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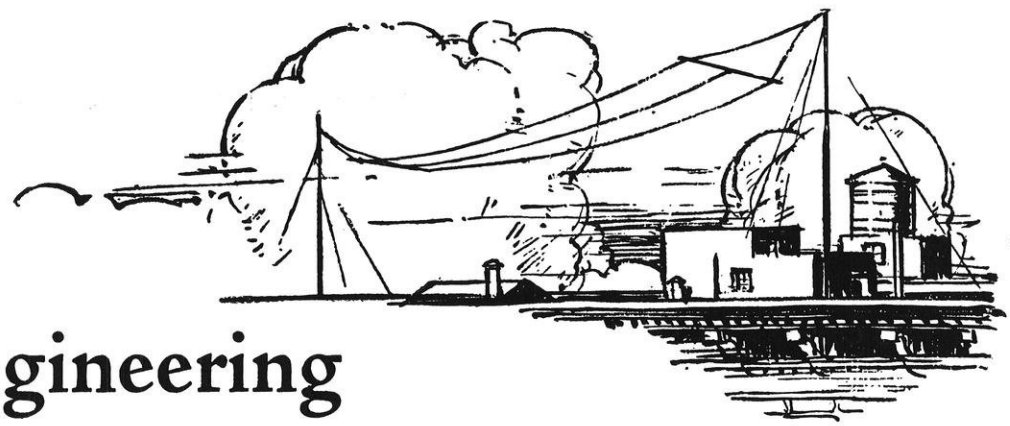


What Engineering Owes to the Imagination

From An Argument Over Watches Came KDKA

BACK in the days when wireless was just beginning to spread, Frank Conrad (now Assistant Chief Engineer of the Westinghouse Electric & Manufacturing Company) and another official, happened to compare watches, to see if it was time to go back to work. Their watches differed.

Unable to convince his friend that his watch was right, Mr. Conrad suddenly remembered that the naval station at Arlington, Va., had just inaugurated a system for sending out daily time signals by radio. Just the thing to prove his point!

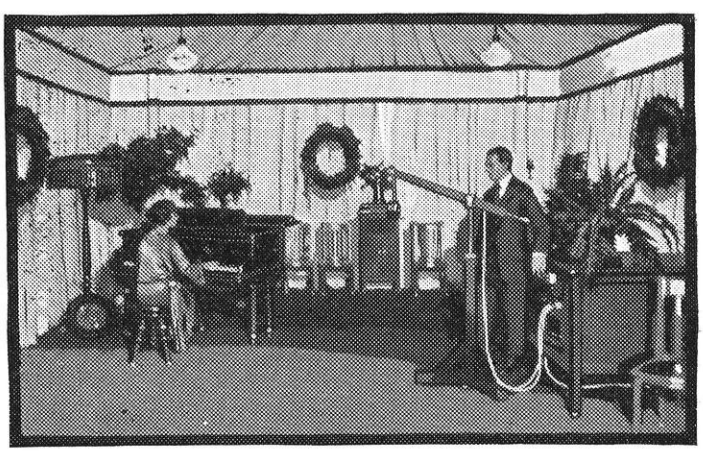
So he built a simple set of receiving apparatus, erected an aerial, and—you can imagine what happened! He was badly bitten by the radio bug. After proving to his satisfaction the accuracy of his watch, he started experimenting with the transmission of music by radio, with good success.

He began sending out phonograph music from his home, and attracted the attention of some of the big department stores, that had installed radio departments. They in turn, started advertising Mr. Conrad's "musical evenings."

Then, one day, upon arriving at his desk, he was summoned to the office of Harry Phillips Davis, Vice President of the company.

"Frank," said Mr. Davis, "I'm going to close your radio station." His attention had been attracted the night before to a simple note in a full-page advertisement, which read, "Mr. Conrad will send out phonograph music this evening."

You know the rest. In November, 1920, "KDKA" was formally opened to send out election returns. It had received the first license issued by Uncle Sam. Today over 500 broadcasting stations entertain and educate millions of people each night, a wonderful result from so insignificant an argument as one over watches.



Broadcasting Studio at Station KDKA, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

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The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

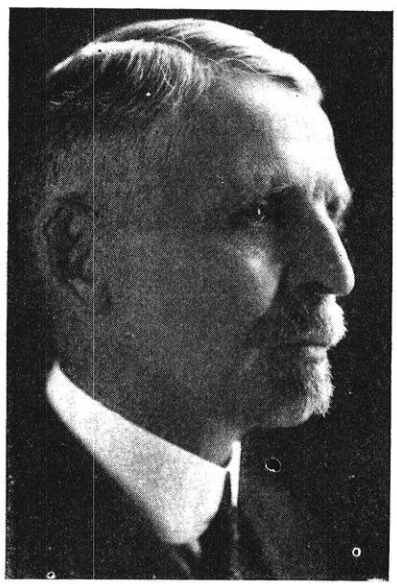
VOL. XXVIII No. 3 MADISON, WIS. DECEMBER, 1923

UNIVERSITY EXTENSION AND ITS ENGINEERING COURSES

By Louis E. Reber

Dean of the University Extension Division

President Birge, writing of the contribution of the late President Charles R. Van Hise to the life of the University of Wisconsin and, through it, to the university life of the country, emphasizes "the development of those lines of activity which, for want of a better name, are inadequately grouped under the name of University Extension." When Dr. Van Hise came to the presidency in 1903, this type of university service in its earliest and simplest form had been carried on in Wisconsin for about eleven years. It had alternately grown and declined with similar attempts in other states and was then at a low ebb.



Louis E. Reber

Mr. Frank A. Hutchins, who was the moving spirit in the establishment of the traveling library in Wisconsin, and Dr. Charles R. McCarthy, the originator of the legislative reference library, had been leading advocates of the Extension movement, and had kept it alive even when legislative and other support were nearly or wholly lacking. These forerunners in much that has distinguished Wisconsin as a leader in advanced measures saw the universities of the country as possible sources of education for the many, rather than for the few who could attend universities. In their revolutionary prevision they included in the functions of a university, education adapted to all classes of people and to be given to all irrespective of preliminary preparation or to the circumstances of their lives.

The time was ripe in the United States for an educational development of this nature. The rise of larger and more enlightened industrial organizations, the growing consciousness and ambition of industrial labor, the spread of reform and betterment programs of every imaginable kind, and other influences too numerous to mention had begun to awaken a truly general demand for the things that go to make up our present day ideas of educational service. It should be noted in this connection that vocational education, now so thoroughly incorporated in the public system of education, was then just beginning to take form.

Among students of collegiate rank, on the other hand, many who entered the University were unable to spend the four full years in residence and failed to graduate for this reason. Those who completed undergraduate courses and entered professional occupations were often handicapped by inability to keep pace with current practices because of the losses incident to postgraduate work at the research institution.

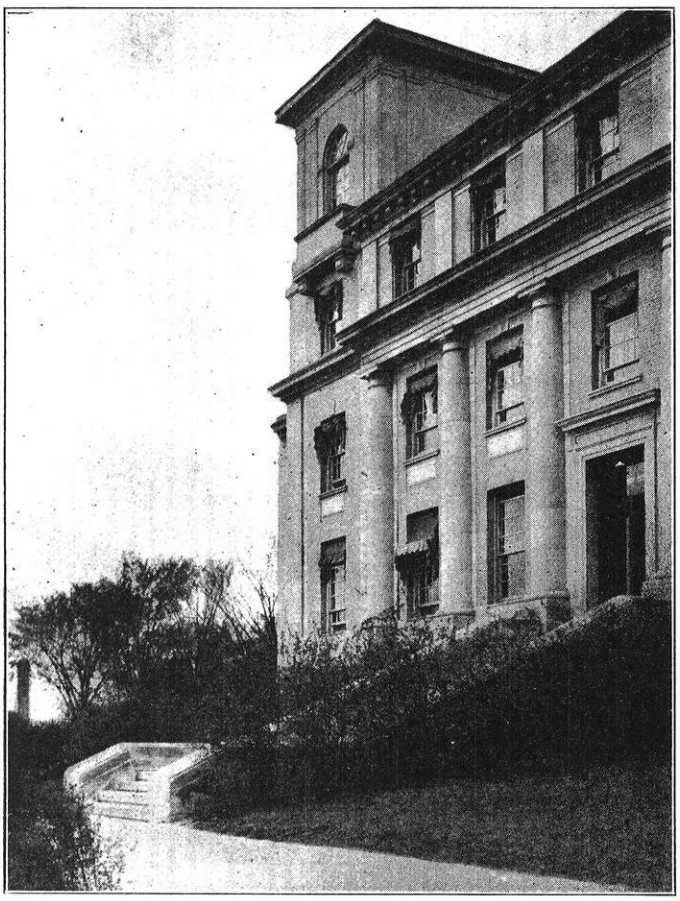
It was in circumstances such as these that the early promoters of University Extension saw the great opportunity of the University in Wisconsin. As has been shown, a very few leaders with almost unaided efforts kept the movement alive up to the time when Mr. Van Hise became president of the University and included university extension in his program of development of this institution.

In the beginning, in Wisconsin as elsewhere, University Extension was closely identified with the public library. During this period, Mr. Hutchins made noteworthy contributions to the earlier phases of extension development. In 1906, President Van Hise began a reorganization that foreshadowed the greatly enlarged scope and modified methods of the present time. He saw in the new departure not merely an enlargement of the accepted University function of teaching, but also an untried field of service introducing new features whereby communities as well as individuals would be benefited. With such a two-fold development in view, President Van Hise gave an impetus and consistent support to University Extension which insured its steady growth and enlargement in scope. In support of this liberal program the state legislature included in its 1907 appropriation to the University $20,000 a year for two years for University Extension. Two years later $50,000 was granted, and from this time the increases were rapid and steady until the income of the Division from appropriation and fees amounts to a sum which places the Extension Division third among the colleges of the University, from the point of view of expenditures.

Lines of Development

A great variety of educational influences has grown out of this widening scope of the traditional university. The resources of this institution of learning have been successfully made available to the people at large. Departments organized to take care of the special problems of extension instruction have been formed and expanded as the demand for particular lines of service has arisen.

Among these, formal education, offered through correspondence-study and local classes, ranks first. Next in importance is the informal education of the Department of Debating and Public Discussion, with its pack-



University Extension Building

age library service. Another informal service of like value is given through lectures and lyceum courses. Other developments, which have grown in response to demands, and which compare favorably in size and value with those mentioned above, include the work conducted by the Bureaus of Municipal Information, Community Development, Visual Instruction, and forces working without departmental organization on commercial and industrial problems.

Correspondence Courses

A wide field of service is covered by the University's administration of correspondence-study courses. As is well known, the work is adapted to meet the needs of students of two types, those who fulfill specified requirements and work for academic standing, and those who meet no entrance prerequisites and study solely for the purpose of improving their general education or vocational qualifications.

Correspondence-study has become an accepted method of teaching. It is effective in teaching either class of students. A method is necessarily thorough which insures the student's attention to the entire lesson, relates him with his teacher as an individual rather than as a member of a class, and throws him upon his own resources and initiative. This is especially true of correspondence-study.

The Extension Division offers 475 courses by correspondence. These are grouped as follows:

I. Regular university courses which may, under approved conditions, be taken for credit toward a degree.

II. Advanced courses designed to help adults in professional or practical life to keep in touch with advancements in science and other fields of knowledge.

