fraternity, announces the election of the following sixteen engineers who have been chosen by virtue of their high scholastic attainments:

Civil engineers: L. W. Empey, G. F. Liddle, B. F. Smith, J. D. Smith, R. J. Piltz, R. R. Schrader; mechanical engineers: R. L. Perry, A. P. Rasmussen, R. H. Sogard, G. C. Breitenbach; electrical engineers: O. E. Anderson, H. C. Wolfe, A. S. Holmquist, N. G. Robisch; chemical engineer: A. P. Colburn; high junior, Emil A. Abendroth, civil engineer.

TRUTH WHICH IS STRANGER THAN FICTION

It's a fact — "Danny" Mead sucumbed to the wiles of a pretty "Octy" saleslady.

The following men were initiated into Chi Epsilon, honorary civil engineering fraternity, on November 24:

Honorary members, Professor Daniel W. Mead, Professor Morton O. Withey. Student members, LeRoy W. Empey '26, George F. Liddle '27, Walter J. Parsons '26, Bert K. Preston '26, Emil A. Abendroth '27, William Z. Lidicker '27.

THEY SHOULD WRITE A DICTIONARY

The Civils, in their engineering English, continue to produce startling definitions. The authenticity of the following is vouched for by Professor Van Hagan.

Agrarian—grass eating.
Cadaverous—meat eating.
Rational—out of the ordinary.
Empirical—average.
Anthropoid—pertaining to the feet.
Annular—yearly.
Nadir—a ruler.
Biennium—a plant that lives only a year.
Myriad—a fairy story.
Indigent—offended.

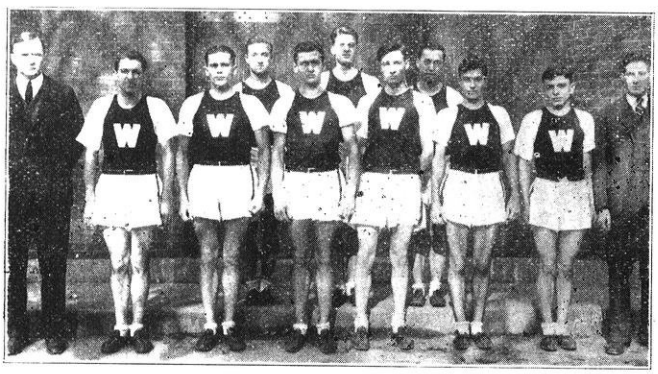
Yea, we thought so. So didn't we. Better look 'em up.

Athletics

B. R. TEARE

THE CROSS COUNTRY SEASON

With the running of the conference meet, this year's cross country season is closed, and Coach Mead Burke may add another success to his list, already long for the five years he has been at Wisconsin. The Cardinal runners have won the conference championship and each of the dual meets in which they participated. The College of Engineering has been well represented on the team by Elleson, junior civil, who added his bit to the score by placing third, second of the Badgers, in the conference meet.



The Cross Country Championship Team

Only one man, Captain Kubly, will be lost to the next year's squad, and with the addition of several other likely men, it looks as if the 1926 aggregation would also be a strong contender for conference honors. George Schutt has been elected to the captaincy for the next year. He is not only a successful harrier, but also has won his "W" in track, and with his experience should prove an able leader.

THE MICHIGAN STATE GAME

On "Dad's Day", November 14, before a crowd of 20,000, the Wisconsin football team downed the strong Michigan State team by a score of 21-10. The teams were closely matched and it was no easy game for the Badgers. From the first moment of play until the gun was fired, the game was full of thrills, and anxious moments came too often when the Aggies broke through the line for a series of gains. Both teams were good on the offensive, but lacked any remarkable strength on the defensive. Wisconsin's score came from touchdowns made by Crofoot, Captain Polaski, and McAndrews; the opponent's was made by a touchdown and a 40 yard drop kick. Unfortunately, this game did not count on the conference standing of the Badgers, but it was excellent preparation for the fight of the season with Chicago.

THE CHICAGO GAME

In the final game of the season on November 21, the Cardinal grid team proved its real ability to come back, and showed plenty of fight for even the most enthusiastic fans. It was a hard earned victory, and also a very satisfactory one, the final score being 20-7. For the first three quarters of the game the team faced a 7-6 defeat, but instead of discouraging them, it only gave them more fight. Finally, when they came back in the last period, under the leadership of Captain Steve Polaski, they crashed through again and again for substantial gains, and nothing the Maroons could do would stop them. When the gun was fired at the end of the game, they were still going strong and with only a little more time could have added to the score.

The line was playing the best of the season in that game, and twice it held within a yard of the Badger goal when Chicago seriously threatened it. Then, too, the backfield played very well, and the unbeatable manner of the advances in the last quarter may well have staggered the Staggmen.

This victory against the old traditional rival of Wisconsin, the first in several years, made a most fitting ending to a successful football season.

THE FOOTBALL SEASON

The 1925 football season, closed by the Chicago game, is the best of recent years, and markedly so. Not only is this true because Wisconsin is tied for second in the conference, instead of in a cellar position, but because of the change of attitude of the students. Athletics has become more important than before, but even above winning is held the importance of a clean, fighting squad, which never stops playing until the gun is fired, and a squad which is backed by the entire student body. To Coach Little goes most of the credit for the season's success, and the way in which the team worked for him shows what they think of him.

The engineers have been well represented on the varsity football squad this year as in other years. In addition to Captain Steve Polaski, their number includes Saltzstein, Splees, Conry, Carlson, Kuehlthau, and Wigdale.

Some of the best players of this year's team will be lost by graduation, among them Polaski, McAndrews, Leo Harmon, Stipek, Nelson, and Blackman, but a wealth of good material left, including "W" wearers, assures us of the foundation at least of a good team for next year. Doyle Harmon has been elected to the captaincy of the 1926 team, and by reason of his

(Continued on page 92)

Alumni Notes

R. T. HOMEWOOD

CHEMICALS

Edward Zaremba, ch '04, has changed his address to 33 Gates Circle, 5F, Buffalo, N. Y.

CIVILS

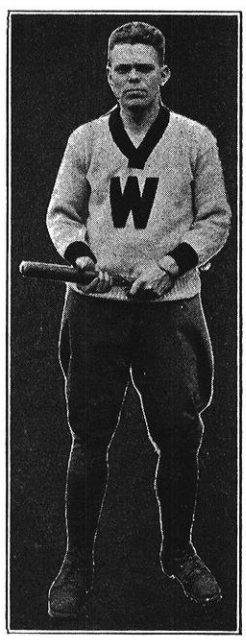
Onward Bates, c '97, (Hon.) has moved to his winter home at 934 John's Road, Augusta, Ga. His office is at 332 S. Michigan Ave., Chicago, Ill.

