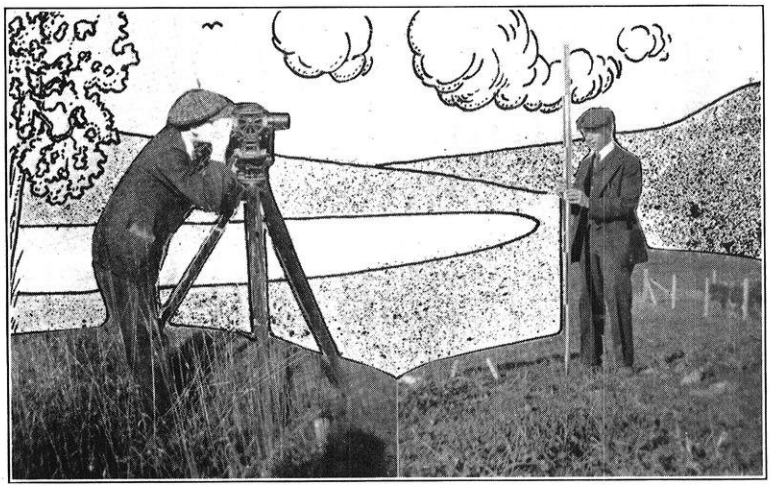
The Wisconsin engineer. Vol. 22, No. 7 April 1918

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

https://digital.library.wisc.edu/1711.dl/7P3DBZ6M5SIJV8I

The Wisconsin Engineer

VOL. XXII APRIL, 1918 NO. 7



WISCONSIN ENGINEER ISSUES SPECIAL NUMBER

April Issue is Dedicated to High School Students of the State

The April number of the Wisconsin Engineer, which will be on sale at the Enginnering building today, is dedicated to the high school students of the state. For this issue, the editors have collected all of the material relating to the College of Engineering and to the opportunities offered by an engineering education, that they think will be of interest to the high school seniors who are contemplating entering the university next fall. Although it is the desire of the editors to interest as many seniors as possible in the wonderful future of the engineering profession, no attempt has been made to hide the fact that shirkers are not wanted.

One of the features of the issue is a series of letters of advice to high school seniors from prominent engineers, among them Herbert Hoover, federal food administrator and noted mining engineer. Another feature of interest is a comprehensive sketch of the life of Magnus Swenson, chairman of the State Council of Defense, who is an alumnus of the Wisconsin College of Engineering. About two thousand copies of the magazine will be mailed to the seniors throughout the state within the next few days.

Cardinal

WISCONSIN ENGINEER ISSUES SPECIAL NUMBER

State Journal

The April number of the Wisconsin Engineer, which will be on sale at the Enginnering building today, is dedicated to the high school students of the state. For this issue, the editors have collected all of the material relating to the College of Engineering and to the opportunities offered by an engineering education, that they think will be of interest to the high school seniors who are contemplating entering the university next fall. Although it is the desire of the editors to interest as many seniors as possible in the wonderful future of the engineering profession, no attempt has been made to hide the fact that shirkers are not wanted.

CONTENTS

The Wisconsin Engineer

VOL. XXII APRIL, 1918 NO. 7

A LETTER FROM AN ENGINEER TO HIS NEPHEW.

J. T. Van Hagan

Dear Ted:—

I got back to the office today from my trip West and found your recent letter waiting for me on my desk. Your letters have never been particularly frequent, and, naturally, I wondered a bit what the motive was that had made you take your typewriter in hand this time. When I found out that you are finishing your high school course this year, and that you want my advice about following an engineering career, I was somewhat shocked because it made me realize that I am reaching "years of discretion,"—a little longer and I will be classed as "old." I was just getting a start in my own engineering career when you came into this world, and here you are yourself, looking around for a "career."

You say that you are not quite sure that you want to follow in your Dad's footsteps, even though he managed to discover a path that led to a fair supply of this world's goods. You come to me, although your Dad would consider the modest pile I have laid away rather scanty, and you ask for pointers on the engineering game. You flatter me by insinuating that my "position" looks more attractive to you than much fine gold. That very remark, however, is what leads me to sit down and tell you what I think of engineering; I feel that perhaps you are of the material of which engineers are made. If the dollar is not your only standard for measuring success, there is a chance for you.

The engineer, you know, is a "rare bird" in many ways. He is a combination of dreamer and builder, of artist and artisan, of high-brow and rough-neck, of scientist and business man. He must have the vision that enables him to conceive great projects, Panama Canals, Eiffle towers, Quebec bridges, East River

tunnels, air ships, wireless telegraphy, and locomotives; and he must have the skill and knowledge to build what he has dreamed. He must have the spirit of the artist,—the spirit that makes him love his work through thick and thin, through the lean years and through the fat ones,—the spirit that makes him do good work for the simple reason that anything less than his best is impossible for him; and he must have the mechanical ability of the artisan so that he may know what is good and what is bad, and how to achieve the good. He must be able to deal effectively with both nature and man in their wild conditions and command their respect; and he must be just as able to turn from the wild conditions and make himself at home in gentler surroundings and among people of culture. He must have the spirit that drives him to study continuously, that makes him want to investigate uncertainties, and that keeps his mind open for new truths; and he must have the hard common sense necessary in the successful handling of any big business enterprise.

It's a pretty big bill to fill, isn't it? Of course no engineer completely fills the specifications that I have just drawn; we do not expect perfection on this mundane sphere. But all engineers who stick have more or less of the qualities that I have mentioned. If they do not have them they drop out. What the profession needs, and what it is just now looking for most earnestly, are men of the type I have indicated. You may or may not know that we engineers have a feeling that the time is coming, and coming soon, when the engineer is going to be a pretty important man in the scheme of things. Engineers, as a body, are beginning to realize that engineering is concerned not only with the great forces in nature which they are to direct, but also with man, for whose use and convenience the directing is to be done. So the engineer is beginning to study psychology and sociology in addition to his mathematics, mechanics, and economics. When he has learned to understand men and social problems as thoroughly as he understands materials, he will be equipped to carry the greatest responsibilities; and when he is so equipped, the responsibilities will naturally gravitate to him. With responsibility goes power,—power to do good or to do evil. We believe that the engineer will use his gifts for good

and therefore we are anxious to see him acquire the power to exploit them. After a period of eclipse, during which other professions have developed and, for a time, surpassed the engineering profession in prestige and power, engineering is coming back strong. The trend of events is unmistakable. People are demanding a more intelligent handling of public affairs than practical politicians and near-statesmen have been able to give. For instance, many cities in this country have put their business affairs into the hands of a "City Manager;" and the city manager is usually an engineer. That is natural because most of a city's affairs are engineering matters; pavements, sewers, water-supply, and electric light plants are engineering works, and people are beginning to realize the folly of allowing saloon-keepers and professional politicians to meddle with them.

In national affairs, much the same condition prevails. The engineer, of course, does not expect to occupy all the place there is "in the sun;" but he is going to emerge from his seclusion and do his part, in cooperation with the law makers, medical men, business men, and statesmen, to make this a "great and glorious" nation. The Day of the engineer is dawning; what kind of a day it will be depends entirely upon the vision, wisdom, and energy of the men in the profession. That is why we are looking for the best men we can find to take up the work.

Like law, medicine, art, or literature, engineering calls for self sacrifice if one is to realize its greatest possibilities. To some people, self sacrifice makes no appeal. If your ambition is to pile up the greatest amount of wealth in the time at your command, I would not advise you to be an engineer; if your ambition is to lead an easy uneventful life, I would not advise you to be an engineer; if your ambition is to live for yourself alone, or for yourself and immediate family alone, I would not advise you to be an engineer. If, however, you feel a love for building, for creating, for scientific research, and have within yourself the power and desire to work with and for your fellow men both in and out of the profession, we want you and you will be happy to be counted one of a great and honored profession.

But you must be filled with something more substantial than a vague longing. That is something that fills a good many

human breasts. The owner of the breast is apt to mistake it for boundless ambition when, in reality, it is nothing but gas on the stomach. The test to apply, in case you have such a feeling, is hard work. If the longing continues and is intensified after a month of effort along the chosen path, it is probably the real thing; not many longings can stand such a test. Many a girl has thought that she would "just love to be a trained nurse" and "do so much good in the world." It appealed to her more than helping mother do the dishes and mend sox; but when she found that she was expected, first of all, to learn how to keep a sick room clean, and that the mop and the broom play an important part in nursing, her vague longing faded rapidly and took with it her desire to do "so much good." The women that stick to the nursing game have been through fire and are pure gold. Its the same with engineering or any other profession. You will have to go through the training process and establish a reputation before you will find a man or a company that will be willing to hand you a couple of million of dollars and say "Here Mr. Jellope, take this and build us a bridge across the Mississippi." And while you are waiting for that time to come, you will have to spend your time acquiring a mastery of mathematics, and mechanics, and physics, and chemistry, and surveying, and many other subjects.

