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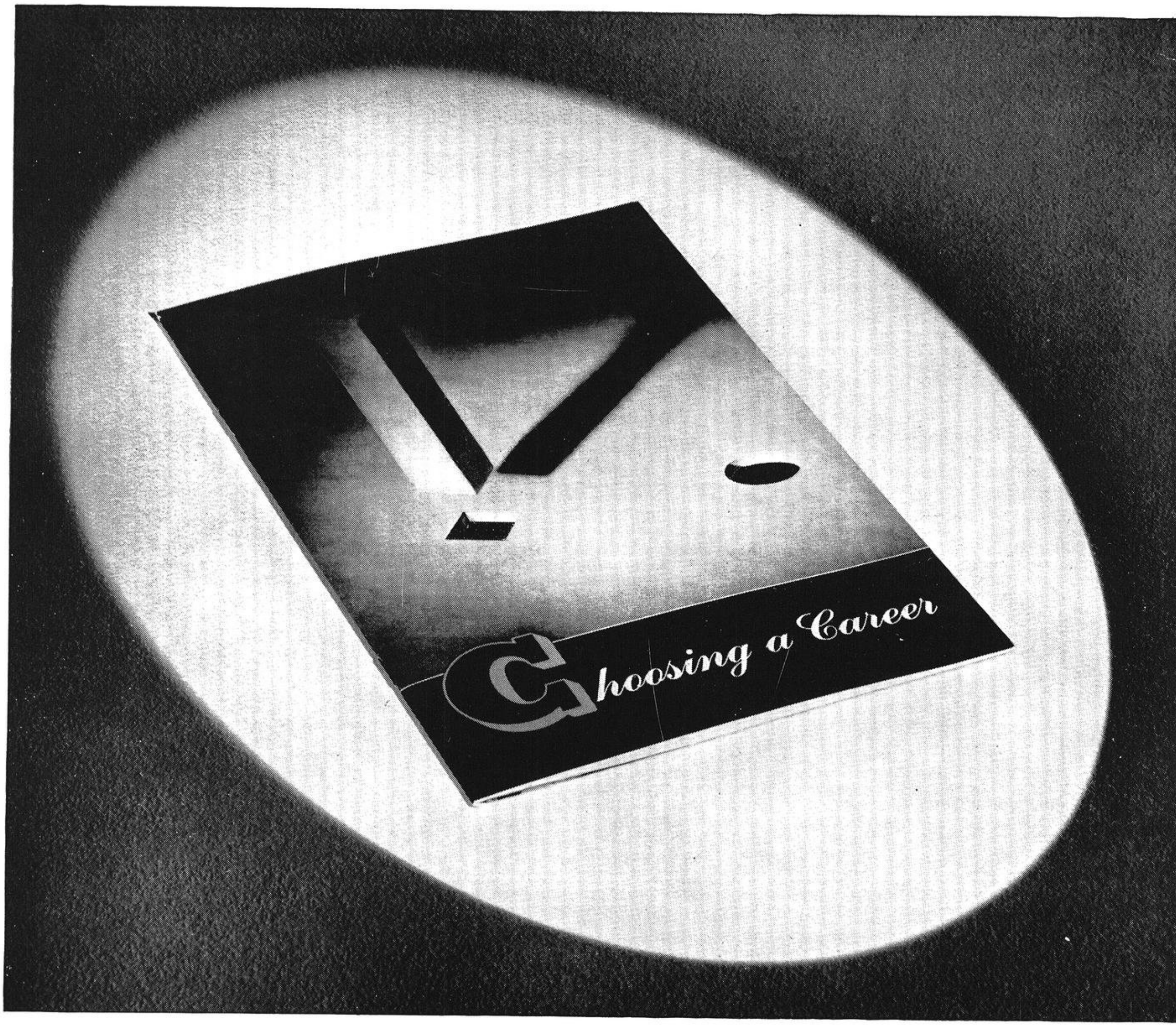
*The*

★ WISCONSIN ENGINEER

*May, 1941* ★ The Wisconsin Engineer Plan -- Pages 3 and 8




# AFTER THE DIPLOMA — WHAT?

● The choice of a career is unquestionably one of the most important decisions a graduate is required to make. It is generally conceded that a man's success in a chosen career is usually the result of a happy alignment of his inherent abilities with the work he undertakes.