III. High school and preparatory courses for those who can not attend the University.

IV. Vocational courses which supply knowledge and training leading to efficiency in a given occupation.

V. Elementary and grammar school courses for adults who need such instruction for any purpose.

Up to July 1, 1923, 90,237 students had entered these courses. Classified by subjects they are divided as follows: Mechanical Engineering 15,842; Civil and Structural Engineering 2,874; Electrical Engineering 2,452; Drawing 1,681; Business 27,804; Mathematics 9,020; English 8,088; Foreign Language 4,739; Economics 3,310; Home Economics 3,108; Education 2,966; Miscellaneous 2,687; Sciences (including Astronomy, Bacterioligy, Botany, Chemistry, Geology, Natural Sciences, Pharmacy, and Physics) 2,553; Political Science 1,885; History 1,318. During the year 1922-23 there were on the active roster 28,722 correspondence and class students.

Extension Classes

The method of class instruction is used by the University Extension in cities or wherever groups of sufficient size can meet together. Since 1907, evening classes in Engineering subjects have been held in Milwaukee, and before the vocational school law was passed a large amount of teaching of apprentices was conducted in industrial shops. More recently the passage of the Wisconsin Educational Bonus Law greatly added to the engineering instruction in Milwaukee, the University having agreed to carry, under the administration of the Extension Division, the freshman and sophomore work in engineering. The engineering, commerce, and other work in Milwaukee has outgrown any available building and suffered from cramped and poorly arranged quarters. The last legislature met this difficulty, however, by making an appropriation for a new building, and plans are maturing rapidly for suitable housing of the work.

Instruction is now being given in Milwaukee in all the subjects of the Freshman and Sophomore years of the engineering courses now offered at the University. There are also, in the late afternoon and evening classes, subjects of interest to engineers and those desiring to be-

come engineers. The following are typical: Bridge Stresses; Electric Design; Geology; Machine Design; Power Plant Design; Reinforced Concrete; Roads and Pavements; Roof Trusses; Strength of Materials; Structural Drafting; Theory of Structures; Accounting; Business Psychology; Commercial Law; Economics; Public Speaking; and Spanish.

Consultation Groups

In addition to the correspondence and class method of teaching the Extension Division has always conducted so-called "consultation groups", which is a step between the correspondence and class method. An instructor meets the group at fixed intervals. The lessons are sent to Madison, and each lesson is carefully gone over by the instructor in charge of that work at the home office. This method has proved a successful one.

The Men Who Take Engineering Courses

Of the 21,000 engineering students who have taken extension courses, by correspondence or in class, it is but natural to ask who and what are they? Probably the most interesting answer to this question is the one based on the student's purpose in taking the course.

The pattern maker enrolled in a course in mechanical drawing, for example, is found to be studying to improve his skill in his daily task; a draftsman, signed up for advanced mathematics and machine design, professes a desire to secure advancement in his job; a high school graduate takes an extension course to secure university entrance credits in which he is deficient. A student studies at home by correspondence while he earns enough to take him to college. A freshman, having failed to meet the requirements retrieves himself and regains his standing by home study; an industrial employe is enrolled in a course in fuels because he is interested in the reduction of fuel consumption in his place of employment; an employer takes the same course for a similar reason; an engineering graduate is enrolled in courses in structures and reinforced concrete, reviewing and bringing himself up-to-date as well as supplementing his residence work; a contractor studies reinforced concrete in order that he may learn to bid more intelligently and to do his work in accordance with latest practices; the teacher from high school, normal school, vocational school, or college, like other workers, needs constant bringing up-to-date or desires to acquire additional university credit. Examples might be still further multiplied and a greater diversity of uses be shown, but only a suggestion is necessary to demonstrate the significance to the working adult of instruction which can be taken without interruption to his earning.

The Engineering Courses Which Are Most in Demand

Of the correspondence courses in engineering, the following are most in demand: Steam and Gas Engines; Drawing and Mechanical Design; Structures and Reinforced Concrete; Roads and Pavements; Surveying; Electricity and Magnetism; Direct and Alternating Current Machinery; Central Station and Power Distribution; and Radiotelegraphy.

Good Instructors a Necessity

The Extension Division, ranking as a college of the University, has its own faculty; the members of the Engineering Staff have been chosen because of their special qualifications for the extension type of teaching. The technique of this type, for the engineer particularly, must combine with academic training and teaching ability a considerable experience in outside practice. The engineering staff is headed by well-known men who have become authorities in extension instruction both on account of the proficiency they have attained as teachers and by their written work.

The Development of Suitable Texts

Early in the history of University Extension, the problem of texts for engineering courses became one of primary importance. Books available on the market did not lend themselves to the requirements of the method.

The production of material that would meet the needs of a widely diversified group of students presented unique difficulties. In time, however, these handicaps were overcome and texts were produced both by members of the home instructional force and by outside specialists brought in for this purpose.

Engineering and vocational texts prepared for Extension use when published have met with marked success both in Extension work and in residence teaching.

The painstaking method in text production may be illustrated by the description of the working out of a single subject. The preparation of a course on the gasoline automobile will serve our purpose.

The development of a course on this subject was started in 1913. An outline was formulated which was tested on twenty-five or thirty classes. Among the students enrolled in these classes were some of the best automobile mechanics in the state. In 1914 the staff was ready to expand the original outline into a course to be mimeographed and tried out for another year both in classes and by correspondence. In 1915 a conference of engineering extension instructors was called, and the mimeographed material was again revised and finally submitted to the McGraw-Hill Book Co., by whom it was published. In 1919, partly because of the rapid developments in automobiles and partly on account of further teaching experience, the book was revised and reprinted. It has recently passed through a second revision of its book form and is now again on the press. This volume has not only served the needs of hundreds of extension students *but has been the fourth best seller of all the texts published by the McGraw-Hill Book Co.,*—a veritable "best seller"! Nor is this book alone in proving the value for residence use of the text adapted to extension teaching. wenty-five engineering texts have been published and all have proved to meet a need. Among them are found such volumes as:

Hool's "Reinforced Concrete Construction" (three volumes); Jansky's "Elements of Electricity and Magnetism", "Electrical Meters", "Direct-current Machin-

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SOME EXPERIENCES GLEANED FROM SUMMER JOBS

By LESLIE F. VAN HAGAN, *Professor of Railway Engineering*

Illustrated by LOUIS C. CREW, *Junior Civil*

An engineering student, who was working with a highway commission during the summer vacation, was sent out one day to cross-section a short stretch of road. "As I set out in the morning," he relates, "my superior informed me that the level was in adjustment,

When I checked back, I was a foot in error. It was somewhat distressing.

so I gave that matter no further thought. Toward the close of the day, when I checked back, I was a foot in error. That was somewhat distressing, so the next day I re-ran the line,—with the same results. About then the thought presented itself that it had been duly impressed upon me by my surveying instructor that a surveyor should make sure, before using an instrument, that it is in adjustment. When I finally checked the adjustments of that level I found it three-tenths off in three hundred feet."

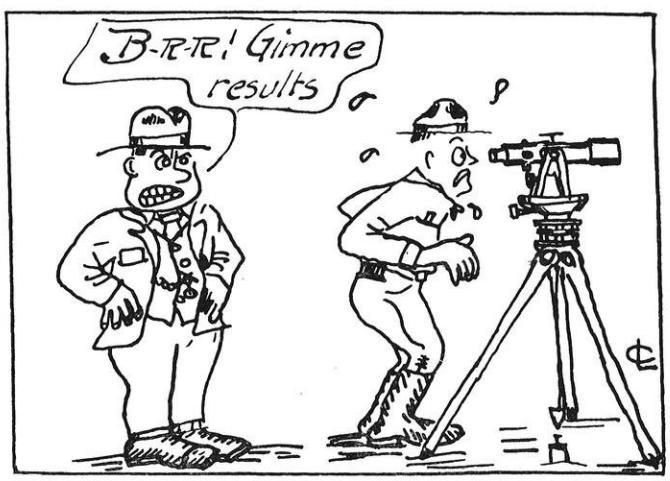
Losing two days work, as this incipient engineer did, cost some one money,—probably a minimum of ten dollars. In other words, it cost ten dollars to impress upon him the necessity for doing something that he already been taught to do in school. But he has acquired experience, and that is one of the great gains to be obtained from summer work.

The majority of our engineering students at Wisconsin find work to do during the vacation periods—it is the exceptional man who plays all summer—and most of them come back to their studies in the fall with a broadened outlook, and a quickened appreciation of the need for a thorough training in their profession.

One of the most important things gained from summer work is self-confidence. This is mentioned frequently in the reports which the men make about their experiences. "While studying freshman English," says one, "Emerson's essay on 'Self Reliance' was, figuratively, pushed down our rebelling throats; but, in the slang of the day, 'Emerson was right'. Self-reliance is one characteristic which an engineer must cultivate if he is to succeed. This fact was hammered home during the past summer while I was on a construction job, and I can say, with all modesty, that, while I did not assimilate such a large store of self-reliance, I did come to realize its importance. Older engineers toss problems to the cub-engineer with little or no explanation and expect results. It is tough training, but 'great stuff'. for it makes one scratch his head and do some real thinking."

Another man describes sensations that are probably common to most young engineers when they find themselves on a real job with some one standing over them who wants results and doesn't care much about the "method" by which they are obtained. "I did all of my practice problems in surveying with a feeling of uncertainty; I never felt that I would be willing to back up my work, and the thought of doing work where I would be held responsible for results gave me a panicky feeling. Seven weeks of practical work this summer knocked most of the uncertainty out of my system.

"My first few days with the transit were the hardest. I puttered around and worried about getting the instrument set up over the exact point. Each time I oriented, I tested the thumb screws five or six times to make sure that they were really tight. I was always afraid that I would delay the party while I was setting up, so I hurried with a selfconscious haste. All of these things worried me; I did not want to show the others



The nerve-racking situation of the young engineer on a real job with some one standing over him who wants results and doesn't care about "method."

that I was green at the game, but my anxious concern certainly proved me to be a tenderfoot. As the days passed into weeks, my puttering changed into fairly skillful operation of the transit, and I became more and more sure of myself. When I set up over a point I knew it would stay there; I tightened the thumb

screws once and knew they were right. I do not claim to have become a wonder, but at least I am not afraid to back up my work."

He Studied Human Nature

Although the engineer is often accused of interesting himself only in material things and ignoring the human element, these engineering students seem to study human nature with the same quick interest that they show for the technical phases of their work. "I was not so much impressed with the processes of the job as I was with its personnel," writes one who spent nine months on a construction job before returning to the University this fall. "I had a business acquaintanceship through various ranks of superintendent, foremen, and clerks, to the large army of common laborers. It was interesting to see how the majority of employees resigned themselves peacefully to their ranks in the great game of building. Most laborers wanted more pay, but were content to be laborers. Carpenters were content to be carpenters, masons to be masons, timekeepers to be timekeepers, they didn't want to lose their jobs, but didn't aspire to outgrow them.

"In sharp contrast to this inert multitude were the few who kept their heads up and eyes open and looked forward to advancement. The job was, to them, a happy hunting ground of opportunities rather than a means for getting a weekly pay envelope. In most cases such men were moved along, for openings frequently occurred in the busy building season of last year.