George H. Burgess, c '95, is now with Coverdale and Colpitts, Consulting Engineers at 66 Broadway, New York.

Jerry Donohue, c '07, Consulting Engineer, Sheboygan, Wisconsin, was in Madison for the Michigan Aggie football game, and spent some time visiting in the Hydraulic Laboratory. Mr. Donohue is President of the Jerry Donohue Engineering Company, and does consulting work on municipal improvements of all kinds in his section of the state.

Phil M. Ferguson, C. E. '24, is detailing and designing reinforced concrete work with Dwight P. Robinson & Co. of New York City. Address: 87 Post Avenue, New York.

Henry Ford, c '21, visited the Hydraulic Laboratory Friday, November 13. He has been, for the past two years, with L. A. DeGuere, Architect and Engineer, Wisconsin Rapids. He has recently accepted a position as engineer for a paper manufacturing company with headquarters at Dayton, Ohio.



Maurice "Moose" Hanson, c '19, is in St. Petersburg, Florida. He writes, "I suppose you are surprised to hear from me in this country. I set sail from Madison June 22, and after a 4,000 mile tour through the East we arrived July 27. So far my pal, C. W. Ever, ch. '25, and I have had a good time and believe that our stay in Florida is well worth while.

"Everyone is in building construction work and yours truly is a regular honest-to-goodness practical sanitary engineer. I am a member of St. Pat's Local 111 United Association Plumbers and Steam Fitters. I have the honor of being one of a few college graduate plumbers in captivity. I expect to tour all of Florida and work in various places.

"Before I come back I am planning on visiting Cuba, the Bahamas, and the Southern States." Hanson's address is 1525 Bay St., S., St. Petersburg, Fla.

N. M. Isabella, c '14, maintenance engineer with the Wisconsin Highway Commission, is the author of an article on "Gravel Road Maintenance", which appeared in the October number of "Engineering and Contracting".

William S. Johnson, c '17, is employed by the Arizona Highway Department as assistant to the Bridge Engineer. His address is 1337 East Brill St., Phoenix, Ariz.

F. A. Kaiser, c '18, has moved to 707 41st St., Milwaukee, Wis.

J. F. Kunesh, c '14, has left the Board of Transportation, City of New York, and has become connected with the Florida Railway Company. His address is Water Supply Engineer, Florida East Coast Ry., St. Augustine, Fla.

J. M. McCoy, c '25, is working in a railway survey party on location of a road from Bend to Klamath Falls, Oregon. He writes, "My rails at Devil's Lake has surely come in good. I am using the stuff every day, and in fact I have learned a lot about railroading that Van did not have time to put across. By the way, ask some of the fellows who know all about railroading what Ginnies are; it stuck me." McCoy's address is Waitsburg, Wash.

W. F. "Bill" Moehlman, c '22, writes from the iron mines at Coleraine, Minn. "I am building a couple of miles of railroad and bridges just now besides my mine work. It is interesting, but keeps me on the jump. I enjoyed the recent issue of the "Engineer" (October) very much and especially the article by Professor Corp."

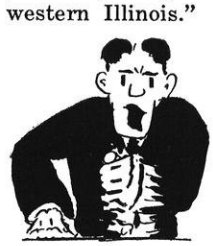
Melville C. Neel, c '20, is efficiency engineer at gas plant, Metropolitan Utilities District, Omaha, Nebraska. He writes, "My wife and I took a 2,000 mile trip through the Rockies this summer crossing the Continental Divide over the new Independence Pass which on account of the snow was rather a nerve-racking experience. My work at the Gas Plant has been interesting because I do the surveying, designing, drafting and constructing. I have had a chance to carry out my own ideas with but little interference and have also had the opportunity to learn something of the operation of a gas plant. We have just recently completed 4 million cubic foot holder which was quite an experience for me."

M. George L. Reed, c '24, is at Haines City, Fla., in connection with concrete products and general building construction.

A. F. Rohlfing, c '22, is engineer on the addition to the new Loraine Hotel at Madison.

Andrew Scherer, c '09, is a salesman with the Index Visible, Inc., Chicago. His address is 755 Bittersweet Place, Chicago.

L. H. Shapiro, c '22, writes, "I am planning on entering the mid-year term of the Harvard Graduate School of Business Administration. Since May, 1923, I have been connected with the Illinois Division of Highways. My present position is that of resident engineer on a 15½-mile job of paving through some mighty rough country in western Illinois."



Franklin Shore, c '25, is now connected with Purdy and Henderson Co., New York, as a designer on Structural Steel and Reinforced Concrete for Building Construction. He writes, "My present work is on the Second Section (about 200 ft. by 150 ft.) of the Plant Store, Newark, N. J. — with nine main stories, one mezzanine, and two stories of basement. — I made a trip to Syracuse University last summer to attend both the Joint Convention of the Science, Engineering, and Chemical Societies of China, and the

Chinese Student's Conference. I won the prize (a silver cup) for the open forum of the Joint Convention. My paper was on the subject of 'Financing the City Planning'." Shore can be reached at 45 E. 17th St., New York City.

Robert D. Short, c '18, is at 124 E. Todd St., Frankfort, Kentucky.

L. T. Sogard, c '24, is masonry inspector with the Illinois Central R. R. working near Chicago. He can be reached at his permanent address, 1521 Wisconsin Street, Racine, Wis.

Edw. B. Tourtellot, c '10, is consulting engineer at Oelwein, Ia. He is living at 25½ S. Fredrick St.

Robert J. Trier, c '25, sends his address as 942 First St., N., Wisconsin Rapids, Wis.

H. W. Vroman, c '12, has been transferred to Milwaukee, Division No. 2 of The Wisconsin Highway Commission.

Kenneth R. Wicker, c '23, is with the city engineer of Manitowoc, Wis.

A. D. Wonders, c '13, has changed his address to c/o Gilbert Baker Mfg. Co., Springfield, Mass.

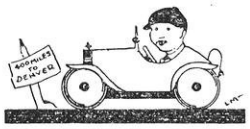
Arnold S. Zander, c '23, is bridge engineer with the Manitowoc Shipbuilding Corporation, which is entering the bridge-building field.

ELECTRICALS

Walker Anderson, E. E. '13, is sales engineer with General Electric Company, Oliver Bldg., Pittsburg, Pa.

S. M. Coe, e '24, is now with the United Power & Light Co., Davenport, Ia. He is living at 429 West Sixth St., Davenport.

Stephen C. Andrae, e '25, sends his address as 2546 W. Washington Ave., Chicago, Ill.



R. G. Averill, e '25, has been taking a 7,500 mile automobile trip thru the western states the past summer. He returned in November to accept an excellent offer in real estate work.