That matter of mathematics is important. What sort of work have you done in high school? I hope that you had a teacher who knew math himself and who worked you hard. An engineer ought to know mathematics so that he can use it without thinking about it, just as a piano player uses the piano keys without stopping to find the right one. The piano player gives his attention to interpreting the music and giving it meaning; the engineer gives his attention, not to the mathematics he is using but to the problem he is trying to solve. The math is only a means to an end. Do you know your math so well that when you are faced with a problem your mind simply goes to its file, so to speak, and automatically offers you the proper method to be used in its solution? You will notice that I say an engineer ought to know his mathematics thoroughly,—not that he always does. Not many lads, however, are able to get through the engineering course of a good school, unless they are

pretty fair at mathematics. Math is a sure test for the fuzzy thinker; a fellow can stall and bluff on a good many subjects, but not so on math. On that subject his ideas must be crystal clear, clean cut, and true, or he will not get along. The world is full of fuzzy-wits who think they think. It's a safe bet they "hate mathematics." It shows them up. If you like mathematics, puzzles, and a good detective story, you have the proper instincts.

Next in importance after mathematics comes the use and command of the English language. An engineer cannot possibly do with his own hands, all of the work that he can plan. He must work through others. This being so, it follows that he must be able to make others understand what his plans and ideas are. This he does largely by written specifications and spoken instructions. He must, therefore, know how to convey his ideas by means of language; it is a necessary thing in his business. It is not enough that he know the rudiments of speech; he must know how to use language just as accurately as he uses his mathematics. He must know the meanings of words and how to put them together in a clear and effective manner. Ordinary conversation is a pretty low form of language; words are used inaccurately and are put together in a confusing manner. You, yourself, have probably witnessed cases in which two conversationalists have gotten themselves gloriously balled-up in an attempt to exchange ideas. In conversation, such confusion may seem simply funny; but such a confusion of ideas in a contract or in working instructions, may have disastrous consequences.

Do not get the impression, however, that an engineer is all head. He must have a plentiful supply of physical as well as mental energy and that means that he must look after his health as carefully as he would look after the health of a prize cow, if he had one. Good health depends primarily upon good food, sleep, fresh air, a proper amount of exercise, and suitable clothing. A man ought to keep himself "in training" all the time if he wishes to develop himself to the utmost. Bad health is a terrible handicap to an ambitious person. A good many young fellows take a fool pride in the amount of abuse they can heap upon their defenseless physical systems; they do not seem

to realize two important things: First, that they are entitled to no personal credit for their powers of resistance; those powers are the result of the elasticity of youth. Second, that the elasticity will gradually disappear until a point is reached beyond which every abuse will leave a permanent mark upon the system. It is a foolish pride, unworthy of an intelligent being; it is as foolish as it would be to abuse a good engine just because it was new and clean and could stand up for a time under the mistreatment. Develop all the energy,—all the power, possible; but develop your self control and judgment at the same time that you may use the power intelligently and not wastefully.

Along with this personal energy,—this "pep," a man must have what we term "good address." No, that doesn't mean that he must live in the swell part of town; it means that he must have an attractive personal appearance and pleasing manners. You will find it much easier to get along if people like to have you around. A person's appearance indicates his cleanliness, taste, and care; personal appearance is the first credential one presents to a new acquaintance and is the basis for the first impressions. Good manners are the result of self respect and an appreciation of the other person's point of view. Only an unselfish person can have genuinely good manners; a selfish person often shellacs his naturally coarse exterior with a smooth demeanor; but, if you have ever tried to paint a bare spot with varnish you know that shellac gives only a smooth surface, it doesn't cover the dark spots. You must be genuine or your dark spots will show through your good manners.

Well boy, there is no use rambling on further. I think this will give you an idea of the kind of man who is fitted for the engineering profession. I wish I knew you better so that I could answer your query more definitely. I suggest that you come to see me some time soon and we will try to get down to cases. If you are the right kind of a fellow, I would feel that I was not true to the profession if I did not "pledge" you; so I'll be expecting you down here soon to talk this over.

Your affectionate

Uncle Dud.

THE COLLEGE OF ENGINEERING[1].

JOHN G. D. MACK
State Chief Engineer of Wisconsin

When engineering again became a recognized profession about a century and a half ago, after a lapse of many centuries, it was as military engineering. Military requirements and war have always demanded from men of science the solution of problems, many of which find application later in the arts of peace. A separation was therefore made between the field of the military engineer and that of the civil engineer, the latter devoting his energies to the works of civil life, such as roads, bridges, mills, machinery, and power development.

As these enterprises became more divergent, terms were employed to indicate the particular branch in which the engineer was engaged, such as mechanical, electrical, mining, or marine engineering. These general classifications have now become very finely subdivided. Two years ago the writer listed one hundred and thirty-six officially recognized varieties of engineer[2]. Doubtless many were overlooked and it is probable the number has been greatly increased by the prominent part taken by the engineer in the war. This subdivision may tend to confuse the prospective engineer unless his choice is already made. The entire matter, however, is not only far less complex than it appears, but is really quite simple, and some thoughts along the line of reducing it to lower terms will be of as much value to the student who has decided on the special engineering course he is to pursue, as to the one whose mind is made up only to the point that he wishes to study engineering.

The practice of engineering rests on solid facts and fundamental principles. This is true for every one of the many varieties of the profession. A large part of the success of an engineer is due to his ability to analyze a problem into its basic elements, the truth of each of which he knows or can prove. He makes this proof by reason and by experience. The portion

[1] From "A Booklet of information for Freshmen" prepared by Dean of Men S. H. Goodnight, University of Wisconsin.

[2] Wisconsin Engineer November 1916, p. 75.

of reason is the principal thing the engineering student gets in the four years college course; the portion of experience comes later in professional practice.

A skilled trade is a happy endowment for any man, particularly an engineer, to possess, but one large difference between the practicing of a trade and a profession is that in a trade the same problem is presented over and over again and solved by about the same methods, while the successful professional man is daily meeting new problems which have to be solved in new ways. A profession, such as architecture, engineering, law, or even medicine, may be, and often is, practiced as a trade. Many instances also come to mind of men who have practiced a trade as a profession, constantly studying to devise better and more economical methods, at the same time widening their view to see and grasp other opportunities. Not the least of the returns upon an acquaintanceship with them, has been the pleasure of watching these men with no technical school training rise in the engineering world by their own efforts. Not one, however, but has wished that he might have had this training, for it shortens the route and lessens the trials.

A man studying his way through a mass of technical subjects alone is like a man making his way through a strange country without a guide. He gets off the track many times; he studies his way through books and subjects only to learn at the end that they were not the books and subjects he needed and that he has wasted time and energy. If, on the other hand, he goes to a good school, he finds laid out for him an engineering course that is the cumulative result and orderly arrangement of decades of study, experiment, and survival,—of changes constantly going on to meet changing conditions.

These changes are made principally in the more highly specialized subjects. The general subjects, such as mathematics, physics, or chemistry change but slightly, for they are built around the facts of science which change only by the slow growth of basic knowledge. These general subjects deal with principles of scientific reasoning and broad training, which are applicable to all branches of engineering. The different engineering courses, therefore, have substantially the same basis.

The work of the freshman and sophomore years is fairly sim-

ilar in all courses, so that even after two years it is not difficult to change from one to another by taking some additional studies. These additional studies, taken in the course of first choice but not required in the second, will never be amiss, for something from them may be just the idea needed to start the solution of a hard problem in the future. Often a graduate from one course enters the field of another with success, because he has been trained in the solution of engineering problems.

Assume, however, that a student may decide on the line he wishes to follow, even before entering the university,—for illustration, highway engineering. The college does not offer a four years' course in this branch, but the student will be directed to take the civil engineering course, which provides in the junior and senior years a small group of electives especially adapted to the profession of highway engineer. These electives the student may possibly take, even if he is preparing for some other line. Thus the board training of the civil engineering course is made to serve as a solid base for highway engineering, while it also prepares the graduate for other fields for which this course is designed. Similar illustrations could be made over and over again, not only with the civil but equally with the other engineering courses, the underlying principle being that the training of the college of engineering is broad and fundamental, intensive specialization coming with the later professional experience. It is hoped that this explanation will clear up many of the complexities due to the multitude of varieties of engineering.

The College of Engineering offers a four years' course in each of the following five standard branches of engineering, which are recognized as such the world over: Civil, Chemical, Electrical, Mechanical, and Mining Engineering. The general plan and purposes of each are described in the Bulletin of the College of Engineering. A few thoughts are worth being reduced to writing and put in plain sight for the prospective engineer to observe during his college course.