This organization, the world's largest manufacturer of ball bearings—now in the forefront of the defense effort—each year employs a limited number of graduate engineers.

This profusely illustrated book will give you a quick, but vivid picture of the past, present and future of this interesting and essential industry. A copy will be sent gladly upon request.

New Departure, Division General Motors Corporation, Bristol, Connecticut.

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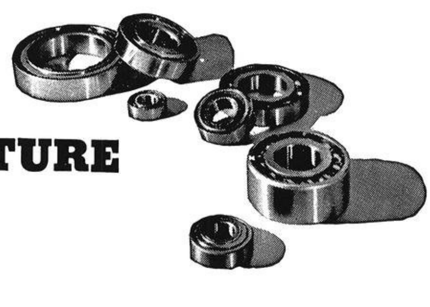

**NEW DEPARTURE BALL BEARINGS**

# *The* ★ WISCONSIN ENGINEER

Founded 1896

Volume 45 — MAY, 1941 — Number 8







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**Subscription Prices**

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## *On The Cover*

We don't like guns on our cover, but guns are hard to ignore. The R.O.T.C. students shown at target practice don't feel that they are playing. With the United States busily endeavoring to raise an army, we see all around us evidences of emphasis upon the military side of the world's affairs. The local unit of the R.O.T.C. has more enrollees than ever before. Next year Lieut.-Col. H. H. Lewis will have an even more difficult job to handle a unit enlarged by compulsory membership.

National defense is the byword, though war is a shorter name for it. Not only the R.O.T.C. members, but all students are concerned with the part they are to play in our country's military program. The most pressing problem to most of us at the present is the status of student engineers with regard to the Selective Service Act.

Partly because of the shortage of trained engineers, industrial production for the national program is proceeding only slowly. Several of the national student societies have asked deferment for student engineers to allow them to finish their college training. The college faculty is doing what it can to help engineering students to obtain deferments until completion of their courses. Whatever the official decree, it is likely that draft boards will see fit to allow more engineering students to complete their training.

## *In This Issue*

# *Foreword . . .*

WE have a proposition to make to you. As an engineering student you are receiving a copy of the May issue of *The Wisconsin Engineer.* It is your magazine as it always has been, but now it needs your help.

Next week the Polygon board will conduct a classroom referendum. You will be given a ballot which reads:

"Do you favor petitioning the Board of Regents to place subscriptions to *The Wisconsin Engineer* on a fee basis for all engineering students?"

If you vote "yes," the Board of Directors of this magazine will petition the regents this semester with your support to back them up.

Here is the plan and the necessity for it:

*The Wisconsin Engineer* is not now self-supporting. The chief reason is the low number of student subscriptions. Something must be done, for a good engineering college magazine cannot exist under these conditions. Published continuously since 1896, this magazine is the the third oldest engineering college magazine in the country. It represents the College of Engineering of the University of Wisconsin in engineering and educational circles. A good magazine is indicative of a good college; certainly a progressive engineering college which places its graduates is not without its college publication.

This magazine is at your disposal, published for you by your fellow students. Its articles, news items, and announcements are printed for your benefit. It can be a link between you and your faculty, you and your college, you and the alumni, and you and the engineering world.

The great majority of engineering college magazines are supported by a fee plan. Since all engineering students benefit by the existence of an engineering magazine to represent their college, it would be only fair that all should help support *The Wisconsin Engineer.* The subscription rate would be lowered to a dollar a year, payable with the regular university fees. With the assured income, a bigger and better magazine would be published.