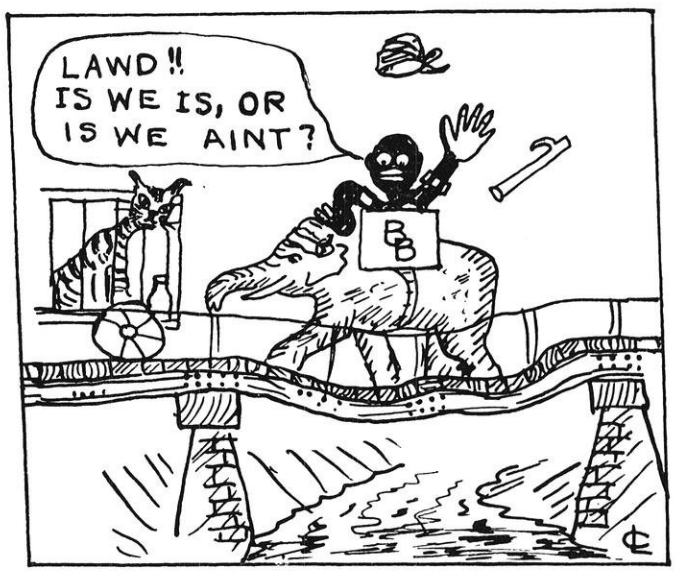
"An interesting example of this great contrast existed on our job. Our head timekeeper had been a timekeeper off and on since 1890. One of our superintendents was born in 1890 and had broken into the building game as a timekeeper in 1915. These two men, both fine fellows, represent the distinctive types of men that I met on the job. I should call them the active and the passive employees."

One of the men, who joined the carpenter's union this summer, has a little clash with union rules that will give him some appreciation of the difficulties that the labor problem offers to anyone who is responsible for the progress of construction. He and another carpenter were putting up some bracing on a big structure and had two laborers preparing the braces and handing them up. At noon they were called before the union boss to explain why they worked with the non-union laborers, and were fined twenty-five dollars for the offense. The fine was remitted in the case of the student, because he was a new member. The experience has doubtless prepared him for some of the idiosyncrasies of labor rules which he will have to reckon with in the near future.

Older engineers realize that it is not sufficient to know what ought to be done and how to do it; they understand that human nature plays a part in all human affairs and that a certain amount of strategy is sometimes required to make people do things that they should do without the strategy. One of the seniors demonstrated the value of such strategy to his own satisfaction, and tells his story thus: "For three consecutive years I have tried to prove to the city council of Bingville that they needed to replace one of the old bridges across the Pelican river with a new one. The present bridge is in a very bad condition, and it is nothing less than a miracle that is has not gone down. At different times I went before the council and each time with the same lack of success.

The Councilmen Investigate The Bridge

"I finally decided to try to make one of the three councilmen think that he had investigated the condition of the bridge on his own initiative and found it to be dangerous. So I waited for the chance. It came one day when a circus was in town. The street commissioner and I were walking across the bridge, and I



I asked the street commissioner if he knew of any way whereby we could find out what effect on the bridge the circus moving across it would have.

stopped and asked him if he knew of any way, whereby we could find out what effect on the bridge the circus moving across it would have. Well, he had a hundred suggestions, but he insisted that we keep the matter to ourselves and take notes before and after the circus had passed. This we did. He brought in his findings to the council with the air of a discoverer, and a leader, and a new bridge is assured."

The problem of handling men presents itself in other guises occasionally. "I was put in charge of a survey party for the first time, in 1922 during the summer vacation," writes a senior civil, "and the question of how to deal with young fellows, most of them just out of high school, presented itself. I decided in treating them just as equals. The result was not satisfactory; they soon began to question orders and waste time. Efforts to regain a hold on them failed. When, during the summer of 1923, I was again placed in charge of another party made up of the same class of men, I

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THE ENGINEER AS A SALESMAN

By William E. Schubert

Senior Mechanical

Each year sales work draws heavily from the several groups of young engineering graduates. Upon first thought is seems very strange that this should be true, more especially in view of the fact that technical education does not develop in a man those qualities which characterize good salesmenship. The engineer has made a specialized study of the "physical laws of nature" and the application of these laws to particular problems at hand. He konws little or nothing of the "laws of human nature" which govern business relations between the salesman and the buyer. Can the technically trained engineer adapt himself to the work in the commercial world? Experience has proven that he can, for today there are found corporation managers, directors, and presidents who are big men because of the engineering education and experience they have had. Perhaps the most striking example is the case of Vouclain, who is "king" of the locomotive industry. Vouclain's success as a sales manager and corporation head can be ascribed to the fact that he was a salesman whose engineering ability enabled him to exemplify his own maxim that "it is a salesman's first duty to serve his customers." There can be no doubt that many industrial men would be enormously aided in their work by a technical education, thus proving that the engineer is excellently fitted to take a business position wherein he can make use of such training as he has had. Realization of this fact is brought out by the demands industrial leaders of today make for college trained engineers, not alone for solution of production and manufacturing difficulties, but also for meeting the newer issue, that of distribution of products.

There was a time, not so many years ago, when production possibilities and limitations determined the growth of a business. The demand was for inventive genius that could devise new articles and for machines that would produce such articles at a reasonable cost, in short, anything which could be produced could be sold,—today anything which can be sold—for which there is a market, or for which a market can be produced." Individual inventive genius has given way to experimental and research departments, headed by engineers and specialists, to whom can be referred all problems of devising new articles and working out a means for producing these at a reasonable cost. The question of today is one of marketing and distribution. In the field of marketing the engineer takes his place, not as a salesman of a "line" but as a salesman of service. He is not to be classed as a "peddler" of wares but as a professional man who is selling service with his product. It is upon this "sale of service" that the growth of market and consequent growth of a business are dependent. Creative salesmanship is perhaps the biggest factor toward this end, and the sales engineer alone makes this form of selling a fact. An example will make this point clear.

"A short time ago a new addition to a Rhode Island plant was being erected. The installation of machinery was to be large and as a consequence, every machine concern in the East had a salesman on the ground. Blue-prints, showing the installation, had been distributed and each salesman had the estimate of his house ready to present on a certain date. One of the men, when he carried the blue-print away, thought he saw a chance for changes, both in lay-out and in type of machines, which would materially increase the output and lower costs. He took the matter up with the other engineers at his company's home office and turned out an entirely new set of drawings showing the new installation that he proposed. On the day set for the submission of bids, every machinery salesman but this one submitted a bid on the installation as originally planned. This man, when his turn came, spread his new plans before the board of directors, explained the changes and improvements proposed, showed how costs would be cut and the output increased, and won them over to the new arrangement. This man secured the contract."

Creative salesmanship as made possible by engineering experience, is largely responsible for the latest improvements in central station design which have resulted in almost unbelievable economies. Pulverized fuel was first sold to central station men by a stoker sales engineer, whose engineering experience had enabled him to recognize the posibilities that lay in the use of powdered coal.

A further instance is that of the Santa Fe Railroad. When the Santa Fe demanded "backing up" locomotives which would hold the rails, Vouclain as the "engineer" had pocketed the order before the so-called "decopods" had ever been drawn on paper. Experience and imagination made it possible for him to realize at once the demands of the Santa Fe people. He knew that the "backing up" locomotive could be produced at his shops.

A higher form of "sale of service" is encountered in consulting work, and if offers a very attractive as well as interesting field. The selling of a highly specialized branch of engineering service is so far above the selling of a concrete article, that it ranks with the professions. It is true that the engineer engaged in this field must have qualifications in common with the "canvasser of customers" who introduces a "line of goods", but in addition he must be possessed with a special training which puts him in the professional class. For salesmen of consulting engineering service—industrial or production—there are two primary requisites. "First, he must have a full knowledge of the service he is sel-

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EXTENSION NOTES

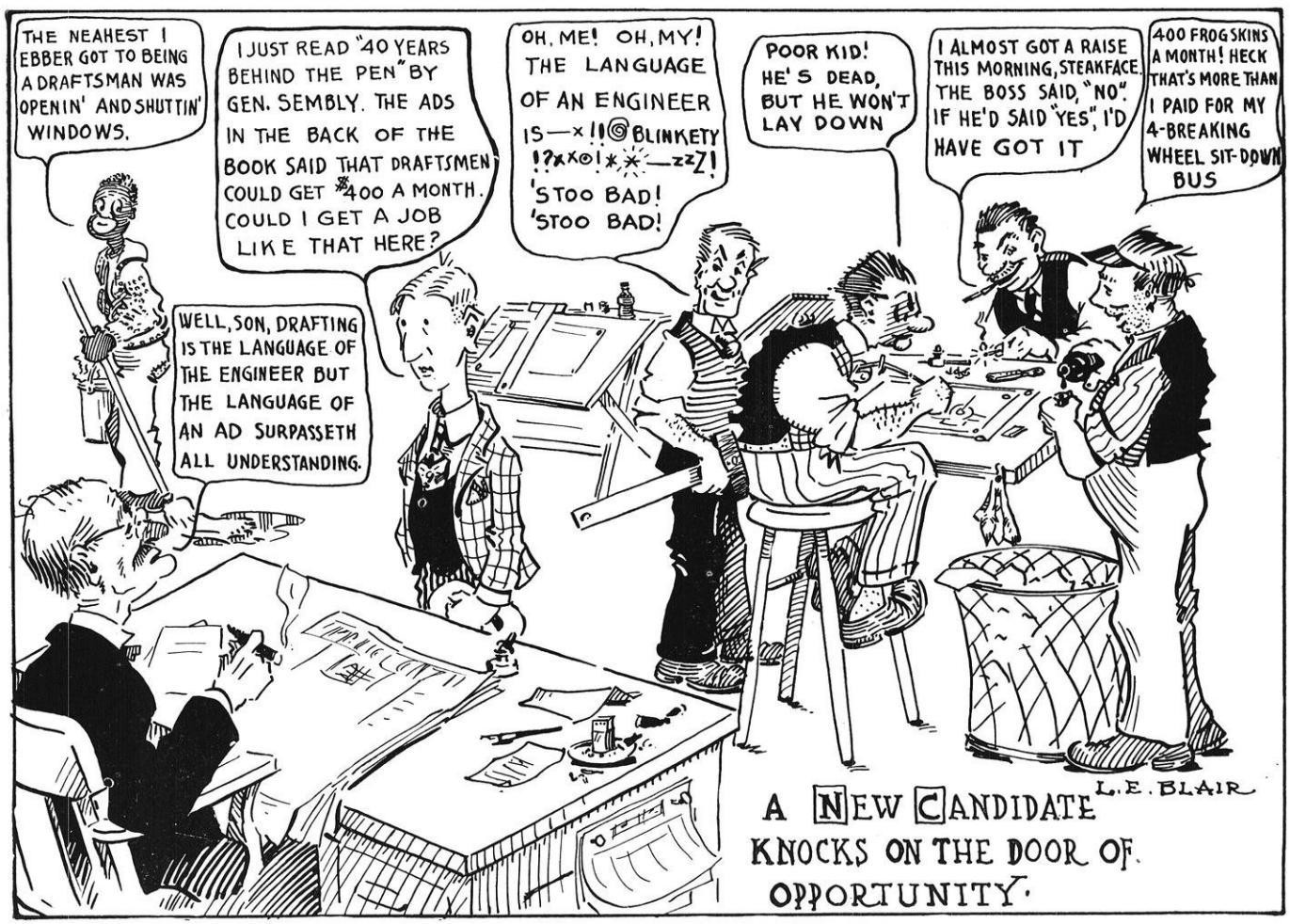
An inspection trip through the plant of the Kohler Company at Kohler, Wisconsin was made by a party of forty-five students from the Engineering classes in Milwaukee on October 31. The party was taken through Kohler Village before lunch was served at the American Club. In the afternoon the party visited the factory where every detail of the work was explained. Mr. Walter J. Kohler, president of the Company, is President of the Board of Regents of the University.

The two thousand horsepower electric generating station at Port Washington was visited enroute. This station is unique in that it is driven entirely by gas engines which are supplied with producer gas from a plant using bituminous coal.

The first dance and all school mixer was held at the Athenaeum Hall in Milwaukee on the evening of November 14. This was the first social event of the school year and was well attended.