Thought 1. The general preparatory subjects, extending in part through three years, must not be looked upon as a useless and disagreeable task to be accomplished before you get to the "real engineering" subjects, for these preparatory studies are

an essential part of the whole. If you neglect them, you will sometime realize to your sorrow that they are just as truly "real engineering" as some highly specialized technical subject. Suppose a graduate in practice, who is qualified on the so-called technical side, writes a report in such miserable form that his superior throws it in the waste basket. Said graduate may be in luck if he does not follow his report; in any event he suddenly realizes that one of the most valuable engineering subjects he neglected in the University was English. Members of the engineering faculty have heard this regret expressed many times, and it applies with equal force to every one of the general subjects.

Thought 2. Never lose an opportunity to broaden your view of the engineering field. As freshman you will attend the series of lectures arranged especially for you, but, in addition, go to the general engineering lectures whenever your schedule will permit. Subscribe to the Wisconsin Engineer. It is run by your fellow students and will help you to keep in touch with the engineering world. Go to the library at regular intervals and look over the technical literature. Subscribe for a magazine in your chosen field, and become familiar with what is happening in that field.

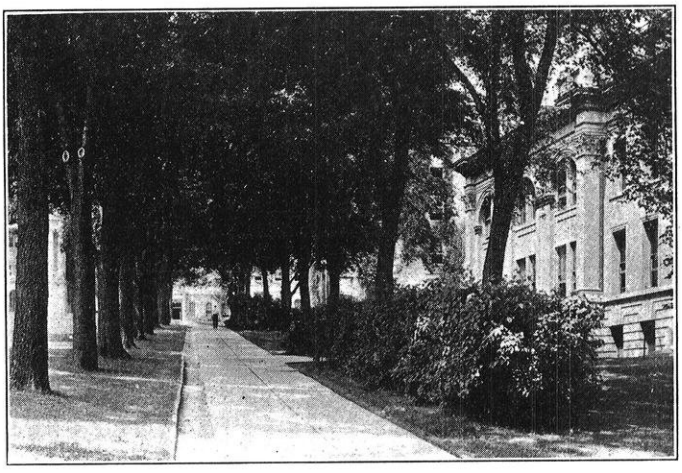
Thought 3. In No. 2 you work alone, but this is not sufficient by far. Join one of the engineering societies in the college and take an active part in its work. In this kind of endeavor you will obtain nothing by absorption alone; in order to get anything of value out of it you must give much more.

Thought 4. Do not be so filled with the idea of narrow specialization that you come to regard a student in another course as in a world apart. Hunt him out and make him tell you about his work; it will be good for both of you.

Thought 5. One of the startling developments of engineering is its increasing grasp of things human; it no longer deals with inert materials alone. Above all, therefore, do not forget for one minute that you are in, as well as a part of, a great university, and do not fail to take full advantage of its overwhelming offers. Use your electives in broadening your outlook, go to lectures in addition to those on engineering subjects, meet students and faculty outside engineering, read something in the

way of literature worth while, get interested in some wholesome activity, in substance, use the university for that training which will make you at ease even when you happen to be the only engineer in any group with which you may meet.

Thought 6. All thoughts along these lines reduce to this: Keep ever in mind that you are studying a profession,—one which at last has come into full recognition as such. The world expects much of the engineer in days to come, therefore make it part of your life to do all within your power, that the world may not be disappointed.



North Walk and Engineering Building

#3'8

CIVIL ENGINEERING AND WHAT IT OFFERS

LESLIE F. VAN HAGAN
Associate Professor of Railway Engineering

The term civil engineering was early used to classify all engineering work that was not military engineering. Electrical, chemical, mechanical, and mining engineering have since that time developed and branched off of the parent stem. At the present time the term civil engineering "includes all kinds of surveying from the simplest land surveying to the complicated and accurate Coast and Geodetic work; the design and construction of bridges; extensive and difficult foundations; tunneling; retaining walls, sea-walls, and other heavy masonry; viaducts; ocean piers; lighthouses; wharves; docks; river improvement; irrigation; harbors, jetties, and other waterways; levees; water-supply; sewerage; filtration; treatment of refuse; highway construction, including roads, streets, and pavements; canals; dams; ordinary railways (both steam and electric); inclined cable railways; gas-works; the general design and construction of all plants (steam, electric, hydraulic, and gaseous); the general design and construction of cranes; cableways, breakers, and other mining structures; the heavier structural features of office buildings and other large buildings that carry heavy loads; mill buildings; the general problems of transportation, quarrying and handling of heavy materials; reinforced concrete constructions of all kinds; and the testing of nearly all the materials used in engineering practice."

An analysis made a few years ago showed that Wisconsin graduates from the civil engineering course are distributed about as follows:

Government service	23 per cent
Engineering professions	20 per cent
Manufacturing	12 per cent
Railways	12 per cent
Teaching	6 per cent
Non-engineering professions	2 per cent
Non-engineering work	5 per cent
Miscellaneous	20 per cent

The work of the civil engineer is largely in the nature of public improvements; he directs the expenditure of the vast

sums of money which organized society gathers together for the purpose of accomplishing what no individual or small group of individuals can accomplish alone. It is not surprising that the civil engineer finds his widest opportunities in the employ of the government. There are no plums in the salary pudding of the government employee; the plums are monopolized by a few elective and appointive job-holders. Government salaries are low compared with what is paid under like conditions in other fields. On the other hand there are certain compensating features to be considered: There is very little uncertainty about the job or the salary; government engineering work is intensely interesting and is done under ideal conditions; and the government job carries with it a certain dignity and prestige that is often highly valued.

Government work offers much variety. It includes the survey of our land and coasts, river and harbor improvements, irrigation projects, the valuation of railways, work in connection with the public utilities commissions, and the construction of highways. This last item,—highway construction—is just at present, a most important one. The widespread good roads movement, which has met with such notable success in the past few years, is certain to become one of the most important factors in our country's progress. The nation is now spending $400,000,000 annually on roads and pavements. The road program of Wisconsin provides for 30,000 miles of improved highways. Although in the past much of the highway work has been done by untrained men, the resulting waste is having the effect of creating a strong demand that the work be turned over to competent engineers under the direction of state highway commissions. No other field of engineering presents today a better opportunity for public service than is offered in highway engineering.

Under the head of engineering professions in the above list, we have grouped the men who are in private practice,—the so-called consulting engineers—and the men who are engaged in contracting. The men in this group receive the highest incomes among civil engineers. The opportunities are very great and success is limited only by ability.

Manufacturing does not offer the same enticing field to the

civil engineer that it does to the electrical, the mechanical, or the chemical. Still there is a considerable demand for the civil engineer either as executive or as a sales engineer. This field offers much undeveloped opportunity. Of our graduates who are engaged in manufacturing, more than one-quarter are in executive positions.

The railway field is not so important just at present as it was twenty years ago but even at the present time the term "civil engineer" and the idea "railways" are closely connected in the public mind. We usually think of the civil engineer as building a railway bridge or surveying a line somewhere out in the wilderness. But railways no longer constitute the greatest civil engineering tasks; they have competition from many sources, notably from highways and from water-power projects, so that now only twelve per cent of our graduates go into this field. Railway salaries are comparatively low, and the work, while always interesting, is very exacting. The railway business, however, is a gigantic one and the opportunities are there for the man who can stand the discouragements that at present attend the early stages. Some of the best known civil engineers of the country are engaged in railway work. The man going into the railway field should study *Transportation* and not simply railway engineering.

A large part of the work of the civil engineer is of such a nature that it is hard for him to have a fixed residence. He is often the pioneer of civilization and industry, and must needs work in the wilderness. He is often a wanderer from job to job, and from country to country. A lawyer or a doctor can pick his town and settle down; the biggest problem the civil engineer has is to find time and opportunity to raise and educate a family. But they do it and the tribe increases, both in numbers and in understanding, and takes pride and joy in the work.

SHALL I TAKE A CHEMICAL ENGINEERING COURSE?

OTTO L. KOWALKE
Professor of Chemical Engineering

What is a chemical engineer? A chemical engineer must be both a chemist and an engineer; he must be able to apply his chemical knowledge to chemical processes; he should be the intelligence department of his industry. His job is to so control manufacturing processes that all waste is eliminated and all by-products are utilized. It is the chemical engineer who found a way of getting for America the potash which formerly came from Germany. He recovered it from the waste dust in the cement industry; he got it from the dust in the iron blast furnace; he converted a waste product into potash valued at $300 a ton. When the tremendous increase in automobiles threatened a famine in gasoline, the chemical engineer came to the rescue and devised new ways of converting heavy oils into low priced gasoline. When sulphuric acid was needed in England for explosives, an American chemical engineer built plants aggregating 25 square miles in area. The tars and oils obtained in the manufacture of gas the chemical engineer splits into materials indispensable for the manufacture of dyes, medicines, phonograph records, and paints; the tar valued at a fraction of a cent a pound is converted into dyes valued at $1.50 per pound. The American manufacturer is keenly alert to use all his products. The new opportunities and commercial possibilities are endless.