M. C. Beebe, e '97, can be reached at the Business Men's Club, Cincinnati, Ohio.

D. H. Corey, e '25, sends his address as 936 Pittsburg St., Springdale, Pa.

H. J. Gregg, e '24, and **H. F. Hoebel,** e '25, are with the Doherty Training School at Denver. The work is under the charge of Mr. Guy W. Faller, Vice President of the Public Service Company of Colorado. Some years ago Mr. Faller was an engineer with the Madison Gas and Electric Company.

R. H. Herrick, e '22, is with the Zenith Broadcasting Station, WJAZ, Mt. Prospect, Ill.

C. Hoover, e '24, who has been at Denver with the Doherty Training school has been changed, with Erick Nelson, to Warren, Ohio.

Edwin E. Johnson, e '24, was married on January 10, 1925, to Miss Xenia Waisenan of Ann Arbor, Michigan. Johnson resigned his position with Electric Storage Battery Company on October 31 to enter the Electrical Department of the Chicago Surface Lines. His Chicago address is 4012 N. Maplewood Ave., and his home address is Dollar Bay, Mich.

E. M. Lunda, e '22, has accepted a position as equipment engineer with the Grand Rapids Railway Company. His new address is 1420 La Fayette Ave., S. E., Grand Rapids, Michigan.

Alexander W. Morgan, e '09, M. E. '17, is an engineer with the Ohio Public Service Co., 1800 Keith Bldg., Cleveland, Ohio.

Erick N. Nelson, e '24, who has been at the Doherty training school at Denver, has been transferred to a position with the electric utilities of **Warren, Ohio.** His new address will be 329 N. Tod St., **Warren, Ohio.**

F. W. Nimmer, e '25, has moved from 2140 Francis Ave., to 137 Michigan St., E., Grand Rapids, Michigan.

F. L. ReQua, e '17, is with the H. B. Squires Co., 583 Howard St., San Francisco, Cal.

John W. Smart, e '23, a former editor of The Wisconsin Engineer, was married on September 2 to Miss Marjorie Hitch of Fort Madison, Ia. They are living at 4023 University Ave., Des Moines, Ia. Smart is employed in sales work with the Electric Storage Battery Company.

E. Steinberg, e '09, E. E. '19, is service engineer for the T. M. E. R. & L. Co., Milwaukee.

Vincent A. Thieman, e '25, is with Westinghouse at Pittsburg. He writes, "Right now I am in an interesting part of the course — the power test floor. One of the most unique of the set-ups is a frequency changer designed for variable frequency, which has a capacity equal to that of the whole Wisconsin River power plant at Kilbourn, Wis. In all, the unit comprises eight different machines — five of them on one shaft. A large induction motor for 60 cycles and a 25-cycle synchronous generator are the main machines, and will operate in either direction; viz: will take power at 60 cycles and put out 25-cycle power, or will operate from 25-cycles and have 60-cycle output power from the induction generator. After I finish the course I want to go into publicity work which appeals very strongly to me. They have an excellent department here, and I look forward to some good training before I am left loose to write those ads which make frenzied housewives storm the electric stores for the new kind of electric iron." Thieman's address is Westinghouse Club, Wilkinsburg, Pa.

W. K. Walthers, e '16, is vice-president of the Findex Company, 326 W. Madison, Chicago, Ill.

Mr. O. H. Wing, e '24, 3723 Main Street, L. P., Erie, Pennsylvania, writes that he will finish his student apprenticeship with the General Electric Company the first of next year. He is particularly interested in hydro-electric work, and wishes to find employment in this line of work.

GENERAL COURSE

C. P. Barker, g '07, has established his own business "The Barker Sales Company" at 549 W. Washington St., Chicago, Ill. The company is jobbing radio and oil burning equipment.

Harold Drew, g '09, is general manager of Zell Motor Car Co., selling Packard automobiles. He is living at Ardeen Road, Mt. Washington, Md.

Allan Lee, g '04, can be reached at 22 E. 38th St., New York City.

MECHANICALS

Harold Addington, m '24, is with the N. O. Nelson Co., Salt Lake City, Utah.

Earl A. Anderson, m '18, is with Bryan-Marsh Division, National Lamp Works of General Electric Company, 642 Beaubien St., Detroit, Mich.

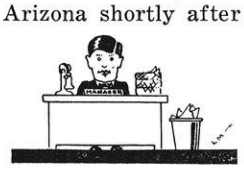
Thomas P. Colbert, m '25, has changed his address to 616 S. Brearly St., Madison, Wis.

W. J. Copp, m '08, can be reached at 2618 Elizabeth Ave., Zion, Ill.

M. K. Drewry, m '22, at one time editor of The Wisconsin Engineer is the author of an article "Comparison of Actual Performance and Theoretical Possibilities of the Lakeside Station", published in the October number of Mechanical Engineering. Mr. Drewry is with the Milwaukee Electric Railway & Light Co., and his official title is "Technical Engineer of Power Plants".

Walter Gesell, m '15, is rate engineer with Byllesby Engr. and Management Corp., Chicago. He is living at Edgewater Beach Hotel.

H. D. Hazen, m '24, was one of a party motoring to Arizona shortly after Homecoming time.



Wm. Mantonya, m '19, is at 4956 N. Hoyne Ave., Chicago, Illinois.

Clarence Zachow, m '15, is manager of the Chicago office of Gurney Refrigerator Company. His address is 1303 Columbia Ave.

MINING

M. H. Hawkins, min '25, is working for Henry Ford at Iron Mountain, Michigan. His address is Box 962, Route 2, Breitung, Iron Mountain, Mich.

Solve problems and then problems and then more problems. No student can get a good working knowledge of mathematics in any other way, and without such knowledge you would be a cripple in the higher fields of engineering. —*Virginia Journal.*

LIBRARY SEARCHES

(Concluded from page 68)

neering Institute of Canada. At the end of each year this material is combined into an annual volume.

Many publications are indexed in this which are not covered by the Industrial Arts Index. The preface of a recent volume states that 1300 publications were examined in making the index. It also gives a short summary of the contents of each article in addition to the title of the article, author's name, and the name, volume number, page, and date of issue of the periodical. However, no attempt is made to index completely, but instead, only the more important articles are selected. The arrangement of the earlier volumes and those since 1919 is alphabetic, but the intervening ones—1906 to 1918—have a topical arrangement which is not so easy to use. When you consult these volumes it will be well to go over the topical table of contents at the beginning of each volume rather carefully.

Science Abstracts

This is published monthly, and since 1903 has been in two parts, Section A, Physics; and Section B, Electrical Engineering. At the end of each year these monthly numbers are bound with their annual indexes, which are placed at the end of each volume. Its greatest advantage is that an abstract is given of each article indexed. Some of these abstracts are more than a page in length. They are very convenient, especially for articles published in a foreign language, as they often give all the information needed and so save the trouble of a translation or the reading of a long article. Each abstract is numbered and the numbers given in the index are abstract numbers not page numbers.