Professor W. H. Lighty, Secretary of the Correspondence-study Department of the Extension Division, addressed the instructors of the University Extension Division in Milwaukee at a luncheon at the City Club on November 10. Twenty-five instructors of day and evening classes were present.

Dean Louis E. Reber spent several days in Milwaukee early in November making a thorough investigation of the different building propositions. The work is now being conducted in two leased buildings; it is planned to have all of the work under one roof in a building owned by the State.



L. E. Blair, *who contributed the above carton, has charge of all Drawing and illustrative work in the Extension Department. He received his training at the Chicago Art Institute.*

Major General Wm. G. Haan, former commander of the Thirty-second Division, addressed the student body as a part of its Armistice Day program. His address covered the advantages of an education, stressing par-

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EDITORIALS

L. T. SOGARD

OUR NEW DEPARTMENT

This issue marks the beginning of a new department in the "Engineer"—Extension Notes—the development of a plan of co-operation between the engineering students and faculty of the University Extension Division and The Wisconsin Engineer.

We have thought, for some time, that, in our failure to establish contact with the large number of men pursuing engineering studies through the University Extension, an opportunity of service to the University and State was being neglected. The faculty of the University Extension has long felt the need of their students for a publication, like the "Engineer," which would serve as a unifying medium of their student body.

Co-operation with the University Extension Division need, in no way, effect the general make-up of the "Engineer."

Our policy has been to avoid material of a highly technical nature and to print only those articles which, though engineering in character, have been written in a — we hesitate to say "popular" manner, but perhaps that best expresses our thought. With this fact in mind, we believe the addition of the new "Extension Notes" department will make the magazine as valuable to the engineering students of the University Extension as to our present group of readers, and in no way will affect the general policy or make-up of the publication.

Co-operaton with the engineering Extension men, a majority of whom are actively engaged in engineering work, will open up a wonderfully rich and diversified field from which material for publication may be drawn.

Viewing the scheme from every angle, we are much impressed with is possibilities and have every confidence in its successful operation.

Wisdom is the result of experience, observation, and thought.

THE APPEAL OF THE CHRISTMAS SEAL

A tiny grave beneath the Christmas snow, a lad of 16 dying of tuberculosis, and his mother and baby sister waging a hard but winning fight for their lives in the grim battle with the great white plague,—the picture comes to the Wisconsin Anti-Tuberculosis Association from a far nothern county, where a free chest clinic was recently held,—yet pitiful as the story is, there is a hopeful note,—the hope of recovery for the mother and the little girl, who are now being properly cared for in a Wisconsin public sanatorium, with every chance of winning their battle.

Fifteen years ago the entire family would probably have been wiped out; then there were no free chest clinics, no county sanatoriums, no public health nurses, no medical inspection in the county schools, no open air classes. But fifteen years ago the Wisconsin Anti-Tuberculosis Association was born, and with it the first Christmas seal, and today all these things exist,—the result of the unceasing fight waged against disease by the little red and green stamp which has come to be associated with the activities of the christmas season. In 1922 alone, 1,091 lives were saved as the result of this fight. Fifteen years ago when the Christmas seal made its first appearance 107.7 people out of every 100,000 in Wisconsin died of tuberculosis. Year by year the deaths have been decreasing, slowly but surely, until in 1922 there were only 1,807 deaths, a rate of 67.1 for every 100,000 population.

Yet the work of the seal is by no means over; health education must still be carried on. Great strides in this direction have already been made, but not until the message has reached every home in Wisconsin and taken root there can the work be thought completed. During December of this year, the Association again conducts, as it has for the past fifteen years, its annual sale of Christmas seals. Once more a great cause asks for your aid. Will you help?

Books are the best of things, well used; abused, among the worst.

RALPH WALDO EMERSON

GONE!

Died October 26, 1923

BY ROLAND BURKE HENNESSY

CHARLES P. STEINMETZ

Gone—though his work, still fresh in mind,
Gives hope to faltering mankind.
Weak as a reed that's blown by gales,
Yet swift as a thought all set with sails.
Nature decreed him short and bent,
Yet beauty of mind on him she spent.
Some might have cursed what fate had done—
He only smiled, with his face to the sun.
Feeble the flesh of that gnarled form,
Grappling the problem of lull or storm.
To him all science, no accidents.
He tore the truth from the elements.
Ever and ever for facts he strove,
Hurled bolts of truth with hand of Jove.
Gone—brave little man! He heard the call.
Gone—to the One who can tell him All.

(Concluded on Page 64)

MY CONCEPTION OF THE FUNCTION OF THE ENGINEERING PROFESSION

By A. J. NECAD
Wisconsin, '23

The various branches of engineering cover a wide field in fulfilling their functions. Sanitary engineering serves to safeguard life against the destructive agencies that come from uncleanliness. Functioning in maintaining liveable conditions, this branch of society certainly aids society by eliminating the misery that comes from sickness and untimely death. Other branches of engineering serve, also to maintain health. Chemical and mining engineers are needed in obtaining materials used by medical men. Practically every type of engineering is used in building and equipping modern hospitals. Thus we find that the protection of public health is one of the functions of the profession.

In the transportation system that engineering has made possible, a two fold purpose is accomplished. First of all, such a system prevents or minimizes suffering due to local conditions. When crops fail in one locality, food can be sent long distances to prevent any starvation. When local calamities such as earthquakes or fire do much damage, help can be quickly sent to lessen the hardships caused. Such a system, also, gives freedom of movement to the individual. Many times the very life of an individual depends on his ability to reach some locality quickly. Thus the profession functions in safeguarding against local disturbances or at least dampening their effect, and it also makes it easier for the individual to select the locality in which he wishes to live. Emerson, where he alive today, might accuse the engineering profession of making an easily accessible Fool's Paradise.

In the comfort and beauty of homes and buildings, we find that engineering has served and still must serve. We enjoy the cleanliness and general efficiency of electric lighting. We glow inwardly as our heating systems maintain a healthy temperature. But behind the beauty and comfort, there are the tools of engineering —the power plants, mills, and factories, operating to maintain old service or develop new.

Pages could be written to show how engineering serves to assist in education and entertainment, but it is sufficient to just name one instance. The widespread use of books, papers, and magazines which constitutes a vital element in our entertainment and educational system, is only possible because of the machinery used in their manufacture and the transportation system used to distribute them. These of course are products of engineering effort.

Thus we see that it is the purpose of engineering to make it possible for society to derive the maximum benefit from the material things which make up its environment. It does this through the application of material laws. The functions, then, of the engineering profession are the applications of material laws for the purpose of betterment of the conditions of society.

ENGINEERING REVIEW

H. C. WOLFE

DEVELOPMENT OF THE ELECTRIC STEAM BOILER

Electric steam boilers or generators are not new, having been used in European countries to some extent for the past fifteen years. During the World War they were developed on a large commercial scale in Italy, and the Scandinavian Countries, where hydro-electric power was available in large quantities. In Sweden, when coal was sixty and seventy dollars a ton, steam was generated by electricity at a fraction of the cost of coal.

Although the first commercial boiler was installed in this country in 1919, we already have much larger units than any in Europe. As yet, however, it is not practical to use these boilers except where there is a large amount of hydro-electric power available, or where there is an excess of electric power during an operating period.

There are two types of electric boilers; those that have resistance elements to heat the water and those of the electrode type. Those of the last type may be divided into two classes. In one the resistance element is placed directly in contact with the water. This prohibits the use of direct current, which would decompose the water. In the second of this type the resistance element is kept from direct contact with the water. In the electrode type the water offers the resistance. The last is the most economical one, commercially, because it permits the use of high voltage (22,000 volts) and there is no danger of burning out the resistance element.

The electric boiler has many decided advantages over the fuel boiler, the most interesting being its high efficiency which is 95 to 98 percent while coal boilers rarely have an efficiency of more than 70 percent. The initial cost and the cost of installation are camparatively low. Operating costs are very low, one attendant being able to take care of several boilers. There are no costs for transportation, storage of fuel, or removal of ashes. A paper mill in Wargon, Sweden, which replaced fuel boilers by electric boilers, was able to dispense with the services of seventeen firemen. The installation of electric boilers in a Canadian paper mill and the subsequent saving in fuel enabled that company to continue operation during the period of depression after war. In factories that pay for electric power by the kilowatt year it is has been found economical to install electric boilers and use any power during low leads to generate steam. There is a possibility of a much greater development of electric boilers.

THE COMPLETION OF THE SURVEY OF THE GRAND CANYON

The last strech of the Grand Canyon has been surveyed by a party in charge of Col. C. H. Birdseye. The trip, which was through 300 miles of the roughest waters and most treacherous sections of the Colorado, began at Lees Ferry, Arizona and ended at Needles, California. The chief purpose of the trip was to make an accurate survey of the canyon and to locate sites at which dams could be built to utilize the wasting waters for flood prevention, power development, and irrigation.

The trip was made in four boats which carried all supplies, surveying and geological instruments, and the ten men of the party. Col. Birdseye's report, which is full of exciting incidents, tells of running rapids where the waves were often 20 feet high. The survey line was run through without a break although great difficulties were encountered in securing a foothold for instrument and rod stations.

At one point of the survey, while the boats were running some rapids, one of the boats was thrown into the air and came down bottom up. The three men in the boat narrowly escaped being crushed. The men were rescued and the boat with its equipment was saved.

On September 18, about six o'clock in the evening, the river began to rise. By eight o'clock the boats were pounding so badly against the rocks that it was necessary to move them. Three of the boats were moved downstream to a sand shore. The cook boat was dragged up the side of the cliff by means of a block and tackle. The men were kept busy all night pulling one boat after another out of the water to higher places on the bank. The cook went to bed ten feet above the water and was flooded out at midnight. The river continued to rise, reaching its peak of 21 feet the following day. During the flood, it was reported that the entire party had been drowned in the high waters.

The party reached Needles, their destination, 450 miles from Lees Ferry, on October 19, having spent three months on the job.

(Continued on Page 62)

ALUMNI NOTES

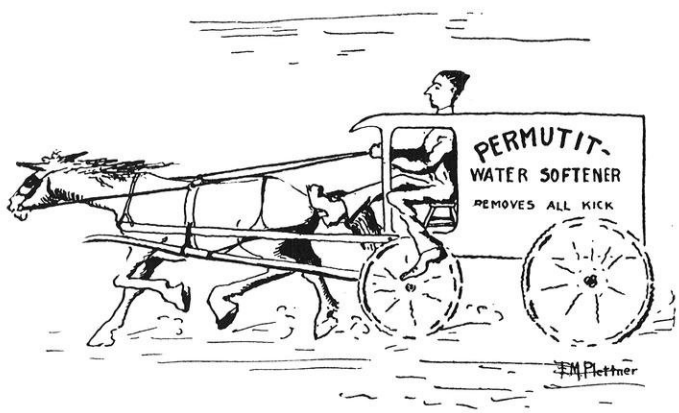
F. D. BLANCH

CIVILS

--**Byron Bird, CE.** '15, formerly professor at Texas A and M College, may be reached at 1602 Second Ave., Fort Dodge, Iowa.

C. B. Christianson, c '22, has left the American Bridge Co. and is in the Bridge and Building Dept. of the Illinois Central Railroad, with headquarters in the Central Station at Chicago. When he wrote in June, he was building concrete pile bridges at Winona, Mississippi.

Bernard M. Conaty, c '18, is selling water softeners for the Permutit Co. His address is 1046 McKnight Building, Minneapolis, Minn.



Robert S. Drew, c '13, was a visitor on October 19. He is associated with R. M. Feustel & Co. of Ft. Wayne, Indiana.