Who employ chemical engineers and what sort of jobs are available? This question may be answered by describing what some of the graduates from the chemical engineering course at the University of Wisconsin are doing. They are engaged, among other things, in the manufacture of paper, iron and steel, dry batteries, metals and alloys by the electric furnace, refining crude oil, glassware, illuminating gas, chemical machinery, tar products for roofing and pavements, coal tar dyes, paints and varnishes, rubber goods, and fine chemicals of various kinds. The graduate is usually placed in the laboratory and

given a chance to learn the business from the ground up. His advancement will depend upon the ability he shows and the results he obtains. Some of the graduates are in the operating departments of the factories as managers, superintendents, engineers, and chemists; some are salesmen of chemical machinery and chemical products; others do pioneer experimental and development work to perfect new processes. There are also many opportunities for chemical engineers on the staffs of state public utility commissions as inspectors and engineers; the Federal Government in the various bureaus, such as the Bureau of Mines, Bureau of Standards, and the Bureau of Agriculture, employs many chemical engineers in metallurgy, clay products, chemical manufacture, etc. The Government is now in great need of men with chemical training to work on war problems, for it is here that such men can play a most important part.

What is the outlook for the future? The opportunities for chemical engineers will become increasingly greater. A great many chemicals and other products formerly made in Europe are now made successfully in this country in factories costing large sums of money. Fine chemicals and dyes exported from this country in 1917 represented a value more than six times greater than that exported in 1914. Secretary Lane of the Department of Interior reports that the increase in the capital invested in the chemical industries in this country in 1915 was 65 millions, in 1916 it was 99 millions, and for the first eight months of 1917 it was over 65 millions. Such investments mean permanent industries. When peace is restored, the American manufacturer must have more men trained in chemistry and engineering to meet the competition from Europe where the chemical industry was highly developed. Everything possible is being done to strengthen the position of the American chemical industries. This means that many chemical engineers are needed for the future.

OPPORTUNITIES FOR THE ELECTRICAL ENGINEER

JOHN R. PRICE
Assistant Professor of Electrical Engineering

These strenuous times are causing remarkable changes in the engineer's position in the world,—changes which predict a position for him dreamt of only by the optimists of the past. Society is coming to a realization of the fact that the right kind of engineering training tends to impart the mental balance, the analytical power, and the judgment in weighing the various elements of a problem that are so essential to correct solution. An unprecedented demand for men of engineering training seems assured.

This is especially true of the electrical engineer. What a different world we would live in were it not for wireless communication, the telephone, the telegraph, the electric motor, the storage battery, and the electric light,—all developed and perfected by electrical engineers of the recent past.

Vast numbers of men trained in the electrical science are required for the operation of the various electrical apparatus during the war, and greater numbers will be required after the war by the electrical manufacturing companies, by the railways and central stations, by the telephone and telegraph companies, and by the many industries, such as steel mills, mines, electrochemical plants, etc., that use electrical power in ever-increasing quantities. All of these industries will require electrical engineers in their sales engineering, manufacturing, operating, designing, or research departments. At the present time the opportunities for the future graduate appear to be numerous and varied. It seems impossible to picture too rosy an outlook.

But all men cannot be engineers, and fewer still can be electrical engineers. Young men who have the problem of their career before them to decide and are contemplating a course in electrical engineering should very properly ask: "Have I had a suitable preliminary training, and am I temperamentally fitted to become a successful electrical engineer?"

Too often the choice of a career in life is made by the young man because of the supposed larger salaries of this or that pro-

fession, rather than because of a real liking and natural ability to do the kind of work involved. The student who is contemplating a course in electrical engineering should assure himself that he has an inclination for the work. A liking and mental aptitude for mathematics is very desirable, as it makes the mastery of electrical theory much easier. Again, the true engineering mind is characterized by a highly developed creative imagination.

If one is certain that he has a natural inclination for the electrical science, the question of salary need not be considered, for it is undoubtedly true that the incomes of electrical engineers compare favorably with those of men of equal ability in other professions.

Graduating from an engineering course does not insure success, but it does unquestionably offer opportunity. What more can fairly be asked? In the electrical engineering profession, the demand for graduates who have conscientiously applied themselves is far in excess of the supply. Final success will depend in great measure upon the extent to which the student improves his opportunities while in college.

A Jack Knife.

THE WORK OF THE MINING ENGINEER

R. S. McCaffrey
Professor of Mining and Metallurgy

The work of the mining engineer which, broadly speaking is the extraction of mineral from the ground, and its preparation into a marketable product, may be divided into three separate parts,—mining geology, mine engineering, and metallurgy. These three fields though closely related require a distinct training and it is hardly probable that one man can become proficient in all branches.

The work of the mining geologist takes up the geological examination of new areas and the detailed study of the geological conditions to obtain data for the future exploitation and development of the economic resources. The geologist is very often retained during the mining operations to continue geological studies of the structure and genesis of the ore bodies, and some of the most important work of our graduates is in this line.

After a deposit of mineral has been discovered and prospected, it is then necessary to extract the mineral economically. Just to give an idea of the magnitude of certain operations of this kind, it might be stated that the excavation in the Mesabi iron district, and this only in one mining district in the United States, was vastly in excess of the excavation for the new Panama Canal when the latter was at its maximum, and was done, too, under the economic limitation that the work must be carried on at a profit—a limitation that did not prevail at the Panama Canal. Some of the larger copper producers handle enormous tonnage daily. The Utah Copper Company produces 25,000 tons every 24 hours, which shows that large operations are not confined to the iron producers. Our graduates who are in the mining part of the work, are now employed in various iron, copper, lead, and gold and silver camps of the United States, and as the mineral development of the past few years has been tremendous it is absolutely impossible to commence to supply the demand for graduates in this line.

The metallurgist takes the ore after it is brought to the surface at the mine and concentrates and separates the valuable

constituents and puts them into a condition in which they are readily marketed. He must be a trained chemist as well as an engineer, and, as all the metallurgical industries are very technical and becoming more so thus requiring the services of technically trained men, the opportunities for young graduates in this line also are very great. It has been impossible to supply the demand in this field.

After the war is over, during the reconstruction period, a great amount of metal will of necessity be used; the mineral industry is not going to feel any depression when peace comes again. If anything, the demands will be increased and with them the opportunities will increase for the men who are technically trained in these industries.

A mining engineer has probably the most general training given in any of the specialized engineering courses, for, in addition to all the fundamental engineering courses, he must have a thorough chemical course and intensive work in geology, mineralogy, mining, and metallurgy. As it is impossible to cover all the various activities of the mining industry in one course, we have three options under mining engineering,—the geological, the mining, and the metallurgical embracing generally the fields which are outlined above.

Next to agriculture, mining is the most important industry in the world, and steel making is the most important manufacturing business. The outlook for technically trained engineers in these industries is better than it ever has been, not only on the purely technical side, but also in operation and executive charge of mines, mills, and metallurgical works.

The Crew

WHAT ENGINEERS THINK OF ENGINEERING

The opinion of the man who is in the thick of things always commands attention and carries weight. In response to a request from the editors, a few of Wisconsin's many sons have paused in their work long enough to present their views in regard to the opportunities now existing in the engineering field and the type of man that is best suited to be an engineer. Their words will be read with profit by every young man who is leaving high school this year.

Onward Bates:[1] Choose your occupation in some line of employment you think you would like to follow. If you have no liking for any particular kind of work there is no occasion for you to make a choice; just take what comes to you and do what other people require of you. Many young men have asked me for advice about their life work and I have been surprised to find they were not aware of any special liking for any particular occupation, seeming to think it should be handed out to them in the same way as other blessings they are accustomed to receive. I was surprised at this because from the time I was a dozen years old I had my mind fixed on the trend of what I wanted to do in this world, and I have followed my desire in the same direction from boyhood to old age. I may now tell you that while I have at no time displayed any particular talent nor made any notable achievement, I have accomplished my idea of success, my life has been happily employed, and I still hope to be in the harness, though at a slackened gait, until I die. Perhaps my acquaintance with you does not justify so intimate a statement, but I am interested in you and I know the narrative of personal experience is more weighty than formal advice. Thinking this subject over, I believe the reason most young men do not know what occupation to choose is that they

---

[1] Onward Bates, hon. C E., '97, is a member of the contracting firm of Bates and Rogers of Chicago, a firm that has handled many of the biggest engineering jobs in the central and western parts of this country. He is a member of many engineering societies, among them the American Society of Civil Engineers of which he was president in 1909.

have not really tried to find out, and that each can determine better for himself than any one else can if he will only set himself to the task. I really believe that some time and effort spent in observing, reflecting, and experimenting on this choice will be of more use to you than to take a haphazard chance in the University, expecting it to locate you, and I say this while remembering the fact that your university instructors will be your best advisers when you have matriculated.