Chemical Abstracts

This is published by the American Chemical Society and is the best index published for chemical subjects. As the title indicates, abstracts are given of the articles listed. The current numbers appear semi-monthly and at the end of each year are bound in three volumes with the index for the year at the end of the last volume for the year. A four-volume general index was published in 1916, and one covering the volumes from that time to the present is in preparation.

Journal of the Society of Chemical Industry

This is an English abstract journal very much like the Chemical Abstracts, but covering a much longer period. There are two collective indexes for this; the first for the period from 1882 to 1895, and the second from 1896 to 1905.

Reader's Guide

This is published by the publisher of the Industrial Arts Index and the arrangement is similar. It is intended for the general reader and most of the periodicals indexed are non-technical. You will find it useful for general and economic topics. A file of it is kept at the University Library reading room.

Agricultural Index

The description of this is the same as for the Reader's Guide except that it covers agricultural subjects. A file of it is kept at the Agricultural Library in Agricultural Hall.

Indexes To Individual Publications

Besides the above general indexes, all worth while periodicals publish an index for each annual or semi-annual volume, and quite a number of them have published indexes covering longer periods. Some of the best examples are listed below:

American Electrochemical Society. 1902-1911.
American Institute of Electrical Engineers. 1884-1910.
American Institute of Mining Engineers. 1871-1916.
American Society of Civil Engineers. 1867-1911.
American Society of Mechanical Engineers. 1880-1923.
Engineering News-Record. 1874-1922.
Institution of Mechanical Engineers. 1847-1910.
Journal of the Institution of Electrical Engineers. 1872-1921.
Journal of the Iron and Steel Institute. 1869-1920.

Most of these individual indexes are published as separates and we keep them on the shelves following the general indexes in the reading room. A notable exception is the Electric Journal, which publishes for each volume not only its own index but a cumulated index covering several of the preceding years. This journal is excellent for electrical engineering subjects, and the index makes it very easy to use.

Bibliographies

Bibliographies represent a more or less complete library search by some one and are often very useful. Many of them are published as separates; are catalogued just as any other book would be; and so can be readily found through our card index. They are filed on the shelves with the books on their particular subject. Others are published in periodicals and indexed in the general indexes such as the Industrial Arts Index. A great many others, which are short, are found at the end of chapters of books or in connection with articles in periodicals. Footnotes and references given in the text of books and periodical articles are also a fruitful source of information.

It is hoped that the above suggestions will be found helpful in making a library search, but as they are far from complete, numerous questions will no doubt arise after you have started your work. Do not hesitate to ask the librarian for help at any time, for he will be glad to render assistance whenever you need it. Do not get discouraged if your first efforts are fruitless. It is often hard to strike the first lead, but after that is found the remainder of the search is easier. And remember that a careful search which proves that nothing has been published about a subject is just as valuable as one which shows by the abundance of material that the subject has been well investigated.

Solve problems and then more problems and then more problems. No student can get a good working knowledge of mathematics in any other way, and without such knowledge you would be a cripple in the higher fields of engineering. —Virginia Journal.

SENIOR CIVIL'S TRIP

(Concluded from page 69)

demonstrated his rare genius as a Romeo when he made the acquaintance of Marge, one of those poor working girls — you know the kind, evenings they dig gold. He managed to elicit a date from her for that evening, but he is reticent regarding the happenings on that date. Jim Whiteside refuses to be outdone by even so good a man as Hebda. Jim claims that on Thursday night he attended a dance at the Wisconsin Roof Gardens and danced with eleven of the prettiest girls there. Toward the end of the dance, he claimed that he had to send in a riot call to keep the girls away from him. Write your own ticket. We think he made a mistake somewheres, — either in numbers or quality, or maybe he had been drinking some of Milwaukee's "near" beer.

For further particulars see Moe

The climax to the week's festivities came on Friday, when "Lenny" Smith arranged a dinner to be held in conjunction with the teachers who were in the city for a convention. Spike Carlson insisted on entertaining the girls with his famous camp song — "Send 'Shorty' Stivers out for beer." Only he sent the teachers. They apparently appreciated his endeavors, since every song and Wisconsin yell was given a tremendous ovation of cheers and clapping. Of secondary importance, Lenny told about Milwaukee's streets, and then invited the boys to take a ride around town and give the streets the once over. They did. They rode in Peerless sedans, Packards, and Cadillacs. All in all it was a very pleasant ride. The scenery was beautiful, particularly that pertaining to feminine pulchritude. The only distraction was the occasional interruption when Lenny insisted on showing the intricacies of building a pavement.

At four o'clock the chauffeurs drove up before the spacious portals of the Gilpatrick. Thus, a trip begun in plebeian walking ended in the most approved fashion for aristocratic touring.

WHY DO RESEARCH

(Continued from page 71)

work on it. The young man did not have anyone working with him who was sufficiently familiar with the field to direct his efforts. He published his results, some of which were interesting, but he did not get a solution. His statement of the problem was not such that one should have expected a definite solution.

The other laboratory that desired to study this problem had had more experience in working with definite physical problems. They employed a man who had considerable training along this same line and associated with him a man who was very familiar with the whole problem. In their statement one feels that at least they knew what they were trying to do. They have just published a preliminary report of their work, and this report leads one to feel that they will give a solution of the problem.

This point cannot be emphasized too strongly. There is, to be sure, considerable work around the laboratory that can be done by men who have not finished their training; however, results show that the main work on any important problem should be done by well trained and able men. The supply of such men is not nearly equal to the demand, which is exactly what the conditions should be to produce the best results.

It does not seem worth while to attempt an important piece of research unless there is available for the man who is to do the experiment enough apparatus to carry on the work. It does not pay to make measurements unless the instruments are good enough to obtain the accuracy required.

If high grade men are employed to do a certain kind of work, they should have the best conditions possible to work under. The time is past when the laboratory should be put off in a dark corner of the factory. A certain research laboratory is in a factory building where the apparatus gets so dirty that it is almost impossible to use it. The men are obliged to spend a lot of their time fixing the apparatus in order to keep it in working order. Such conditions do not pay.

These three factors have been emphasized because they seemed to be important. Do not think that good work cannot be done under adverse circumstances as to surroundings and equipment. Far from it. The point is, that attempting to do research under such conditions is very poor economy. At a certain time in one's life it may be necessary to get some impetus from necessity or adverse circumstances; however, when a man gets to the point of doing a piece of research work, the problem should be the controlling factor and should take all his time. It is known that some men have done very well under trying conditions. One of our leading experimenters in this country has built up a very enviable reputation without all the help that he should have had in apparatus and conditions under which to work. Gallileo, Faraday, and a number of our early scientists did a very great work without what we would consider adequate apparatus. Considering their work and interest, is there much doubt as to what more they would have done if they could have had what we would call good equipment?