William A. Goss, c '15, is assistant engineer with the C. B. & Q. Ry. with headquarters in the general offices at Chicago. Residence 410 N. Brainard Ave., La Grange, Ill.

Penn P. Livingston, c '22, is with the U. S. G. S. in the Water Resources Dept., at Chattanooga, Tenn.

G. H. Nickell, c' 11, is secretary-treasurer for the Nickell-Grahl Construction Co. of Waukesha, Wis.

John E. Noran, c '23, is with the A. T. & T. Co., in the structural department. He sends word from South Bend, Indiana, that he is working there on the construction of new buildings and that he expects to be there this winter. His address is 222 South Scott St.

Paul Paine, c '14, is with the Minnesota Highway Department at Chaska, Minn.

W. A. Peirce, ex-c '12, is living at 227 Clifford Court, Madison, Wis.

R. B. Pewell, c '23, is reported to be with the Dixie Construction Co., at Cragford, Ala.

Victor H. Reineking, c '08, died at Milwaukee on October 16. He had been engaged in private practice in hydraulic engineering at Portland, Oregon, since 1913.

Lester C. Roberts, c '15, is in charge of the consrtuction of some subways that the Illinois Central R. R. is building. He may be reached in care of Bates & Rogers Construction Co., Champaign, Ill.

Edward E. Sands, c '00, died, after a long illness, on October 28, at the home of his parents in Milwaukee. Mr. Sands acquired national fame in his profession. He was city engineer of Houston, Texas, for several years during its greatest development. During the war he was employed in army construction and was active in the construction of Camp Logan, Kelly Field, and Gerstner Field. He was president of the Texas section of the American Society of Civil Engineers for the year 1922-23.

James A. Schad, c '16, who is with the Corrugated Bar Co., has been transferred from Chicago to St. Paul. His new address is 1872 Dayton Ave., St. Paul, Minn.

G. R. Schneider, c '22, is resident engineer for L. A. De Guere of Wisconsin Rapids, at a dam and power house being built at Grandmother Falls on the Wisconsin River, by the Tomahawk Paper Co. He was married, on June 26, 1923, to Miss J. M. Gillis, of Hayward, Wisconsin.

Frederick A. Schewede, c '08, is with the Public Works Dept., Mare Island Navy Yard, Calif.

Lewis R. Sherburne, c '20, is resident engineer for the Milwaukee Sewerage Commission. Res.: 252-26th St., Milwaukee.

ELECTRICALS

Thos. W. Ayton, ex-e '22 gives his address as Room 410 Public Service Building, Kenosha, Wis.

Miles W. Birkett, e '08, is general manager of the Washington Power Co. at Spokane, Wash.

Lewis R. Brown, e '03, has recently been appointed manager of the Transformer Division of the Central Station Department of the General Electric Company. Brown entered the Students' Training Course at the Schenectady Works of the General Electric Company and from there was transferred to the Switchboard Department of the Company, where he was engaged in the work of station layout engineering. He joined the Transformer Sales Department when that department was established, in 1906, and spent three years in transformer work in Chicago, Texas, and New York territories. In 1911 he was made head of the distribution section of transformer sales, and in 1913 he established the first transformer commercial offices at Pittsfield. He was one of the company's first transformer specialists.

Charles W. Hejda, e '04 is state engineer for the Hartford Fire Insurance Co., with offices in room 410 Railway Exchange, Milwaukee. His residence is 2834 State St.

Elmer D. Johnson, e '21, is at 1317 Center St., Wilkinsburg, Penna.

E. M. Lunda, e '22, sends us his check for another year of the "good old Magazine." He is with the railway department of the Wisconsin Public Service Corporation, at Green Bay, Wisconsin, and has charge of all equipment.

Anthony Pesch, e '21, is results engineer with the Madison Gas and Electric Co. of Madison, Wis.

Orville Radke, e '20, is telephone engineer with the Illinois Bell Telephone Co., of Chicago.

Robert I. Svitavsky, e '22, is engineer-inspector with T. M. E. R. & L. Co. Address: 1462 Fifth St., Milwaukee, Wis.

Raymond Wood, e '17, is with the Western Electric Co. Address: 526 North Central Avenue, Chicago, Ill.

(Concluded on Page 65)

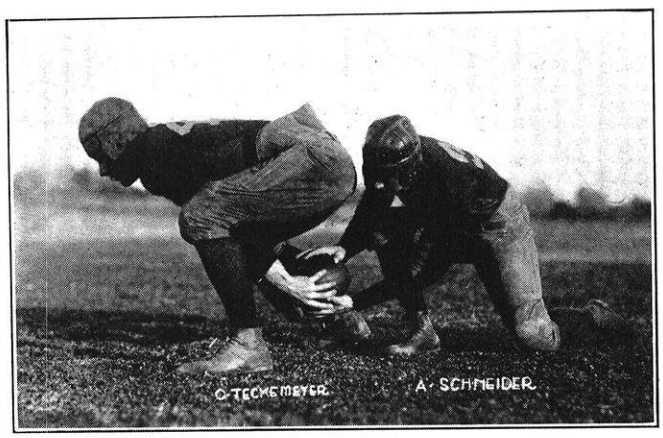
ATHLETICS

E. R. SUMMERS

FOOTBALL

Nothing is ever so bad that is could not be worse. We might have been beaten by Indiana. However, even the most optimistic Badger cannot pump up much enthusiasm over the past season. (Thank Heaven, it IS past.)

The first defeat of the season is always a bitter pill to take, but since the possibility of our losing was at least admitted—if not expected—the victory of Illinois carried a sting less painful than was the case last year. The event with the Indians was nothing more than a formal introduction to "Red" Grange, a lad who has the speed of Zev and the coy elusiveness of a well lubricated "porker."



TECKEMEYER AND SCHNEIDER, *center and quarterback respectively—two football luminaries whom we are proud to own as fellow engineers.*

The air about Camp Randall had a distinctly sulphurous odor at the conclusion of the Michigan game. The blasts of lurid invective directed at the referee were roughly estimated to contain 63,636,363 B. t. u., and raised the temperature within the stadium to one hundred and three degrees Fahrenheit. So many unkind remarks were passed concerning Mr. Eckersall that it was said his ears sizzled when touched with the moistened finger.

Although Michigan left the field with the heavy end of a six to three score, there was no doubt in the minds of the 25,000 spectators as to the real victors. The Cardinal jerseys ran circles, ellipses, hyperbolas and parabolas around their opponents; they demonstrated superiority in every department of the game, but were beaten by a decision which outraged every sense of fair play.

The calamity at Chicago can be more easily endured, for no unfortunate incidents marred the contest. Both teams fought gamely and cleanly to the end,—it was anyone's game until the final whistle. The teams were quite evenly matched—Chicago having, perhaps, a little the better of the comparison. From the spectators viewpoint, it was a thrilling battle,—made possible by ideal weather conditions and a dry, fast field.

The third quarter gave the teams some real excitement and suspense. Late in this period a pass, Harris to Taft, was completed on the Maroon's ten yard line. and Taft carried the ball over the goal line for Wisconsin's only score. The quarter ended with the score six to six.

The next quarter was a fierce battle of line plunges and forward passes. The Maroons seemed to have the odds in their favor. The ball was carried to Wisconsin's 12 yard line. There was a tense moment of suspense in the Badger section of the stadium,—then a sigh of relief,—the kick went wild. Taft punted to Pyott. The Maroons made a couple of line plunges, and then the fateful moment arrived. A 38 yard pass, Pyott to Harry Thomas, put the ball on the Wisconsin 10 yard line. Pyott was thrown for a 1 yard loss. Then Pyott took advantage of the last opportunity and made a brilliant end run for the touchdown that cinched the game. With a few minutes left to play, Wisconsin had no chance to score.

Two of our plumbers have fought their last gridiron battle for Wisconsin. Their hard struggles on Badger elevens entitle them to a permanent berth in the Plumber Hall of Fame. Advantage is taken of this opportunity to express profound gratitude for the services of

TOM C. NICHOLS
HAROLD J. BENTSON

BASKETBALL

Coach Meanwell has a difficult task this year. The loss of three W men by graduation is a matter of no small concern to basketball fans. The scintillating career, of Williams and Tebell form an annal of basketball history that would be hard to equal. Never has the Big Ten produced a better combination of guards. Out future hopes lie with the surviving members of last year's squad. Among the varsity candidates who have had previous experience under the Meanwell system are Spooner and Elsom, forwards; Barwig and Diebold, guards; and Gibson, center. With these men as a nucleus, Dr. Meanwell hopes to build up another championship team. Several promising new men are

included in the list of candidates for the team. Nelson, Varney, and Merkle, all candidates for the forward position, will give Spooner and Elsom plenty of competition. The prospects for guard material are promising. Harris, Meyer, and Wolf apparently possess enough ability to take care of this phase of the game nicely.

The basketball squad will have more material now that the gridiron season is over. Radke, c '24, Harris, and Nelson are expected to be in this year's lineup. Approximately 25 candidates for the varsity squad have been working out daily. At present Coach Meanwell is drilling his men in the fundamentals of the short pass. Practice was started in earnest recently; at that time the squad was cut down to about 15 men.

From all indications the conference schedule will be even more difficult than last year. Iowa, Michigan, and Purdue have suffered very little from loss by graduation, and Indiana can always be counted upon to upset the dope bucket one way or the other. Much is to be expected from the squad during the next three months. Meanwell feels quite confident. "There is no reason," he said, "why an institution of the magnitude of Wisconsin should not turn out good teams in every branch of sport". Although the outlook may appear somewhat dubious to some of the fans, the confidence of the students in the ability of Dr. Meanwell never weakens.

SWIMMING

Coach Steinauer's fish are taking daily practice to get in condition again. Ineligibility cuts deeply into the squad again this year. It is a cloud on the horizon that forever threatens to play havoc with any coach's aspirations. Steinauer is getting the scholastic standing of his men, and, if the worst comes to the worst, a study fest will be held in his office at the gymnasium.

Capt. Hugo Czerwonky, the national breast stroke champion, will pilot Steinauer's proteges. "Czerwonk" won easily in the national meet at Princeton last year. His time for the 200 yards was 2 minutes, 47 seconds. Czerwonky, a senior mechanical, already has two major W's to his credit. He is a very hard worker at every task that he undertakes; only one man in the conference beat him last year. That man is no longer in the conference. The road is open. He will no doubt show the rest of the conference up with that breast stroke and backstroke this year.

Norman Koch, m'24, is a W man from last year's squad. This is his third year on the varsity squad. Although he may be somewhat short of stature, he is not short of wind. The "Flying Dutchman" he is, and shall be.

Walter J. Flueck, c '25, is a good diver as well as an excellent sprinter. Although quite calm and reserved in character, he is a whirlwind in the tank. He is a swift dash man of the tearing, Lamboley type. When he dashes across the tank, he just naturally eats a hole right through the water.

"Joe" Bell, ch'26, is a new man on the varsity squad. Bell was one of the best men on the frosh squad last year. The probability curve (ouija boards are obselete) says that he will do equally well on the varsity. He is quite frequently called "Handsome", but he is trying to keep it a secret until Christmas.

The varsity team will have meets with teams of such calibre as Minnesota, Illinois, Indiana, Illinois Athletic Association, Milwaukee Athletic Association, and many others. The development of swimming as a sport at Wisconsin has been nothing short of phenomenal during the last couple of years. Swimming as a sport was organized at the University in 1904. From 1904 to 1922 no conference dual meets were won. In 1922 Wisconsin won six out of six dual meets and lost the conference meet by only a two point margin. In 1923 two dual meets were won, two were lost, and the team finished third in the conference of nine teams. Such development speaks good for Steinauer as well as for the team. Steinauer began in 1921 to devote his entire time to the swimming team. He is a hard worker and is well liked by all of the men.