Success is largely a matter of estimation, depending upon the assumptions with which you begin your calculations. If the acquirement of large sums of money with its corresponding influence and responsibilities is your idea of success, then avoid all professions and take up some line of commerce or industry. This course is honorable and useful; you cannot use more than a limited amount of money for food, clothing, and shelter, and more than this amount, if acquired and properly used, will, in direct and indirect ways, add to the wealth and prosperity of others. There is no reason why you should not go in for wealth if that is your ideal of success; if you do succeed in that line, it will give you enlarged opportunities for exercising good citizenship. My idea of success if for one to spend his life,—all of it, actively and usefully in an occupation which in its nature is agreeable to him; to raise a family, living with them in moderate comfort with enough trials of all kinds to solidify his character; and, when he dies, to leave a good name and enough of this world's goods to provide for the necessities of those dependent upon him, but not enough to be a temptation and an injury to them. As I have already tried to tell you, any profession or business offers that opportunity, and this leaves you free to choose one to your liking.

If you have a natural disinclination for work, or have adopted the idea, common to present day reformers, that work is a hardship which is to be avoided, then by all means keep clear of engineering which offers nothing of value to those who shun work. I think better of you than to put you in that class, so let me give you some cardinal principles:

Work is a blessing as well as a duty to God and to your neighbor.

Work is a necessity for your health, your happiness, and your self-respect.

All necessary work is honorable.

Any work you put your heart into is enjoyable.

Work, faithfully and persistently performed, in any legitimate occupation will be crowned with success.

Every proper occupation offers inducements to good workers, for whom there is always room with promise of reward.

Do not take up engineering unless you mean to follow it with work and study while you live. The profession has recently come into its right place; any one who reads the newspapers must know this is the engineering age. The demand is for good men and for no others; unless you are a good man keep out of it, or you will be run over and left by the wayside. Engineering offers plenty of work, hard work, lots of preparation, waiting for the rewards perhaps a long time; but for such as make good the rewards are sufficient. If you love the profession it will repay you manyfold. I have not space to write in detail about it and so I repeat to you the advice of the Apostle Paul to the Philippians: "Think on these things."

Ray Palmer:[1] It is the writer's belief that opportunities today for the technically trained engineer have never been equaled. This is true of the technical engineer, not only for purely engineering positions, but for the larger field of management. The honest and broad minded engineer is being continuously demanded for responsible positions in most lines of industry. With the engineer's technical training, which tends to develop the ability intellectually and economically to solve operation, maintenance, and construction problems applicable to almost every kind of industry, and with his capacity for handling men, he can and does today fill many very responsible positions involving constructive management.

To be permanently successful, every line of large industry needs economical management which the technical engineer, after he has rounded his career with a business training, is better able to give than most other professional men. A business training, resulting in the development of a sound judgment, is

---

[1] Mr. Ray Palmer, President of the New York and Queens Electric Light and Power Company of New York, was graduated from the course in electrical engineering in 1901.

an essential factor in the career of nearly every successful man, and it is my belief that capable engineers with sound judgment today have more and better opportunities to advance to prominent positions and go even to the top of their industry than heretofore. Those who have control of industry recognize, more than ever before, that the physical conditions and the net results of their business depend mainly upon good executive management, and that managership positions are better filled by technically educated men than otherwise. Without question most men with an engineering education for a foundation will succeed in the world of affairs, if they have a liking for mechanical work, a love for doing things—accomplishments,—and a proper share of "stick-to-it-iveness"—perseverance.

Carl Hambuechen:[1] In reply to your letter requesting my views on (1) opportunities open to the engineer (2) the type of man best fitted for an engineering career, wish to say that I find it rather a difficult task to outline this briefly in a short letter, because to my mind engineering covers such a broad and varied field. The modern tendency now is to call any person an engineer who produces results. The Engineer is in the eye of the public today, and they have observed that a man with engineering training is best qualified to keep pace with the march of progress.

If I were again graduating from a high school, expecting to attend a University, I would give the following factors careful consideration in choosing my future career: First—What are my natural inclinations? Second—What physical qualifications have I that fit me for this profession?

The professions open to a young man may be classified in the following manner: Engineering, Scientific, Medical, Legal, Literary, Commercial, Art and Music. It will be noticed that Engineering occupies a peculiar position in this group in that it is practically an entering wedge for all other professions, art and music naturally being excluded. A scientific education might possibly lead into engineering, but a man with a medical, legal,

---

[1] Carl Hambuechen, e '99, E. E. '01, is Assistant Manager of the American Carbon and Battery works of East St. Louis, Ill.

or any other professional training is not apt to drift into engineering. This leads to the conclusion that a person with an engineering training does not have to follow pure engineering, but that his training is useful in many other lines and is a foundation or stepping stone for other professions.

We practically have two classes of engineers: First, the theoretical engineer, who only deals with pure engineering problems, and, second, the engineer who wishes to deal with manufacturing problems and executive work. Both of them require a knowledge of engineering. The second class produces Patent Attorneys, Purchasing Agents, Manager of Manufacturing Enterprises, Technical Salesmen, Efficiency Experts, Technical Editors and Corporation Attorneys.

If my selection was theoretical or pure engineering, I would take up as many subjects as I could carry through my college career. Although it sometimes appears that a study has no particular usefulness, in later years this particular study may be the most useful, and a student can take it for granted that the study would not be listed in any engineering course if the engineering faculty had not deemed it advisable to offer it to the student. If on the other hand I wished to follow engineering to obtain an executive position I would take, besides my regular engineering work, a number of side studies such as economics, business management and the like.

In choosing a career we do not want to lose sight of the physical qualifications. For example: If a young man finds that he has a particular liking for mineralogy he might come to the conclusion that he would like to be a mining engineer. But he might be a frail individual and his physical makeup would make it practically impossible for him to stand the hard-ships of outdoor life. This young man naturally would waste his time taking up the studies of the mining engineer. A similar process of reasoning can be applied to other engineering professions.

In conclusion I might say that an engineering education gives the young man the best training he can obtain, a training that never is wasted because he can apply it to many other fields. He has been thoroughly trained to *analyze and reason correctly,* which practically means that he will have a successful career.

James F. Case:[1] It is no easy task you have set me for in effect you are asking me to advise you in your choice of a career. I can only present the impressions gained from my own experience, in the hope that they may help you in making your own decision.

You ask (1) What are the opportunities open to the engineer, and (2) What type of man is best fitted for an engineering career. Right here I am tempted to reverse the order of your questions, for what good, may I ask, are the opportunities, if you are not the man to grasp them.

Engineering is a very broad term, and I need not tell you that the present is becoming an age of specialists. The ground work of the various branches, however, is nearly identical, and opportunity will probably influence your choice of a special field.

The present world struggle is a war of engineering, and though its object is destruction, there is much to be learned and applied to constructive effort in normal times. First of these is the problem of transportation, and in this field I believe you will find a great opportunity for the engineer. Due to high construction costs and unsettled financial conditions, railroad work has been confined to maintenance essentials, and no new construction has been undertaken. Existing lines have been overtaxed, and congestion has resulted. Peace will certainly be followed by a huge construction program, and engineers will be in demand. Furthermore, the United States has at last turned its attention to overseas transport. We are now building ships on an unprecedented scale and by revolutionary methods. The plan of quantity production of standardized, fabricated ships is purely the development of the American engineer. With it must come harbors, docks and yards, terminals and cargo handling methods, all of which bring countless opportunities to the profession. If the United States is to take and hold a dominant position in ocean transport, it must be done by economies in motive power and operating costs. Internal combustion en-

[1] Major James F. Case, c '90, one of Wisconsin's most loyal alumni, is Chief Engineer of the American International Corporation. It is this Corporation upon which the country depends for the creation of enough ships to beat the submarine.

gines are susceptible of great improvements. The higher paid American seaman must do his work in competition with the foreigner through the aid of labor-saving machinery. This is the special field of the American engineer and the opportunities are many. I have emphasized this particular field because I am myself engaged in it and its imperative necessity of better transportation facilities is evident. In the general field of engineering, it seems hardly necessary to refer to the opportunities offered in the development and transmission of electric power, either from steam or water power; nor in water supply, sanitation or irrigation. They are too well known to need comment. Structural engineers have an opportunity to cooperate with metallurgists in the development of new materials and alloys of less weight and greater strength, for dead weight at present limits our efforts.