The incandescent lamp industry has been built upon research. Ever since Edison, after considerable work, brought out the first incandescent lamp, many problems have presented themselves. As a result of the solution of some of these problems, the product has been considerably improved in efficiency and quality. Edison's first lamp had an efficiency of about 2.5 lumens per watt. At present the corresponding lamp has an efficiency of about 10.5 lumens per watt, while the high efficiency gas-filled lamp is about twice as efficient. This great increase in efficiency has been brought about as the direct result of research. Not

only are the lamps more efficient, but they are also much more uniform in their performance.

When the General Electric Company started their research laboratory at Schenectady, one of the first things Dr. Whitney undertook was a study of the incandescent lamp filament. As a result of his work he found out how to metallize the filament by heating it to a high temperature in a furnace. His new filament was about 20% more efficient than the old one. Early in the manufacture of incandescent lamps it was recognized that a search for better filament material should be made. A number of laboratories were busy on this problem. In Germany the use of tungsten as a filament was first suggested. As soon as this filament was introduced in this country, work was started on the various properties of tungsten.

It is very interesting to hear the lamp men of that day telling about some of their efforts. The filaments were very fragile. They were made by mixing the tungsten powder with various binders and squirting the mixture through dies. These pressed filaments were heated to very high temperatures, after which they could, with very great care, be mounted in a lamp bulb. As some of you remember, these lamps had to be very carefully handled. It was extremely difficult to pack these lamps in such a way that they could be shipped with any satisfaction at all. The experience of an electrical engineer, who was a foreign representative of an electrical firm in Japan when the tungsten lamp was first introduced, is interesting in this connection. He was asked to bid on a plant to light a certain building or set of buildings. He based his calculations upon the use of tungsten lamps, and, of course, obtained the contract since his figure was so much lower than those of the men who figured on the use of carbon lamps. He installed his plant and ordered his lamps from Germany. Knowing that the lamps were very fragile, he ordered twice as many as he would need and requested that very special care be taken in shipping them. Every one of the first lot was broken when they reached him. When the second order reached Japan there were only three or four lamps that would burn. Only after the third lot came through, which were packed much more carefully than either of the others, did he have enough lamps to light the buildings. It is interesting to contrast this with the strength of present day tungsten lamps which, with a minimum of packing, can be shipped any distance with almost no breakage.

As was mentioned above, research may be directed toward a desired end or the practical result may be, as it were, a by-product. Two developments in the incandescent lamp industry illustrate these two principles very well. After the pressed tungsten filament had been introduced it was early recognized that the great need in the lamp industry was tungsten wire for their filaments. Dr. Coolidge of Schenectady started out on this problem with the direct determination of satisfying this need. One day in breaking an ingot of tungsten with a hammer he noticed a small flake that could be bent a small amount with his fingernail. With this as a hint he kept on working, and as a result he was able to make tungsten wire.

Since that time there has been a lot of work put on this subject. Now tungsten wire is drawn through diamond dies at the rate of about 200 ft. per minute. Somewhat later Dr. Pacz, working in Cleveland, brought out a new process of making tungsten wire. The wire developed by Dr. Pacz, when operated at high temperatures, sags much less than the first tungsten wire. As a result of these researches, today, we can make tungsten wire of any size desired, down to a few ten-thousands of an inch in diameter.

The solution of a particular problem may lead to very important results beyond the particular results desired. The air was formerly pumped out of a bulb through a tube sealed on the top of the bulb. When the lamp was sealed off, a tip was left on the bulb. It was long felt that a tipless lamp would be a good improvement. This problem was given to two lamp engineers that were very familiar with this particular work. A solution was found such that several operations were eliminated from the making of a lamp. This tipless construction was helped in a large way with modern high speed production. In this case, as in all others, when a problem presented itself a careful study was made of various conditions. Attempts are always being made to improve the product and at the same time simplifying the process of making the lamp. This goes on from the making of the base until the lamp is in the hands of the customer. Then much is done to show the customer how to use the lamp to the best possible advantage.

Dr. Arthur D. Little, in a recent address, likened conditions in industry to the conditions when Belshazzar saw the handwriting on the wall. Dr. Little's interpretation of the writing is "The price of progress is research which alone assures the security of dividends." A study of conditions in many lines and of many firms that have failed, will convince the most sceptical that such is the case. The various industries that are prosperous today and will be prosperous tomorrow are the ones that are keeping their products up to standard and up to the times.

ATHLETICS

(Continued from page 82)

stellar service this year is well qualified for his position. Wisconsin may look forward to another worth while season next fall.

WRESTLING

A few weeks ago Coach George Hitchcock called his wrestlers together and officially opened the season. At the first meeting the coach signed up the men, and in a short talk told them his aims for the season, explaining the training rules and fundamentals of wrestling. The coach stressed strength, endurance, and even more than either of these, headwork, this quality being very essential in this sport, which is almost wholly individualistic.

A wrestler must at all times be on the offensive, as well as on the defensive, and ever alert to the possibilities of his art. Only a few holds should be used, but these must be completely mastered.

Practice is held at three-thirty on Tuesday, Wednesday, Thursday and Saturday afternoons, and from thirty to fifty men report, many of them new, but promising material. Captain Lisle Zodtner, senior chemical, and five other wearers of the "W", are back, and the prospects are exceedingly bright. Last year only two meets were won, but with these veterans back and the greater interest shown, the results should be better. Among the Frosh there is a scarcity of heavy material, and more could be used. Many of the men have passed the squad tryouts and have been given the right to compete for the varsity. With the stiff training rules and practice exercises the mat men should be coming into good shape soon.

SWIMMING

For some time Coach Steinauer has been giving his Wisconsin swimming squad workouts three days a week. With a goodly number of veterans back, plus some good new material making altogether a squad of 60 men, it looks as if Wisconsin should have as good a team or a better one than the one of last year which took second place at the conference meet. Captain Herschberger, one of last year's most outstanding men in the conference, will no doubt bring in many points in dashes; Wheatly and Simpkins will dive for the Badgers, and others from last year's team can be relied upon for additional scores. Ratcliffe, Hotten, Bell, Abendroth, and Bardeen from the former, and Kratz, Wray, and Doodson from last year's frosh squad look like promising material. The freshman squad this year has been practicing twice a week and time trials show that good material is not lacking. Coach Steinauer has had plenty of trouble with ineligibility. Every year it seems some of his best men are barred from conference competition, to the great disappointment and handicap of the Badger squad. Unless this factor becomes too strong, Wisconsin hopes may justifiably run high for the swimming season.