With the present development of the sport at Wisconsin, does not swimming deserve a major sport classification? The fellows have worked hard for their Alma Matr. Come, Wisconsin, recognize and reward real service when it is once rendered. If the sport is given a major classification, more swimming talent will be attracted to the University. The team wants swimming classified as a major sport with the same awards as at present. Talk it up gang, and give them a hand, —they deserve it!

Sixty-five freshmen turned out for the first meeting of the frosh squad. Steinauer's advice to the yearlings was: "Put your studies first, and make good on the hill; quit diving for pennies." The frosh squad represents the pick of the various high schools. Several of the new men have shown real speed in the practice swims. The varsity squad will have to put out all sails to keep in the lead. The freshmen and varsity met met for the first real tank competition on Tuesday, Novebmer 17. Steinauer has selected 25 men to compose the best yearling squad that we have ever had.

WATER BASKETBALL

Coach Joe Steinauer intends to put water basketball on the map this year. Players will be picked through a series of inter-fraternity meets to be held during the early winter season. The sport has been somewhat weak in past years due to the fact that a victory in that event counted no points toward a dual swimming meet. Formerly Steinauer has left water basketball in care of his assistants. This year he is going to take the bull by the horns himself and see that he gets some good material. The tank is just new and well equipped for the sport.

(Concluded on Page 62)

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.

CAMPUS NOTES

L. C. CREW

OFFICERS ELECTED AT MINING CLUB MEETING

The first meeting of the Mining club was held Nov. 7, in the mining laboratory. A steak supper was served. After the banquet officers for the coming year were elected.

They are: M. H. Hankins '24 President; W. W. Boley '25, Vice-president; I. M. Murphey '25, Treasurer; H. C. Weiss '25, Secretary; W. G. Beatty '24, Publicity Manager; A. M. Zoeller '26, Mixer; D. S. Blair '27, H. J. Carroll '27 and Paul Ritter '27, Assistant mixers.

GET HIM A ROBBER'S HORSE

An irate fan, after the Wisconsin-Michigan game, stepped up to Eckersall and demanded, "Where's your dog?"

"Dog?" replied Eckersall in a puzzled way, "I have no dog."

"Well, you're the first blind man I ever saw who *didn't* have a dog," returned the disgruntled one.

Dr. Joel Stebbins, director of the Washburn Observatory, addressed the Madison section of the American Institute of Electrical Engineers on the subject "The Electrical Photometry of the Stars" at a meeting held November 22 in the auditorium of the Engineering building.

ENGINEERING FACULTY THROWS A PARTY

New members of the Faculty of the College of Engineering were welcomed with a dancing party held on the evening of November 15, in the gymnasium of Lathrop Hall which was decorated for the event. The guests were entertained during the early part of the evening by a number of amusing events that were staged under the direction of Kenneth L. Scott, chairman of the entertainment committee. Included among them were the estimation and determination of the coefficient of CORP-orosity of Professor Corp, a demonstration of impromptu poetry, and a class in spelling that flunked out on the word "hieroglyphics". A feature of the dancing was the use of colored lights which had been placed in various parts of the hall.

FRESHMAN OPEN HOUSE

On November ninth the Wisconsin Branch of the A. I. E. E. held open house for all engineering freshmen at the electrical laboratories. The aim of the members in holding open house was that of becoming better acquainted with the Freshmen while giving them some definite ideas as to what their future work in the laboratories might be. This idea has not been used in the College of Engineering before, but it was carried through successfully this year.

All arangements were made by a committee acting under S. M. Coe as chairman and made up of the following men; H. H. Ratcliff, R. A. Merrill, J. S. Timmons, A. J. Larson, R. E. Purucker, and E. M. Plettner.

There's a silver lining to every cloud. Even the Michigan game has its compensation; we have added a new term to our vocabulary. Hereafter, let any bad decision that ranks with the rankest be known as an "Eckersall".

THAT'S SO

The "Road Scholars" and "Probates" seem to outnumber the "Rhodes Scholars" and "Tau Betes."

THE ENGINEERING FACULTY PARTY

The series of engineering lectures was opened on November 19 by Mr. H. S. Smith, chief engineer for the Prest-O-Lite Company and past-president of the International Aceylene Association who spoke entertainingly about the manufcature and use of acetylene. Junior and senior classes in professional subjects were excused to permit members to attend the lecture.

HEIGHTS UNATAINABLE!

SUCH AN OUT-OF-THE-WAY PLACE

Elmer Krieger had just tackled a question in a Roads and Pavement recitation and been thrown for a loss. Then ensued the following conversation:

Professor Smith: Mr. Krieger, if I tell you where you can find the answer to that question, will you look it up and read it?

Elmer: (eagerly) Oh, yes indeed, professor.

Professor Smith: Well, young man, you will find it in the text book,—in today's assignment.

The Michigan game brought us a visit from Wendell E. Doty manager of finance for the Michigan Technic.

A new three screw Riehle Universal testing machine has been added to the equipment of the materials laboratory. The cost of this machine was $3600. It weighs 13,000 pounds and delivers a maximum load of 200,000 pounds. It is well adapted to the testing of concrete cylinders, building blocks, and piles. It is convenient for tension tests on large metal specimens.

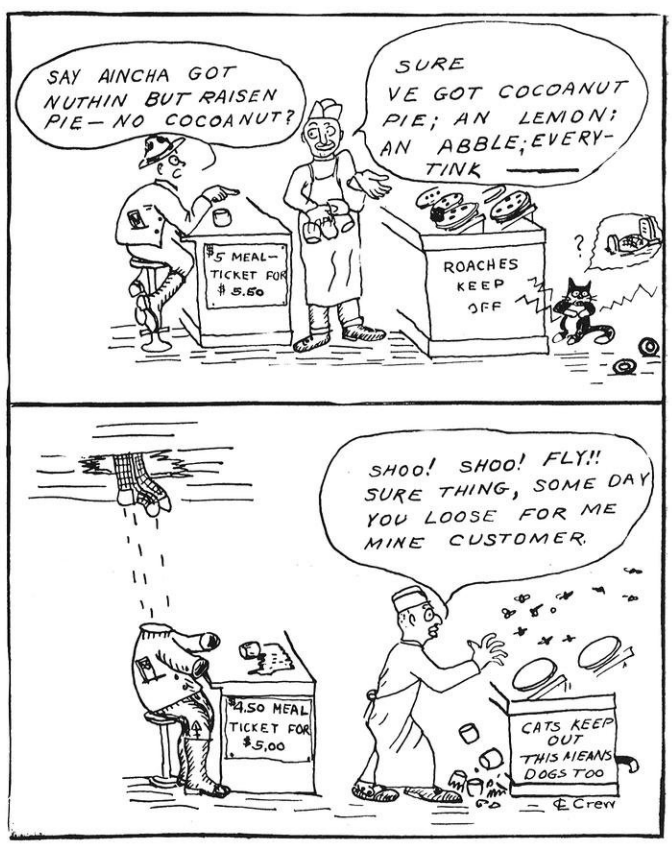
The materials laboratory has seven smaller Riehle and Olsen testing machines with capacities from 20,000 pounds to 100,000 pounds and one hydraulic universal machine of 600,000 pounds capacity. The new machine was purchased to balance this equipment.

I SHOULD SAY NOT!

The frosh who thought that railroads had to use alternating current to operate their swinging signals isn't so much worse than the agric who grounded his radio in a flower pot.

NEED A MAP?

Do you need a map for that next seminar topic? There are some on the walls of our various buildings, but they are usually too far out of reach to be of service. Why not try the library? You will find several good world atlases; for example, one by George F. Cram (G. Z., C 84, A. 2). If you need a larger map, try the Geography Department on the third floor of Science Hall. Perhaps its a geological map you want, in which case you should visit the geology seminar room on the second floor of Science Hall. For the benefit of would-be surveyors, who are looking for latitudes and longitudes of various places in the United States, there are magnetic tables and charts in our library (SQA, UN3, S.44) They are often handier than maps.



SANITARY ENGINEERING *or How the Fly Swatter was Invented.*

We wish to report Dick Rhode on a grave offense. Dick tore his hair and became generally dishevelled in trying to cube 1 on his log-log sticks! Ye Gods, what torture ye demand.

WHY, HANK!

The rarest one so far is on Hank Sherburne. A prof asked him if he was any relation to Louie Sherburne.

"I guess so," says Hank, "I'm his brother."

THIS LITTLE PIG

Suggested monument for the winner of the Yell Contest.

Professor Roy Shorey was on his way West with the mining engineers. In the opposite section of the Pullman sat a sweet-faced, tired-appearing women with four small children. Being fond of children, and feeling sorry for the mother, Professor Shorey soon made friends with the kiddies.

Early next morning he heard their eager questions and the patient "Yes, dear" of the mother as she tried to dress them; and looking out, he saw a small white foot protruding beyond the opposite curtain. Reaching across the aisle he took hold of the large toe and began to recite:

"This little pig went to market; this little pig stayed at home; this little pig had roast beef; this little pig had none; this little pig cried 'Wee! Wee!' all the way home."

The foot was suddenly withdrawn, and a cold quiet voice—that of the mother—said, "That is quite sufficient, thank you."

Carlotta—"You're not a bit polite."

Carl—"How so?"

Carlotta—"Every time I tried to say a word at the football game you would shout "hold that line."

ATHLETICS

(Concluded from Page 58)

CROSS COUNTRY

One more cross country season was completed when the Badgers raced into third place in the conference meet at Ohio State on November 24. True to expectations, Ohio State copped first place easily. Illinois, always a dangerous contender, nosed Wisconsin out of second place by a slim margin. Iowa was safe in fourth place. The dope was strong in favor of Michigan for at least second place, but the Wolverines were forced to take the trailer position for a change. Evidently there are no flukes in a cross country race.

On the whole, the Badger cross country record was quite successful this year, only one dual meet being lost. Minnesota and Chicago were easily outclassed in the early dual meets. Everything went fine until the fateful November 17. Then the Wolverines came out with the long end of a 31 to 24 score. Three of the Michigan runners crossed the finish line before any of the Cardinal runners appeared on the scene. All thoughts of a conference championship were forgotten as quickly as possible. The Cardinal runners did better in the conference meet than advance dope predicted. Michigan was defeated. Good work. That alone made the conference meet worth while.

TRACK.

Capt. "Bill" Hammann, c'24, is the leader of the cinder fireflies. He is a good all around athlete, and his work will no doubt help to make Wisconsin track history this year. The other boys on the team that throw snowballs from the north side of the campus are Donohue, c'24, Finkle, e'24, and Krieger, c'24. No doubt these healthy plumbers got their early training by chasing out to the Camp Randall shops in their freshman year. Several of the luminaries on the team hail from the Ag School. Hunting cows before breakfast must be a wonderful tonic.

In addition to being good athletes, Hammann and Finkle are excellent students. "I never need to worry about their eligibility," said Coach Burke.

RIFLE TEAM

Our rifle team made a most remarkable record last year. Of the 35 competitive matches fired, our team had the big end of the score 31 times. Not content with this, the bulls-eye chasers raced on and won the national intercollegiate meet. As a result the sport has become quite popular at Wisconsin this year. A goodly number of the applicants are ever present in the gallery. The team, under the leadership of Sgt. Shire, coach, and W. A. Rorison, Capt., has already won one match from Ripon, this year. L. P. Drake, e '26, and G. H. Ross, c '26, are both veterans of the squad. Drake won the rifle championship of the corps last year. The athletic department is seriously considering adopting rifle shooting as a minor sport. Why not? Over 50 men turned out for the first rifle club meeting. The team has won national honors. Is that not a sufficient record to merit a minor sport classification?