Now in every field, remember that the engineer is not confined to design and construction. His education and training should fit him for organization and management, and here he will find unlimited opportunities. Your second question as to the type of man best fitted for an engineering career calls for genuine self analysis. Are you really attracted to the profession and can you put your heart in it? Engineering, like any other profession, calls for continuous application. A college education is but a primary kit of tools, to which you must add as your skill increases. Constant study and application are essential. The engineer must approach his problems with an open mind; must collect his data carefully; array it logically, and draw his conclusions judicially. His success cannot always be measured by financial reward. Personal satisfaction in accomplishment weighs equally with it in measuring results. Enthusiastic devotion to the profession will surely bring recognition and reward.

If in this very brief synopsis you find something of help in making your decision, I shall be more than satisfied.

Volume 22 Founded 1890 Number 7

The Wisconsin Engineer

$1.00 a Year 15c a Copy

Subscriptions, payable before February 1, $1.00 a year in United States, Porto Rico, Hawaii, the Philippines, Cuba, or Mexico; $1.25 in Canada; and $1.50 in other countries. Entered at the postoffice at Madison, Wisconsin, as mail matter of the second class.

Published monthly from October to May, inclusive, by
THE WISCONSIN ENGINEERING JOURNAL ASSOCIATION,
306a Engineering Building, Madison, Wisconsin
Telephone University 276

TO THE HIGH SCHOOL SENIORS

You find yourself, at the end of your high school course, faced with the problem of deciding whether or not to continue your education, which school is best suited to your needs, and which, of the many courses offered, is the one for you to choose. The men behind the Wisconsin Engineer, acting in the knowledge that many of you are fitted to succeed as engineers and to forward the profession and find happiness in it, have endeavored to bring together in this number of the magazine such material

as will, in their opinion, help those of you who are attracted to engineering to make your decisions wisely. There is no desire to attract men who are unfitted for this particular line of endeavor; there is, however, a desire to bring to the University of Wisconsin, strong, hardworking, earnest men.

THE BULLETIN OF THE COLLEGE OF ENGINEERING

Those who are interested in engineering should write to F. E. Turneaure, Dean of the College of Engineering, and request a copy of the Bulletin of the College. This bulletin is sent free of charge. It contains information in regard to entrance requirements, the curricula of the various courses offered in the college, and a brief description of the various subjects that are taught.

TO PROSPECTIVE ENGINEERS

It has been found, at the University, that a large number of freshmen engineering students are handicapped every year, by their failure to start their work on schedule time. Considerable time and trouble will be saved to the student if he will observe the following suggestions.

You prospective engineering students who intend to enter the University of Wisconsin, should not fail to fill out an application sheet for the College of Engineering while you are still in high school. If your principal makes no announcement of this, ask him about it. In connection with this application, make sure that your high school credits are forwarded to the University. It will save you considerable trouble if these are at hand when you register.

Try to register at the University at the earliest possible date. First go to the Registrar's office, then to the office of the Assistant Dean who will assign you to an adviser. Your adviser will direct you, and inform you concerning anything about which you are in doubt. Do not hesitate to ask him for any help which you desire; he will take a personal interest in you, and will assist you at all times. Pay all your fees to the University Bursar before your classes start. Having done this, you will be

able to obtain your cards for every class which you attend, and you will then be able to enter classes without loss of valuable time.

If these preliminaries are attended to during the first day or two of registration, you will have left a little time in which to get acquainted with your new surroundings. You will have also the satisfaction of knowing that you have made a successful start in the work which lies before you. R. B. B.

HERBERT HOOVER SAYS—

At the request of a member of the staff of the Wisconsin Engineer, Herbert Hoover, United States Food Administrator, has given his opinion in regard to the increasing need in this country for technically trained men, as follows:

The war has brought out more clearly than ever the need of trained men to solve the complex problems of civilization. The training of the mind that comes from completing a technical course is of the greatest value in meeting new situations.

The work of the engineer is basic. Our modern method of living requires us to accept his work and to insist upon his training being sound and satisfactory. Our bridges, our high buildings, our sewer systems, our railroads are vital and they have to be in the hands of experts.

There will be many opportunities for the graduates of recognized colleges of engineering in the government service during and after the war. I would particularly urge upon all those entering upon a course of engineering to see that their general training is liberal and that their special training is as good as can be obtained. The engineer must have wide training and understanding if he is to take the place to which he is entitled.

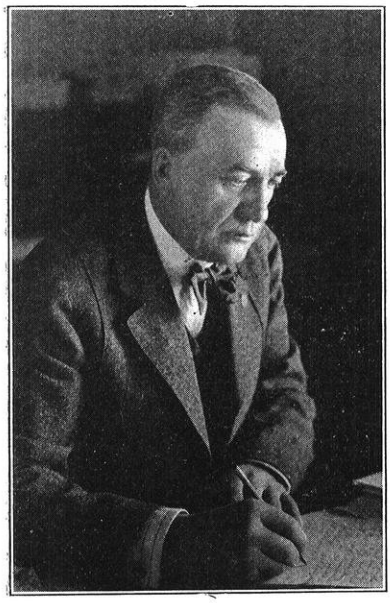
I trust that the efforts of Prof. Slichter in this direction will result in securing greater registration in our engineering and technical colleges.

Yours faithfully,

HERBERT HOOVER.

SUCCESSFUL WISCONSIN ENGINEERS

MAGNUS SWENSON, (Met. E. '80, M. S. '83, M. E. '98), now *Chairman of the State Council of Defense and Federal Food Administrator for Wisconsin,* should serve as an inspiration to all present and future engineers. If the details of his varied experiences could be written they would read more like a romance than a chapter from real life. Unfortunately the space allotted will permit of only a brief outline.



In 1868 he left his native land, Norway, in a sailing vessel, bound for America.. The voyage was long and tempestous. It lasted twelve weeks. during which time, twenty-two of the sixty passengers died of starvation and exhaustion. The ship finally landed at the island of Anticosta, at the mouth of the St. Lawrence river.

From there the ship was towed to Quebec where the passengers were landed. No friends were there to welcome him; even the skies were dark and foreboding; and a thunder storm was raging such as Magnus had never seen nor heard in Norway. He now found himself a stranger in a foreign land, unable to speak a word of its language. His assets were a few personal belongings in a little wooden chest, barely enough money to take him to his destination, and a never failing optimism and courage. He was bound for Wisconsin and in spite of the hardships of the ocean voyage he again took passage on a boat, up the St. Lawrence River and thru the Great Lakes to Detroit. It was a freighter and at night he curled up on the deck and slept like a little soldier. From Detroit he went to Chicago by rail and then on to Wisconsin.

After spending a short time in the public schools, to learn the language, he went to work in the blacksmith shops of the Chicago and Northwestern Railway, at Janesville. While engaged in sharpening tools for the workmen building a steel bridge across the Rock River, this wonderful piece of construction work so impressed itself on his mind that he was fired with the ambition to become an engineer. He sent for a catalogue of the University of Wisconsin, and after preparing as best he could by himself and at evening school, he came to Madison, for "Commencement" on June 20, 1876; but, to his surprise, he learned that the "Commencement" announced in the university catalogue meant the end of the school year—not the beginning of it—and that he must wait until September to begin his university course.

With what money he had saved, and what he could earn after entering the university, he was able to pay his way, and he graduated four years later, with the highest honors, in the course of Metallurgical Engineering. For three years following he was instructor in Chemistry at the University of Wisconsin.

About this time the United States Department of Agriculture offered a prize of $2500 for the best paper on the chemistry and manufacture of sugar. This prize Mr. Swenson won, and with it came an offer of the management of a large sugar factory in Southern Texas. He was engaged in this work for several years, and during this time he made many improvements in sugar machinery and processes. During this same period he was engaged by the United States government as an expert in the sugar industry.

In 1889 he began the manufacture of special machinery for sugar and for other chemical industries. Three years later he moved his manufacturing plant to Chicago, and here his attention was immediately turned towards saving the waste products in various lines of chemical manufacture. He personally visited all the largest plants in the country and induced the owners to install waste saving appliances. "Save the Waste" has always been his motto and his technical training as a chemist and mechanical engineer, together with a fertile brain, enabled him to produce many valuable conservation devices. His principal work was improving the processes and designing and constructing machinery for the manufacture of cane and beet sugar,

sugar of milk, glycerine, soap, caustic soda, paper pulp, glue, fertilizers, and for many other lines of chemical work.