Several changes have been made in the events to be run off at meets. The plunge has been abolished, and a medley relay substituted; water polo will take the place of water basketball; and the 440 yard swim has been substituted for the 220. This makes the events to be held the following: 160 yard relay, dives, 220 yard breast stroke, 100 yard free style, 150 yard back stroke, 440 yard swim, and the medley race.

BASKETBALL

Shortly after classes were running smoothly, basketball practice was started; but only a few weeks ago did it begin to proceed with real intensity. The playing was rather ragged at first, as might be expected, but, at this time, most of the corners have been rounded off, and it looks as if Coach Meanwell would have a squad well in keeping with his reputation. In the first scrimmage with the frosh team, the varsity downed the yearlings by a 47-33 count, showing some brilliant playing occasionally, but most of the time it was no better than would be expected.

In preparation for the conference games, the first of which is held with Minnesota at Madison on January 5, the Badgers will play several preliminary games, with North Dakota State, South Dakota State, and DePauw. After these games with opponents of no mean ability, the Wisconsin team should be in fine shape to meet the conference contenders. It is too early to predict what will be done, but it is not too much to say that we may look forward to a better rating in the percentage column this year than last.

For a while it seemed certain that the games would be played in the stock pavilion, which has double the capacity of the gym, but the state Industrial Commission ruled that only 3,000 could be seated there with safety, while 2,200 have regularly attended the games in the gymnasium. Consequently not enough more seats could be sold in the stock pavilion to pay for the construction expense, and so the games will be witnessed by only the lucky few in the gym, and the rest will have to get the reports by radio — it is rumored that Joe Steinauer will announce again this year.

THE SENIOR MECHANICAL-ELECTRICAL TRIP

(Continued from page 72)

of the men saw big generation units for the first time. The plant is in a stage of expansion (and will be until it is completed). It was interesting to compare the load controls of this station with those at Lakeside. Afterwards, the busses took the gang downtown to the Morrison. This transportation was greatly appreciated by everyone, and Commonwealth Edison received the thanks of each member of the party.

Saturday morning the Underwriters Laboratory was inspected by the mechanicals, while the electricals proceeded to the telephone exchange of the Chicago Telephone Company. The gang was a trifle depleted, but those who came were well rewarded for their efforts. The tests of all safety appliances and safe building construction were explained to the mechanicals, while to the E. E.'s the most interesting phase of their mornings inspection was the inspection of the device for transmitting photographs by telephone.

On being turned loose at 10:30, the bunch paid off the hotel people, and then made for Stagg Field. Here, after two and a quarter hours of hair-raising football, the whole week was happily climaxed by a decided Wisconsin victory. Steve Polaski, who had been on the trip, sure was a fighting demon and the engineers at times conducted their own little yell fest for his benefit.

Thanks are due all of the companies who conducted the men through their plants, and hopes for as profitable trips for future seniors are expressed by this year's inspectors.

THE ENGINEERING CURRICULUM

(Continued from page 71)

believe that the adoption of some such system would weed out undesirables, and give the survivors a better chance."

One man who is now a consulting engineer outlines his views in a very clear and direct manner. He says, "In general, the undergraduate engineering curriculum may be divided into four important classes:

1. Those fundamental studies or subjects which deal with the abstract in mathematics, in the fundamental natural or physical laws, and those dealing with the graphical picturization of thought.
2. Those subjects which deal with the practical application of these fundamentals in the industries.
3. Those subjects which deal with the transmission of thought to others by the spoken or written word.
4. Those subjects which make it possible to transform an engineering problem into a practical business problem.

To illustrate, let us place under:

CLASS I.

All branches of mathematics
Physics
Chemistry
All drawing courses
Theoretical electricity
Theoretical mechanics and kindred subjects

CLASS II.

Practical electricity
Practical mechanics
Surveying
Practical hydraulics
All laboratory courses

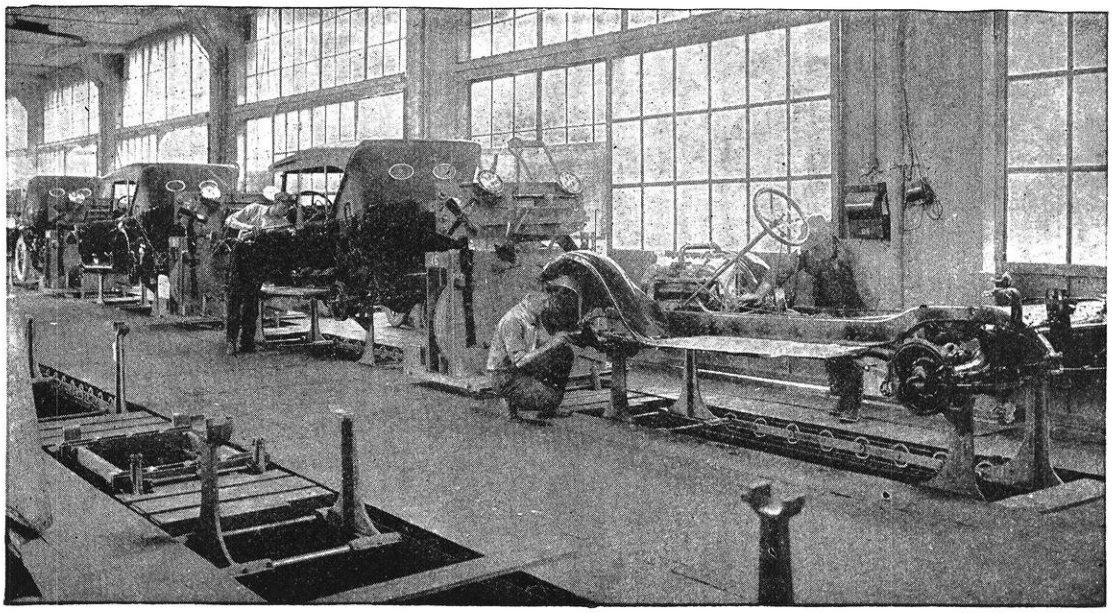
CLASS III.

English
Grammar
Literature
Public speaking
Report writing (technical writing)
Thesis writing

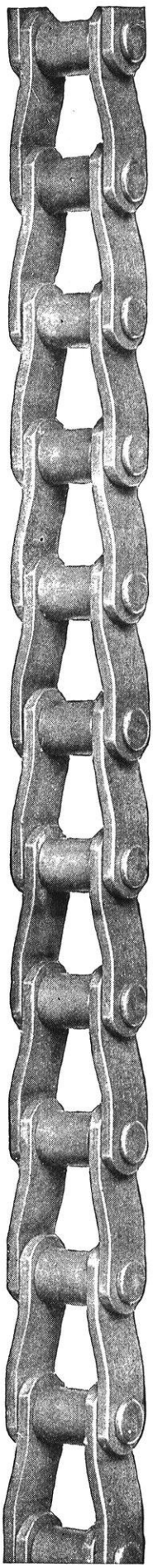
CLASS IV.