ENGINEERING REVIEW

(Continued from Page 55)

RUBBER PAVING BLOCKS

Experiments with rubber paving blocks are being carried out in England. A street in Manchester is being paved with rubber. The traffic passing over it daily consists of approximately 9000 vehicles and 1000 tram cars, the total weight being estimated at 15,000 tons. Instead of the usual method of employing small blocks as in wood paving large slabs of rubber, weighing 600 pounds, are being used. The slabs are reinforced by steel bars in order to prevent creeping of the

rubber, and each slab is secured to the next by steel pins. Creeping is one of the troubles to which rubber roadways are liable. The slabs will be laid on a concrete foundation, to which they will be attached to a bituminous compound. The surface of the slabs is corrugated to give the appearance of small blocks. In addition the slabs are reinforced at intervals with steel bars which keep them rigid while retaining the necessary pliability to insure noiselessness.

—Engineering News-Record

DEVELOPMENT OF HEAVY ELECTRICAL TRACTION

The Virginian Railway has started the electrification of its line from Roanoke to Mullens, a distance of 134 miles, involving 213 miles of single track. The traffic is nearly all coal and very heavy trains are hauled. It is planned to increase the tonnage of loaded trains from 6000 tons to 9000 tons. The system will be 11,000 volts, single phase, 25 cycle. The locomotives will be of the split phase type, weighing about 385 tons each. The total cost is estimated at $13,000,000.

—Electric Traction

THE MOFFAT TUNNEL

Actual operations are under way for the Moffat Tunnel. The contract for the tunnel, which is the largest tunnel project in the United States, has been let by the Colorado Tunnel Commission to the firm of Hitchcock and Tinkler, of New York and San Francisco. The Commission has appointed R. H. Keays, of Allaben N. Y., to be the chiel engineer. Mr. Keays is an engineer of national reputation, having been engaged in the construction of the Hudson River Tunnel, the McAdoo Tunnel, the Capital Park Tunnel, and the Shandaken and Wallkill Tunnels. V. A. Kauffman and Burgess Coy have been engaged to assist Mr. Keays.

According to the contract the Moffat Tunnel will be completed by August, 1927.

CHINA ADOPTS LATEST AMERICAN ROAD METHODS

Following similar action by municipalities in India, Australia and Japan, cities in China are putting into practice the latest methods adopted by American highway engineers for the construction of automobile roads and modern paved streets. According to C. Harpur, a commissioner of public works at Shanghai, Chinese highway bureaus are beginning to replace their water-bound macadam streets with asphaltic concrete. In Shanghai, last year, five and one fourth miles of asphaltic concrete pavement were constructed. Nearly three miles of this are on roads approved for new lines of railless tram cars. The mileage of streets traversed by Shanghai tramway system is about twenty-six miles.

NEW HELIUM PLANT

It is proposed to bring up a bill at the present session of Congress to authorize the expenditure by the Bureau of Mines of $5,000,000 to purchase helium-bearing gas and gas fields. A new helium extraction plant on a semi commercial scale will be put in operation shortly at Fort Worth by the Burea uof Mines. It is expected that this improved process will produce helium at much less cost than former processes.

TEXAS ICHTHYOL DEPOSIT

According to a report from Austin, Texas, capital to the amount of $500,000 has been raised in Denver, Colorado, for the development of a deposit near Burnet, Texas, which is reported to be rich in ichthyol.

Ichthyol, according to Thorp in his "A Dictionary of Applied Chemistry", is a pharmaceutical product of oily consistency, distilled from fossilized fish remains found in the Tyrol, on the coast of the Adriatic, and in other places in Europe. The chief source of the crude product is in the Seefield district, between southern Bavaria and Tyrol, where it has long been used as an antiseptic. The crude "rock oil" is obtained by simple distillation from the shale or "stink stein", a bituminous substance of grayish color. It is extensively used in the medical profession.

The Texas deposit, claimed to be the only one in the United States, covers 1700 acres. The "ore" which is said to be grayish in color, contains many marine fossils, and when broken reveals a thick, black, oily substance.

—Engineering and Mining Journal Press

DON'T PITY THE ENGINEER PUBLICALLY

One of the little things noticeable about the engineers as a whole, but more especially in the students who have attended the college a year or two or three, is the fact that they are terribly overworked by the curriculum of their profession. Somehow an engineer seems given over to grumbling about his plight; yet it is his own wish that he persists in the course that he is pursuing, for a change is nearly always possible. Too often he bores his friends with a weird and exaggerated accounts of work he has been to do. Practically always when a group get to-gether for an informal discussion, a joy-killing engineer tries to arouse some sympathy for his fellows.

This is something worth avoiding in the coming year. True it is that our course has well earned the reputation of being as difficult as any, and little harm can come of our discussing the subject among ourselves, arguing one way or another over the apparantly abusive or unfair details. But where the serious objection comes in is in grumbling over the details to others. After all, everyone has his difficulties, and those of a lawyer or an artist are no less than those of an engineer. It is unfortunate that there is so little room for courses in philosophy or allied subjects in the education, but all the more so should we try to learn without special instruction that we must avoid "desiring" the imposed upon attitude.

—The Sibley Journal of Engineering

EDITORIALS

(Concluded from Page 52)

BOOZE AND ENGINEERING

Booze and engineering do not mix. As a class, engineers are and ever have been decidedly temperate in their drinking habits. Their profession demands a clear head and a vigorous body at all times. The engineer who succumbs to alcohol simply cannot stick to his profession; a drunken engineer—like a drunken physician—would be too great a menace to be tolerated. Having always been temperate in regard to liquor, engineers do not find total abstinence a hardship.

The engineer is a respector of law. His profession is based upon a knowledge of natural laws. He appreciates the absolute need for law and order in a community if his work is to forward. Law to him is something to be respected, not to be flouted.

Being, therefore, both temperate in regard to liquor and appreciate of the value of law, the professional engineer is not apt to look tolerantly upon bootlegging and its attendant evils. An exception may be found here and there, but the stand of the great bulk of engineers can be predicted with certainty from their known characteristics.

Among engineering students there will be a certain number of men who are there by mistake,—men who do not have the characteristics of engineers and who will never enter the profession. Among them, also, will be certain immature individuals struggling for the appearance of maturity and worldly sophistication. Some of these may follow the example set by numberless citizens of their country and indulge in an occasional souse. But their numbers will be small and their influence unimportant. The men in this College—and we believe it holds for the men and women throughout this university—can be counted upon to discountenance drunkenness.

To the engineers, after God and George Washington, the American people owes most of its present prosperity.

THE OLD CRY, RECKLESS DRIVING

It is alarming how much reckless driving occurs on our campus daily. The lack of consideration which some of the drivers show for the rest of us does not fit in with democratic college spirit.

A car doing more than 15 or 20 miles an hour through the crowded campus streets is a menace that, at any moment, may maim or kill. It is unecessary to picture the misery of being crippled for life; it is unecessary to say that we do not want sudden death constantly hanging over us. It is necessary, however to stop reckless driving.

But two remedies can be offered: Careful driving, or prohibiting student cars. The second, while enforced at some schools, is too narrow for consideration at so large a school. The first is simple and sensible.

Student-driver, be considerate. Drive conscientiously. Let Wisconsin students be free to own cars.

E. K.

Editors Note: This writer knows whereof he speaks; last year, through no fault of his own, he was in a smash up and was badly bruised. His appeal is genuine; reckless driving must cease.

The international mind is nothing else than that habit of thinking of foreign relations and business, and that habit of dealing with them, which regard the several nations of the civilized world as friendly, and co-operating equals in aiding the progress of civilization, in developing commerce and industry, and in spreading enlightment and culture throughout the world.

NICHOLAS MURRAY BUTLER

EXTENSION NOTES

(Continued from Page 51)

ticularly the fact that no man can be self-educated but that he must learn and profit by the experience of others. Some reminiscences of war days and particularly of Armistice Day at the front were particularly pleasing to the students. About forty of the regular day students at the Extension Division were formerly in the Thirty-second Division and served under General Haan.

Strength of Materials by Professor W. E. Wines is a new text book recently published by McGraw-Hill Book Company for the Extension Division. This book has been given a good reception and has been adopted by several schools.

President J. M. Thomas of the Pennsylvania State College was a visitor at the Extension Division in November. Pennsylvania State College is one of the leaders in Engineering Extension.

A new text on Storage Batteries is on the press for the Extension Division. It is the work of Professor Jansky and Wood of the Elecrtical Engineering Department.

Mr. H. E. Shraeder, formerly instructor in Mechanical Engineering is now in the department of the Lamson Co., Syracuse, New York.

The Milwaukee Branch of the University Extension Division will be located in a new home as a result of a bill passed by the 1923 session of the legislature, approximately $150,000 for a University Extension Building in Milwaukee. A special committee of the Board of Regents is investigating sites and locations for the new home.

Mr. G. E. Moore, Washington D. C., Engineering Student in the Extension Division, has been conducting some very interesting and valuable experiments on the use of gas fired steam and hot water boilers, for house heating. With coal at $15 per ton and gas at $1 per thousand feet, the cost of heating with gas is from one-half to twice the cost of heating with coal.

The Bureau of Visual Instruction has recently received a number of moving picture films on engineering and industrial subjects. These films are being distributed in co-operation with the Bureau of Mines, Pittsburgh, Pa.

Engineering classes at the Nekoosa Edwards Paper Co. will start about the middle of December. The classes in Manufacture, Treatment of Wood Pulp, and in Electricity will again be offered. In addition a special course in Steam Engineering will be given for the men in the power plants. Mr. E. P. Gleason, U. of W. 1910, is chief Engineer of this company.

The annual meeting of the National University Extension Association will be held at the University in April, 1924. Mr. R. B. Price, Director of University Extension of Minnesota, is president of the Association.

ALUMNI NOTES

(Concluded from Page 56)

MECHANICALS

Fred R. Erbach, m '22, is assistant refrigerating engineer with the Lipman Refrigerator Co. of Beloit. Address: 535 Public Avenue, Beloit, Wis.

Elmore W. Fiedler, m '20, is with the Western Elecrtic Co. His address is 4940 W. Monroe St., Chicago.

Arthur E. Liebert, m '20, is with the Bucyrus Co. Adress: 680 Holton Street, Milwaukee, Wis.

Merrill D. Love, m '22, gives his address as Brea, Calif.

Harrry V. Plate, m '16, who has been in power work in the southwest, is with the Wm. Baehr Organization. Address: 1547 Illinois Merchants Bank Bldg., Chicago, Ill.

Clarence W. Peterson, m '21, is assistant construction engineer with the American Brass Co. at Kenosha. Address: 913 Second Ave., Kenosha, Wis.

UNIVERSITY EXTENSION AND ITS ENGINEERING COURSES

(Concluded from Page 47)

ery"; Radiotelegraphy"; and Shealy's "Heat". "Steam Boilers", and "Steam Engines'.

Some of the texts have had very remarkable sales. Among the most widely used are: Elliot and Hobbs' "Gasoline Automobile", Hool's "Reinforced Concrete", Hill's "Machine Drawing", George's "Advanced Shop Drawing", Longfield's "Sheet Metal Drafting", Norris, Winning, and Weaver's "Gas Engine Ignition" and Wines' "Strength of Materials".

Extension Texts Widely Used

The records of the publisher show that the University of Wisconsin Extension Division texts are in use in over 157 colleges and 221 secondary schools. The records are necessarily incomplete because the list is growing steadily. The texts are becoming important factors in both industrial and engineering education in the United States and Canada.