In 1900 he sold his plant to a New York company and moved back to Madison, Wisconsin, in order to give his children the benefit of an education from his Alma Mater, and to take a well earned rest.

However, an active mind such as his, and an ambition to make his life count, did not permit him to stay long idle, and soon he became interested in the enormous power going to waste in the Wisconsin River. Within the last few years he has financed and built the two largest hydro-electric power plants in Wisconsin, located at Kilbourn and Prairie du Sac. From these plants the electric current is transmitted to Milwaukee, about 70 miles distant, to Madison, and to many other towns in Southern Wisconsin. The coal saved by these two plants amounts to over 200,000 tons annually, and is of special significance now on account of the war.

In 1912 he assisted in organizing the Norwegian America Line, a steamship company in which he is a director; and the following year he visited Norway for the first time since leaving there as a boy. He went on the maiden voyage of the first steamship built for the company, and he was received by the highest officials of the government in recognition of his valuable assistance in establishing the first direct and regular steamship service between Norway and America.

For several years Mr. Swenson was Chairman of the Executive Committee and also President of the Board of Regents of the University of Wisconsin. He was also Chairman of the Executive Committee of the Capitol Commission of Wisconsin and gave a great deal of his time freely, for several years more, to the work of building our beautiful capitol.

Since the war started he has given his entire time to state and federal war work as Chairman of the state Council of Defense, and Federal Food Administrator for Wisconsin. Here again he is trying to "Save the Waste" and Wisconsin is recognized in Washington as one of the most efficient states in the matter of food conservation, and in all patriotic activities.

Mr. Swenson possesses those qualities that go to make up a sturdy and loyal citizenship. He loves America and never tires of speaking of her as the land of opportunity for those who have vision, and are not afraid of hard work.

WITH THE COLORS.

It is desired to leave a record, as complete and accurate as possible, of the response made to our Nation's call in this hour of need, by the students, the faculty, and the alumni of the College of Engineering. We most earnestly hope that you will give your assistance and coöperation toward this end. Bits of news, extracts of letters, photographs, and material of a similar nature will be welcome and should be given to some member of the Staff, or dropped into the mailbox of THE WISCONSIN ENGINEER, addressed to WITH THE COLORS. Letters and photographs will be returned undamaged.

By LOYAL S. BAKER

HONOR ROLL (SUPPLEMENTARY)

ANDERSON, VICTOR, m '08, is a lieutenant in the 314 F. A. at Camp Lee, Va.

BALSLEY, HENRY, c '09, is lieutenant in the 24th Engineers, in France.

BENNETT, JOSEPH G., senior civil, Asst. Paymaster in the Navy, has been ordered to report, on April 1, at the Great Lakes Station.

DODGE, CHESTER C., e '17, is in the Signal Corps, stationed at the Great Lakes Training Station.

GRANT, EUGENE L., c '17, advises that he did not enter the R. O. T. C. as he had planned to do. Instead he enlisted in the Naval Reserve as a 2nd class seaman, and on Feb. 25, went into training at the Municipal pier at Chicago. He expects to go shortly to Pelham Bay, N. Y., where there is a camp of 10,000 men.

JAMES, BURTON E., junior mechanical, is with Base Hospital 22 His present address is Auditorium, Milwaukee.

LINDEN, JOHN F., freshman mining, has been called on the draft and ordered to report to Fort Worden, Washington. He will probably be in the heavy artillery.

McDONALD, HARRY L., c '04, is a captain in the U. S. Reg. Engrs. at Animas, N. M.

POLACHECK, STANLEY, ex-'18, has recently been appointed Navigating Ensign in the Naval Reserve.

RAU, HAROLD L., min '16, 3rd R. O. T. C. at Camp Custer.

ROWELL, L. D., e '01, assistant professor of electrical engineering at Purdue, is now a captain. He is at Washington, D. C.

WEAVER, WARREN, C. E. '17, is in the Science and Research Division of the Signal Corps.

Bob Johnson, c '17, who is now a Lieutenant in the Engineer Corps, has had charge of the building of a set of miniature trenches for use at Camp Custer, Mich. A description of the work is given in a Detroit paper:

One group of engineers, under Lieutenant R. C. Johnson, has this winter constructed a plaster model of the whole trench system, perfect in detail of contour and topography to the work already done. This model, built on a ground scale of 1 to 100 feet and a vertical scale of 1 to 25 feet, enables the engineers to show in a space 6 by 8 yards what actually represents 600 to 800 yards.

The trenches are complete in every way, with their barbed wire entanglements, no-man's land, communicating trenches, etc. Even the machine guns are there—clever little guns made out of nails and wires. The woods are duplicated by diminutive green trees, the bridges by small, hand-made structures of the toy type, and every curve in the land is reproduced.

Despite the elaborate nature of the trench model, it cost only $30. The materials were found largely in camp and the men made their own plaster tools out of spikes and such things, which they took to the blacksmith shop for remodeling.

When work is resumed on the trench system, this model will be taken to the trenches and placed in a shed. At present it is in Company B's barracks, where it is one of the sights of Camp Custer.

FIRST WISCONSIN ENGINEER TO GIVE LIFE

Fern W. Bristol, a freshman engineer of last year, is the first Wisconsin Engineer to give his life for his country. Bristol left school early last spring to enlist with Company D, Wisconsin National Guard. He was sent to Waco, Texas where his company was made Company B, 128th. Infantry of the Rainbow (32) Division. They were landed overseas a short time ago. Bristol was taken sick soon after landing, and died of pneumonia on March 9, 1918. In the short time that he was at Wisconsin, he made himself well known and well liked. His friends regret deeply his untimely death.

CAMPUS NOTES

By Edmund M. Wise

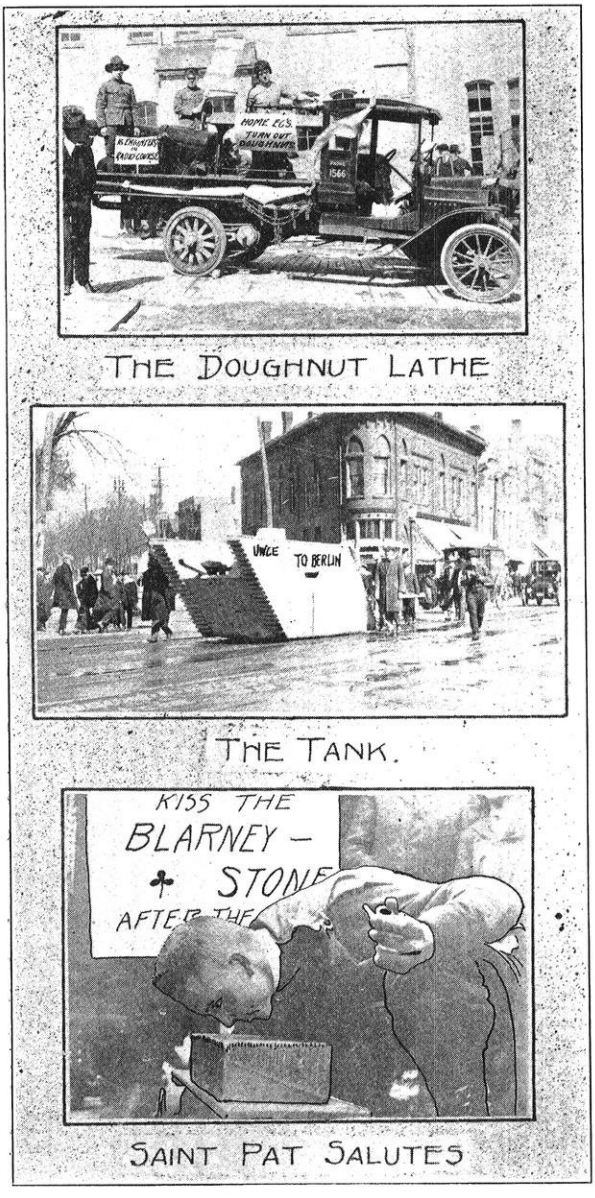
The biennial minstrel show, which was due this year, will not be attempted. Another of War's horrors. Some of the energetic spirits among us, however, were not content to let the whole thing drop, and they aroused enough of the old zingo to stage a big parade on March 16. Saint Patrick (E. M. Wise) rode at the head and in the wake came many rare and curious exhibits some afoot and some on wheels. The snake was there and the famous wrench invented by St. Pat to the sorrow of the Law School. And at the end of the ceremonies when each engineer kissed the Blarney stone and pledged his faith anew, sure there was not a dry foot in the crowd.

It is estimated that there will be about 3,250 students in attendance next year. Returns from the high schools indicate that the number of this year's high school graduates who enter the University will be as large as usual. The decrease will be largely in the upper classes.