Political economy
Business writing
Business organization
Business administration
Business relations

"No one can succeed as an engineer unless he possesses a fundamental knowledge of those subjects recorded under Class I, and the under-graduate curriculum is complete in this respect, although not thorough enough. However, the undergraduate should be made



Here successive steps of final assembly occur as the cars slowly proceed to the end of the conveyor
The weight of each car is carried on eight chain rollers



THE SWIFT *and* SURE ADVANCE OF MECHANICAL HANDLING

Strictly speaking a conveyor is installed as a means of transporting goods. It would be expected to carry them at least cost.

But that is not all. That alone is not sufficient to account for the rapid advance of mechanical handling in America.

Conveying contributes to the success of industry in many other ways.

In progressive assemblies, conveyors have reduced the cost of building automobiles, stoves, threshing machines, washing machines and tires. They have made labor more efficient and ended much drudgery.

In foundries, conveyors carry the flask while pouring, carry the molds to the shakeouts, handle the sand and the castings, and carry the iron and steel to the furnaces.

In hundreds of industrial plants, Rex Conveyors have broken the bottle necks of production and have balanced production by securing an even flow of material through the plant. They have saved valuable floor space, and cut out idle machine time. In one automobile plant, the conveying system has been developed to such an extent that under the same roof two cars are now produced where one was built before.

The business of building material-handling machinery is still young. Much progress is being made annually in the engineering of this new science. Each year its markets are broader.

Whether you are a student, graduate engineer, or manufacturer, it might be well to see what this expansion of Mechanical Handling holds for you.

The Chain Belt Company will gladly answer the inquires of anyone interested.

REX CONVEYORS

CHAIN BELT COMPANY *759 Park St., Milwaukee, Wis.*

ALSO MANUFACTURERS OF

Rex Chain - Rex Sprockets - Rex Concrete Mixers - Rex Traveling Water Screens
Rex Q. D. Elevators and Conveyors - Rex Power Transmission and Material-Handling Machinery

Kindly mention The Wisconsin Engineer when you write.

to see that an engineer is not necessarily a mathematician. The practicing engineer above all must have a thorough knowledge of the fundamental natural and physical laws, for it is to this storehouse that he goes most often to solve the problems thrust upon him. General physics is not given its proper weight in the engineering curriculum. If a sacrifice must be made, make it in the higher branches of mathematics and put more stress on the fundamentals in the lower branches of this science. I have employed college trained men who were formula engineers and who knew little or nothing about the rudiments of arithmetic, algebra, geometry, trigonometry and physics.

"Class II comprises an interesting and valuable group of subjects. Its object it to teach the student how his abstract fundamentals are put to pracical use. The laboratory courses are most complete and thorough and I have only one suggestion to offer which might enhance their effectiveness most materially. Would it not be a valuable addition to place upon the faculty a man of broad experience in the industries in general engineering, to give a lecture course covering the application of fundamentals to concrete examples as he has encountered them? He might also work out a method showing how, in general, to analyze and approach a practical problem.

"A student well versed on fundamentals but lacking the power of analysis for application will never make his mark as an engineer.

"A discussion of the subjects in Class III brings us to the most important of those groups discussed previously. In my estimation it is because of the deficiency in this training that a large number of engineering graduates leave the profession for other pursuits.

"An engineer's stock in trade is ideas. He must sell these ideas before he can put them into practice. An idea poorly expressed and unconvincingly offered is not readily marketed. The student must be made to realize that in the field he deals with modern business men who cannot be classed as 'Rough Necks'. His written reports must be in good English, concise, and to the point. His oral reports must be delivered convincingly and unfalteringly in good English.

"The subjects in Class IV should be included in the engineering curriculum because they broaden the field in which the graduate may seek employment.

"Industry has found in recent years that the fundamental training of the engineer has fitted him admirably for executive work. His broad knowledge of the natural and physical laws and their application and the keen faculty of analysis which he has acquired thru his college work is of great value to industry in directing men. However, unless he can transform his technical phraseology into the parlance of dollars and cents of the business world, this field is closed to him."

Views on some subjects are very diversified. The committee in charge of the work is attempting to summarize the replies, and will undoubtedly reach some definite conclusions in the near future.

INDUSTRIAL BUILDINGS SHOULD BE WELL LIGHTED.

From the employer's viewpoint, the big difference between men who work out of doors and those who perform tasks inside the building, is the factor of light. Daylight furnishes sufficient illumination outside during the daytime working hours for men to pursue their tasks efficiently and safely. But the proposition of getting enough daylight into the interior of industrial buildings, requires some thought.

It is not a difficult problem by any means, and any employer can take advantage of daylight and utilize it for lighting his building during the daytime, if he desires. It is an excellent light, especially suitable for the eyes, reducing eye strain and eye weariness to a minimum, and has the great economic advantage of costing nothing.

To utilize daylight to the utmost, we must first provide means for allowing daylight rays to enter the interior of buildings in sufficient quantity—namely, proper and adequate windows and skylights. Many excellent instances of buildings designed with a due regard to the importance of daylight lighting can now be seen in many of our industrial cities. Such buildings present the appearance of being practically all windows—"window walled," as they are termed—and this type of daylight construction is coming rapidly into favor, because it constitutes a more healthy building for large numbers of employes, both from the lighting and ventilation standpoints.

Among those who have constructed this type of modern industrial building may be mentioned: The Shredded Wheat Co., Gillette Safety Razor Co., Lyon & Healy Piano Co., H. J. Heinz Co., Corona Typewriter Co., Skinners Macaroni Co., Grape Juice Co., Dodge Bros., Nelson Valve Co., Piston Ring Co., Remington Arms Co., and a great many others.

The Larkin Co., Philadelphia, has erected a building almost entirely glass, 85% being windows, and the Loomis Breaker, operated by the D. L. & W. R. R. Co., Nanticoke, Pa., is literally a glass house, being 93.5% of glass. The new buildings of the Winchester Repeating Arms Co. have an average glass area of 58%.

An investigation covering 18 buildings constructed by the Aberthaw Const. Co., Boston, shows that the average window area is 57.5%.

These figures indicate how important the subject of lighting is now considered by employers of industrial labor, and how well the idea has been carried out by the architects and engineers, in order that all parts of a building may receive sufficient daylight. But, in addition to providing ample window space, there is another factor which is equally important, and that is, equipping the windows with the proper glass.