Importance of Extension Teaching of Engineering Subjects

Among the representatives of our increasingly forward-looking communities, to whom the advantages of extension education makes its strongest appeal, the engineers and those in engineering pursuits have for years taken a leading place as indicated by the great demands for work calculated to meet the needs of this group of workers. Although there are many other important objects of extension work, that of assisting the men who carry responsibilities for solving technical engineering problems must be regarded as one of the most important. By joining forces with the other agencies which are making Wisconsin a leader in its development of engineering technique and in engineering achievements, the Extension Division is rendering a service which must be particularly gratifying to all who have a part in the work.

SOME EXPERIENCES GLEANED FROM SUMMER JOBS

(Continued from Page 49)

decided on a new policy. The result of going about the work as though positive, being firm though fair, and keeping just a little aloof, was that more was accomplished with less trouble and worry."

An interesting point is brought out by a senior who was a cadet engineer with the Blank Meter Company. As a part of the training course all cadets were invited to attend the Sales Service Conference,—a meeting of all sales and service men held each year during the latter part of August.

"The purpose of this conference," we are told, "is to provide an opportunity for personal contact between officials and the public representatives of the company. It also gives the officials a chance to discuss with the salesmen proposed changes in the meters and in the policy of the company toward its customers. The major purpose of the conference, however, is to give the men who come in contact with the buyers a chance to express their opinions on anything pertaining to meters.

"The meeting was of particular interest because all the sales and service men employed by the Blank Meter Company are young fellows recently graduated from different engineering colleges throughout the United States and Canada. To me the conference was a great success in every respect save one: A great many of the fellows recited incidents where the meters failed to work properly under some peculiar condition, but not one had a suggestion as to what changes in design or otherwise might be made so as to provide against the contingency in the future. In view of the fact that all of the men were engineers, it seemed strange that no one offered a remedy along with his criticism."

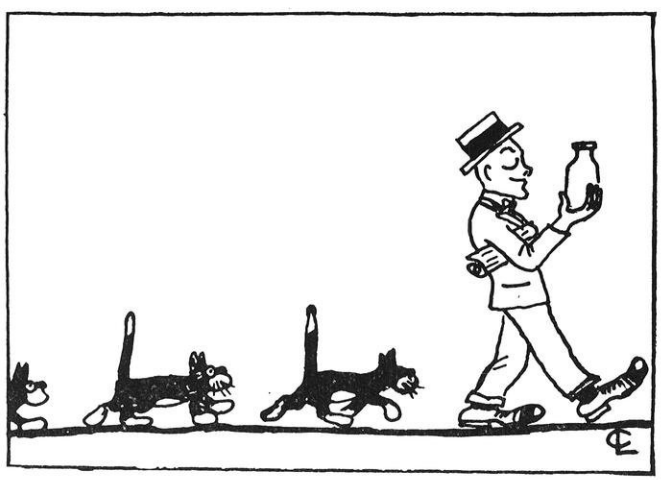
The inconsistency of keeping an eagle eye open for small wastes in industrial operations and at the same time allowing large wastes to go unchecked, struck one man forcibly. He tells how the same company that made its engineers put up a deposit to cover plumb-bobs which it supplied them and kept a close watch to prevent the pilfering of old and useless ties, seemed to feel no concern about the careless firing of its 25 locomotives and 18 steam shovels. "Coal, where shovels have been moved and where fires have been drawn, is left where it lies," he says, "and steel of all kinds is found all over the place."

Short-Cut Estimates are Useful

Most students go out from the colleges of this country without much knowledge of how to make estimates, and yet estimating is an essential part of the preparation for construction. Plans, specifications, and estimates—they are the inseperable trinity that govern construction work. Estimates fall into two classes: Detailed estimates, and rough estimates. A senior who has had a good deal of experience on road work writes, "What impressed the writer most in his summer's work was the need for an engineer to know how to make, quick, reliable, rough estimates. The general opinion of the public is that an engineer ought to know how much a project will cost merely by looking at it. He may be able to do this by comparing this project with others, the cost of which he knows, or he may make a rough estimate by short-cut methods.

"During this summer, the writer was called upon to decide whether a nine-foot or a twelve-foot roadway could be built, over a certain ten-mile section, with the twenty-thousand dollars available. One day was thought sufficient time for this. By estimating distances, soil classification, approximate number of drainage structures, amount of clearing and grubbing, and by taking average per cent side slopes and using prepared yardage tables and cost data, the writer was able to make fairly good estimates of the cost to construct both widths of roadways. These estimates were checked by comparing the per mile cost with the per mile cost of similar projects."

No story of summer experiences would be complete without bringing in the student who tries to get rich selling books, hair brushes, or spark plugs.



Was I not selling the best malted milk drink mixer on the market?

"I had never tried selling until this summer," says one hero. "My first day out was a great surprise to me. I was under the delusion that every prospect was a customer. Why not? Was I not selling the best malted milk drink mixer on the market? With the commission I was receiving on each sale I didn't see how even the gods could prevent me from becoming rich. Every dispenser of soft drinks was a prospect, a prospect who might not say yes immediately, but I never doubted for an instant that after hearing the facts the prospect would ultimately say yes. But such was not the case, for I received a few scattered yeses with a hundred noes."

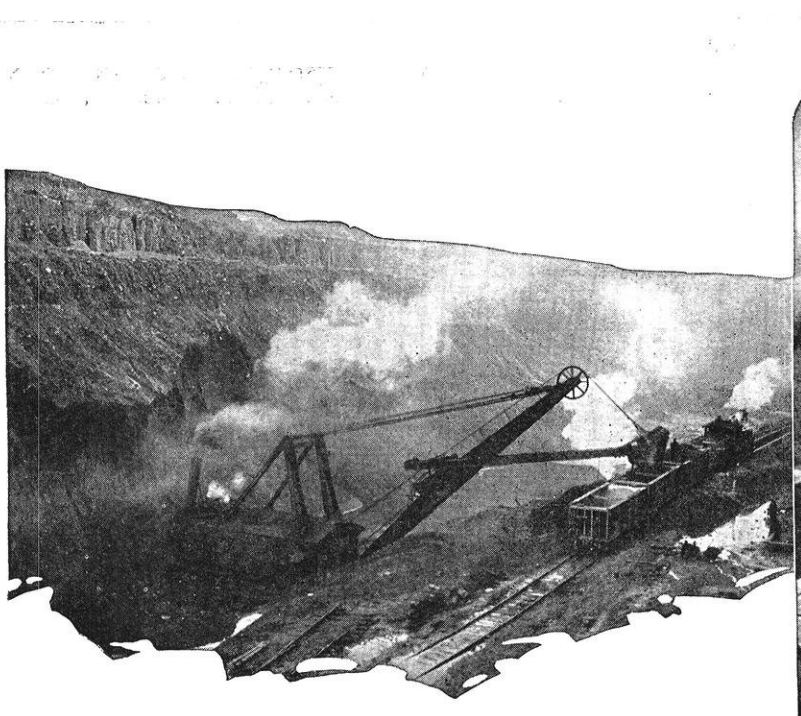
THE ENGINEER AS A SALESMAN

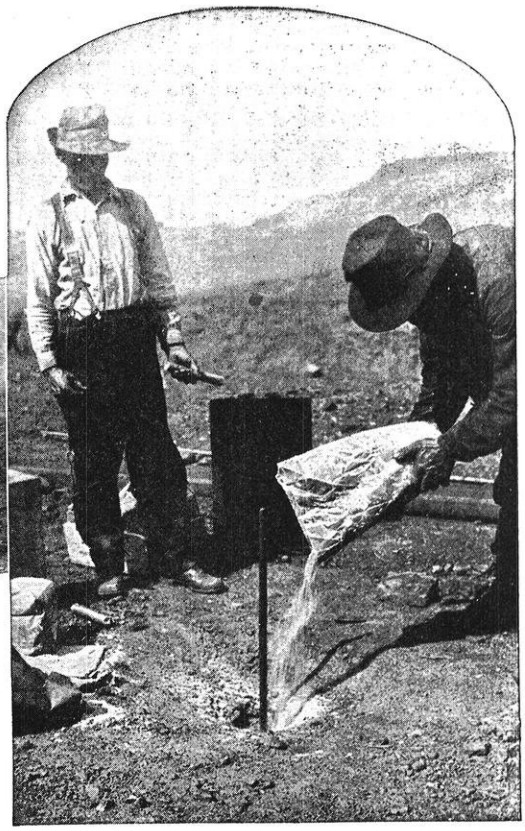
(Concluded from Page 50)

ling, and second, he must have implicit confidence in the firm for which he is working, and it's ability to render adequate service to the client." The two points are very closely allied and can best be discussed together by use of a supposition.

Let is be supposed that a consulting engineering firm, specializing in power plant construction and operation, requires the services of a salesman to introduce its engineering service to men engaged in power production. The man to perform this work must be an engineer who has a general knowledge of station design, methods of operation, and economies which are to be expected of certain equipment under various conditions. He need not be a first class engineer who is a specialist in this work with which he is associated, but he must be capable of carrying on an intelligent conversation, and through it make those impressions which will pave the way for a sale. A fundamental engineering education, coupled with general experience is essential in the sale of consulting service, and it enables the salesman to direct his talk with but one end in view, that of bringing his client to a point where he is desirous of presenting the problems to the experts for solution.

The foregoing discussion has been devoted entirely to the use of engineering education and experience in the business world. Mention will now be made of those general qualifications which must be possessed by the engineer who engages in sales work. John H. Hays in his book, "The Engineer", states, "Engineers have been criticised in the past because the tendency to specialize has stood in the way of their general culture, and they have emerged from their technical course letter-perfect in their specialty but lacking in educational balance. This one sidedness has shown itself in an inability to express themselves properly, ignorance of other subjects than their own, inability to be at ease and congenial with other professional men, insufficient knowledge of the world, business incompetence and provincialism." These faults are largely due to the engineers themselves, who have not demanded anything more than a knowledge of their branch. An Engineer who is satisfied with this very narrow background cannot hope for success as a salesman. Salesmanship demands a very liberal education, and, whether it be gotten in or out of school, it is of vital necessity. Character, personality, agressiveness, diplomacy, ability to judge character, honesty and conscientiousness, ability to meet competitor, and ability to market at a substantial profit are all necessary qualities in a salesman, but above all must be placed his ability to sell.





The Hercules Specials Approved on the Iron Ranges

An explosive that is accepted in the Lake Superior iron district must have unusual merit; it must pass the severest tests under competent judges, who figure costs to the fraction of a cent.

Hercules Special No. 1 and Special No. 2 have made good in the open-pits on the iron ranges. Mines that have used black blasting powder for many years have found that costs are no higher with Hercules Special No. 1 and Special No. 2, that safety is increased, and that, particularly in the hard taconite, results are better.

Hercules Special No. 1 and Special No. 2 contain about 70 more 1¼" x 8" cartridges per 100 lbs. than ordinary dynamite. On work for which it is suited, Special No. 1 frequently replaces 40% dynamite, cartridge for cartridge; and Special No. 2 replaces 30%, cartridge for cartridge. The resulting saving in explosives costs is at least 20%.

Special No. 1 and Special No. 2 are packed in standard size cartridges up to 5" x 16", or in 12½ pound bags. They are well suited for pouring into the hole as shown in the above photograph, taken on the Mesabi Range.

Have you read our booklet *Volume vs. Weight—A Lesson in Explosives Economy?* If not, write to our Advertising Department, 939 King Street, Wilmington, Delaware, for a free copy.

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