The coming of the soldier students has meant some strenuous changes for the men taking shopwork. The 8 o'clock classes have been set ahead to 5:30 a. m. so that the regular students will be through before the soldiers begin. There will be some night work in the shop and in the steam and gas laboratories. Keeping in mind that the clocks have been set ahead one hour, you can figure for yourself when you have to get up to make a five thirty.

Attention is called to the fact that there are a number of Legislative Scholarships open each semester to engineering students whose scholastic record is high. These scholarships are, in effect, a remission of the non-resident tuition fees.

Firms of almost every kind are endeavoring to secure technical students for summer work. According to Dean Turneaure



St. Patrick's Day Parade

Photographs by G. B. Kuebler M. E. 2

many splendid offers are being received. The Fore River Ship Building Company of Quincy, Mass, is desirous of securing college men for the summer, and is making a rather attractive offer. A number of men are needed also on construction work in the Miami Conservancy District, near Dayton, Ohio. The contractors will pay from $60 to $85 per month, room and board furnished. Further information pertaining to these and other jobs may be obtained from the Dean.

On March 14th, Prof. Callan gave a talk to the Student Branch of the A. S. M. E. concerning his recent trip to England. Prof. Callan has just returned from England, where he has been testing some new engines for the United States Shipping Board. He had many interesting stories to tell of his trip over on "camouflaged" ships, and of his experiences while "over there." During one of his nights in London the city was bombarded by German planes, and Prof. Callan's description of the affair was very realistic. He told some interesting things about the peculiar noise that a twin-engined plane makes, due to the interference of the sound waves when the engines get out of step with each other.

Professor D. W. Mead has been appearing before the California rate commission in connection with the application of the Spring Valley Water Company for a change in rates. This company supplies San Francisco. Professor Mead's testimony was on the point of going-value.

Mr. Peter F. Hopkins, instructor in Topographic Engineering, has left to accept a position with Milo S. Ketchum. He will be supervising engineer in charge of the construction of munitions plants in West Virginia. His work will be taken by Prof. Smith, assisted by Paul Gillette, Fellow in Hydraulic Engineering, and H. H. Gumprecht, a senior civil.

C. B. Willmore, ch '16, is with the American Steel and Wire Company, Worcester, Mass.

The plans for the much needed infirmary and the Cornelia Bradley Memorial Hospital have been approved by the Board of Regents. Each building will be 140 by 41 feet, and will have two stories and a basement. The Memorial Hospital, the gift of Doctor and Mrs. H. C. Bradley of the University of Wisconsin, and of Mr. and Mrs. Charles R. Crane of Chicago, will front upon Orchard Street, while the infirmary will open upon a court between Orchard and Warren Streets. These buildings, which will cost about $50,000 each, will be similar in architecture to the University Extension Building.

Electrical engineers will be interested in a new bulletin Volume 8, Number 6, of the Engineering Series, entitled *A Digest of the Relations Between the Electrical Units and of the Laws Underlying the Units.* It was prepared by Edward Bennett, Professor of Electrical Engineering of this College. As stated in the preface, the object of this digest is to present "in a consecutive manner the relations between the units of an ampere, ohm, ampere-turn, weber system of units from which all conversion factors and irrational 4π factors have been eliminated." The recommendation is made that students be taught the single system of units in place of the three systems in use at the present time, and that the relations between the electrostatic, electromagnetic, Heaviside, and the hybrid practical systems be taught only after the student has learned to think in terms of a simple factor-free system. The present sophomore class is learning this system.

Every one of the thirteen hundred students and faculty members in active service will have a star in the monster service flag being planned for the University. The name of each man in service will be embroidered upon a star by University women.

ALUMNI NOTES

By WALTER S. NATHAN

The Wisconsin contingent in the Emergency Fleet Corporation at Washington continues to grow. We take pride in announcing that F. C. Thiessen, c '10, and J. P. Schwada, c '11, are both working under S. C. Hollister, c '16, in the Concrete Surveying Section. W. A. Klinger, c '10, and A. J. Sjoblom, e '10, are also with the Corporation but we do not know just what the nature of their work is. W. H. Wetzler, c '06, C. E. '10, is in charge of the Drafting Section of the Corporation. Watch Wisconsin at Washington!

F. E. Bash, ch '16, Research Dept., Leeds & Northrup Co., Philadelphia, has had a prominent part in the successful development of a new optical pyrometer.

O. B. Cahoon, m '04, is an inspector of power plants and arms in the Navy.

D. P. Dale, c '11, is County Engineer at Mount Ayr, Iowa.

W. H. Damon, e '12, is now at 783 Lawe Street, Appleton.

C. A. Fourness, ch '14, is standardizing the various mill operations of the Kimberly-Clark Paper Company at Niagara, Wis.

W. D. Fowler, C. E. '16, is at the Lakeside Hospital, Cleveland, recovering from injuries received when his automobile was struck by a train. He has been on his back for five months, but expects to be around soon with crutches and a steel brace. At the time of the accident he was with the Dravo Contracting Co. as Assistant Superintendent on the construction of the Trumbull Steel Co's mill extensions at Warren, Ohio.

L. L. Hebberd, m '11, is located at 463 South Street, Appleton.

J. G. Hirsch, c '08, C. E. '11, is Chief Draftsman with the American International Shipbuilding Corporation of Philadelphia. His address is 140 N. Broad Street.

But for Electricity, the Panama Canal would still be a dream

Notable Electrifications of the General Electric Company in construction work and the operation of canals

N.Y. State Barge Canal
(Great Lakes to Tidewater)

Catskill Aqueduct
(N.Y. City Water Supply)

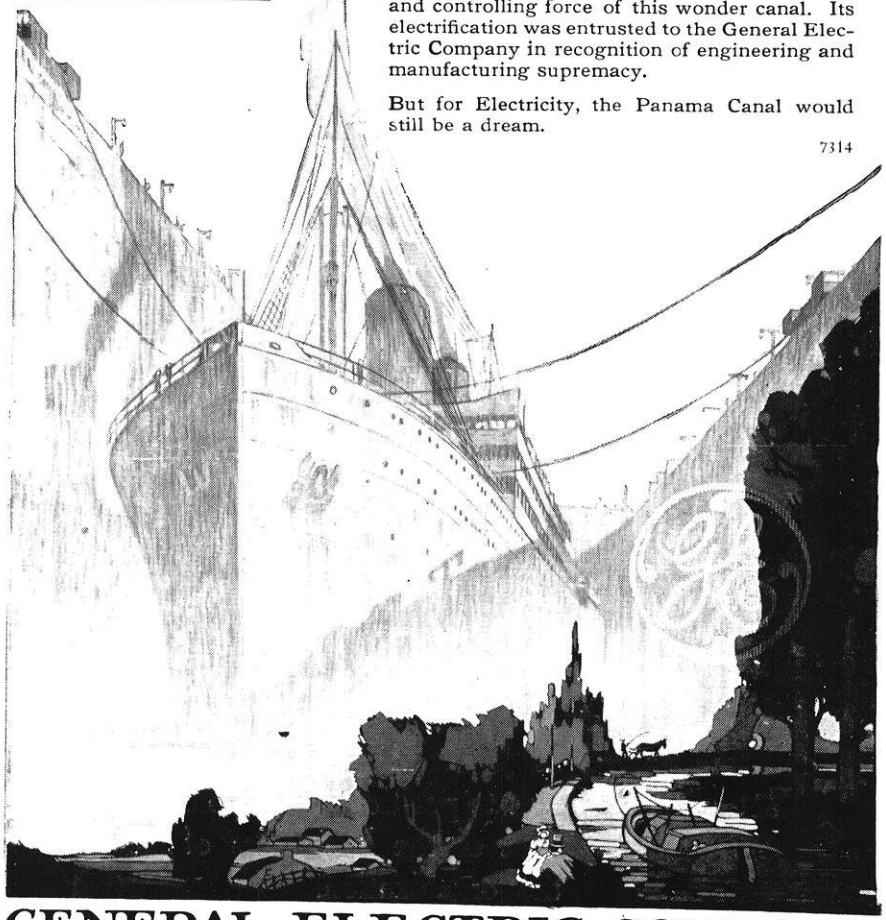
Panama Canal
(Atlantic to Pacific)

WHEN engineering science decreed that Electricity should be the motive power to operate the towing locomotives, the interlocking systems, the fender chains, the pumps and the spillway gates at Panama, the Canal as an avenue of commerce began to redeem itself.

Electricity was preordained to be the driving and controlling force of this wonder canal. Its electrification was entrusted to the General Electric Company in recognition of engineering and manufacturing supremacy.

But for Electricity, the Panama Canal would still be a dream.

7314



GENERAL ELECTRIC COMPANY