The bright direct rays of the sun should not be permitted to strike the eye, and we must provide a means for reducing the glare to rays which will not be too bright. This is accomplished by glass especially manufactured for industrial windows, known as Factrolite. This glass possesses the property of breaking up the intense rays of the sun and diffusing the light into the interior of the building in proper portions, solving the problem of sun glare.

If you are interested in the distribution of light through Factrolite, we will send you a copy of Laboratory Report—"Factrolited."

MISSISSIPPI WIRE GLASS CO.,
220 Fifth Avenue,
St. Louis. New York. Chicago.
No. 4.

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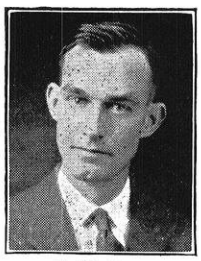
Going Up



R. W. Owens

EVERY time you go up in a modern building having high-speed elevators (the Chicago Athletic Club, for instance) you are lifted by the ingenuity of at least one Westinghouse engineer who is barely ten years off the campus.

Until three years ago, high-speed elevators invariably required direct electric current. There was no practical method of using alternating current, and since many districts are supplied only with alternating current, a serious handicap existed.

It was possible to employ a motor generator to convert alternating current into direct current, but when that was done no practical system of control was available if the elevators were to be operated at high speed. The suggestion was made that the control be accomplished by varying the voltage of the generator and (among others) to a young man of thirty-three—R. W. Owens, Illinois '14, now head of the direct-current section of the motor engineering department—came the special problem of designing an electric generator that would perform as one had never performed before.

The question is sometimes asked: Where do young men get when they enter a large industrial organization? Have they opportunity to exercise creative talents? Or are they forced into narrow grooves?

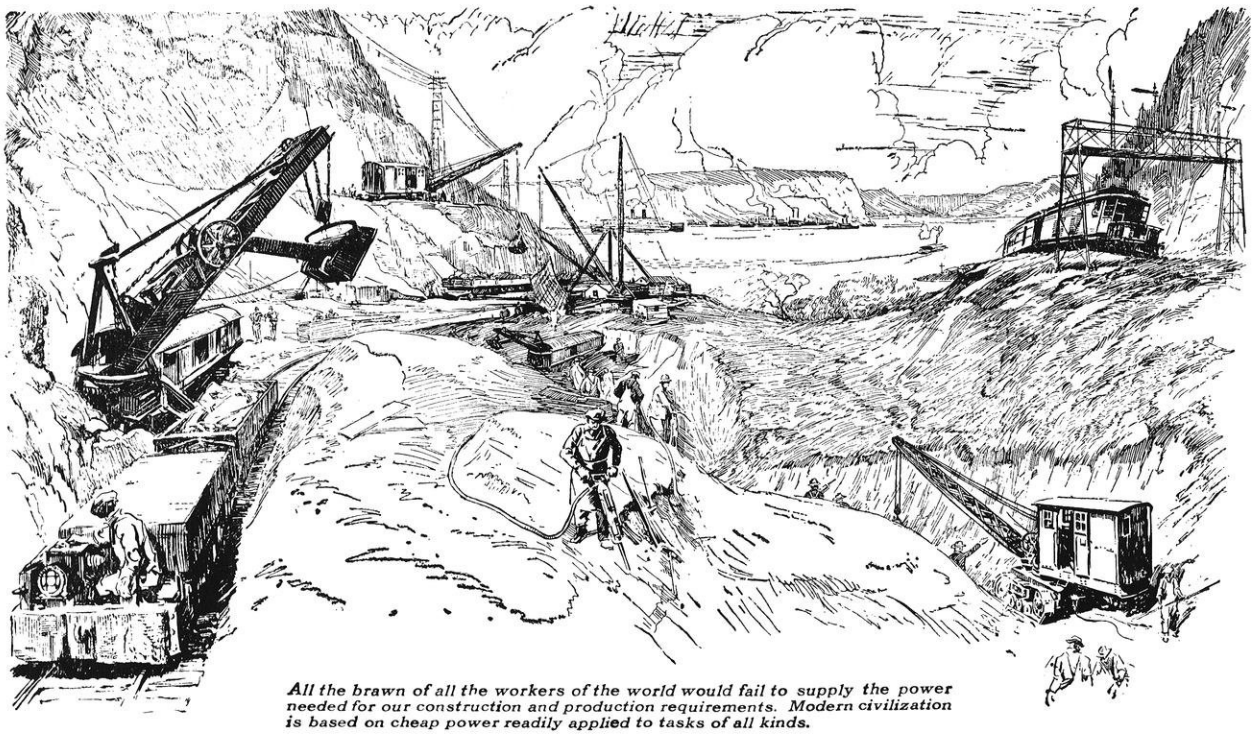
This series of advertisements throws light on these questions. Each advertisement takes up the record of a college man who came with the Westinghouse Company within the last ten years, immediately after graduation from his university.

Many were associated in the undertaking, for it involved pioneering in control apparatus as well as in generator design, but eventually all difficulties were overcome, and there emerged the "Variable Voltage Control System for Electric Elevators", now standard throughout the building industry.

Here you have the type of problem that confronts the design engineer in an organization like Westinghouse. Not all are as large as this, or lead to such sweeping results. The design engineer works for the customer. He starts with an analysis of the customer's needs and develops apparatus to meet those needs.

His responsibilities are varied and heavy. The jobs of the direct-current section of the motor engineering department range from motors for driving ventilating fans to those for dumping whole cars of ore at the docks. A force of 1,000 men is constantly occupied building the motors designed by this section.

Westinghouse



All the brawn of all the workers of the world would fail to supply the power needed for our construction and production requirements. Modern civilization is based on cheap power readily applied to tasks of all kinds.

Machinery *works*: Man *thinks*

According to college tests, man develops one-eighth horsepower for short periods and one-twentieth in steady work. As a craftsman—a worker who uses brains—he is well worth his daily wage. But as a common laborer, matching brawn against motorized power, he is an expensive luxury.

With a fifty-horsepower motor, for instance, one man can do the work of 400 common laborers. He is paid far more for his *brains* than his *brawn*.

The great need of this and future generations is for men who can plan and direct. There is ample motorized machinery for all requirements of production and construction. But motorized machinery, no matter how ingenious, can never plan for itself.

And that is precisely where the college man comes in. Highly trained brains are needed more and more to think, plan, and direct tasks for the never-ending application of brawn-saving electricity.

In most long-established industries the General Electric Company has brought about important changes making for better products with minimum human labor and expense. And in many new industries the G-E engineers have played a prominent part from the very beginning.

A new series of G-E advertisements showing what electricity is doing in many fields will be sent on request. Ask for Booklet GEK-1.

32-2DH

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

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