The engineering faculty members are 100% behind this proposal and have gone on record as supporting it. Every engineering society and fraternity contacted up to press time has favored the plan. Groups which passed resolutions in favor of putting *The Wisconsin Engineer* on a fee basis are the A.I.Ch.E., A.S.C.E., the Polygon Board, Pi Tau Sigma, Alpha Tau Sigma, Eta Kappa Nu, Triangle, and Kappa Eta Kappa. Other groups who had not yet discussed the plan by press time, but whose presidents are supporting the proposal are A.S.M.E., S.A.E., A.I.E.E., Tau Beta Pi, Chi Epsilon, the Mining Club, and Evans Professional Group.

These resolutions reflect the attitude of representative student groups towards the proposal to include *The Wisconsin Engineer* subscription in the university fees. The engineers contacted felt it their duty to support their magazine. Many who had not gotten around to subscribing said they would welcome the fee plan by which they could conveniently pay for subscriptions. Others felt it would be only fair to pay a dollar fee to do their part in maintaining the prestige and reputation of this college.

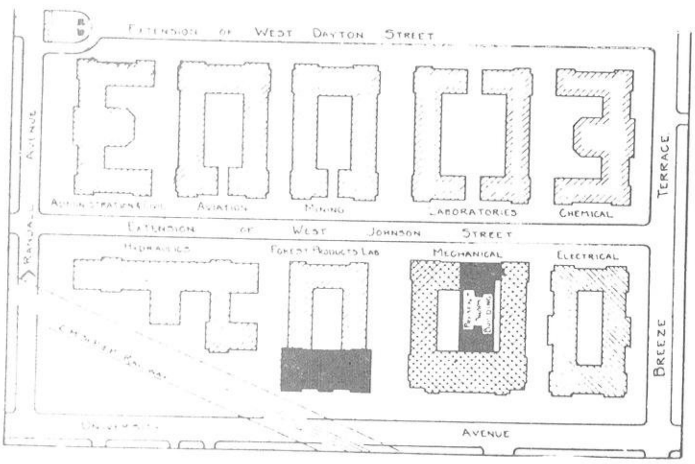
So there's the proposition. If you want to help your college and yourself, as well as receive a bigger and better magazine at less cost, vote "yes" in the impending referendum.

Thank you for your attention. We hope you enjoy the pages ahead.

# A BUILDING FOR ENGINEERS

*by Blake Wheeler, e'42*

"I SHALL never rest content until the boundaries of the campus have become the boundaries of the state." This memorable statement was made by President Van Hise many years ago, but today it still repsents the University of Wisconsin's concept of its work. In education, scientific research, and public service the University has exhibited leadership, but at present this leadership is seriously endangered by crowded conditions, outmoded equipment, and a limited budget. The caliber of the staff is far above that of the conditions under which they have to work. With attention focused on industry a recognition of the importance of a complete and efficient engineering school must come to the forefront, yet this school is one of those most sorely in need of greater facilities. In addition to the obsolete equipment and crowded conditions the present engineering buildings are so widely scattered over the campus that students are frequently prohibited from taking desired courses because they cannot change classes in the allotted ten minutes. If Wisconsin is to maintain an engineering college among those ranking at the top, means must be found for rectifying these conditions.




These Engineering College plans of 1928 now abandoned for one large unit.

Bill No. 555, A, introduced March 19 in the Assembly of the State of Wisconsin Legislature by the joint committee on finance, is the first step toward this rectification. Quoting from this bill: "On July 1, 1941, $1,975,000 as a nonlapsible appropriation for fireproofing stairways and corridors in Bascom hall, for the construction and equipment of a dairy industry building, for the construction and equipment of a short course building, for the construction and equipment of the engineering buildings, for equipment, safety devices, and utilities and for moving equipment and remodeling buildings, and for expanding the facilities of the home economics and extension departments."

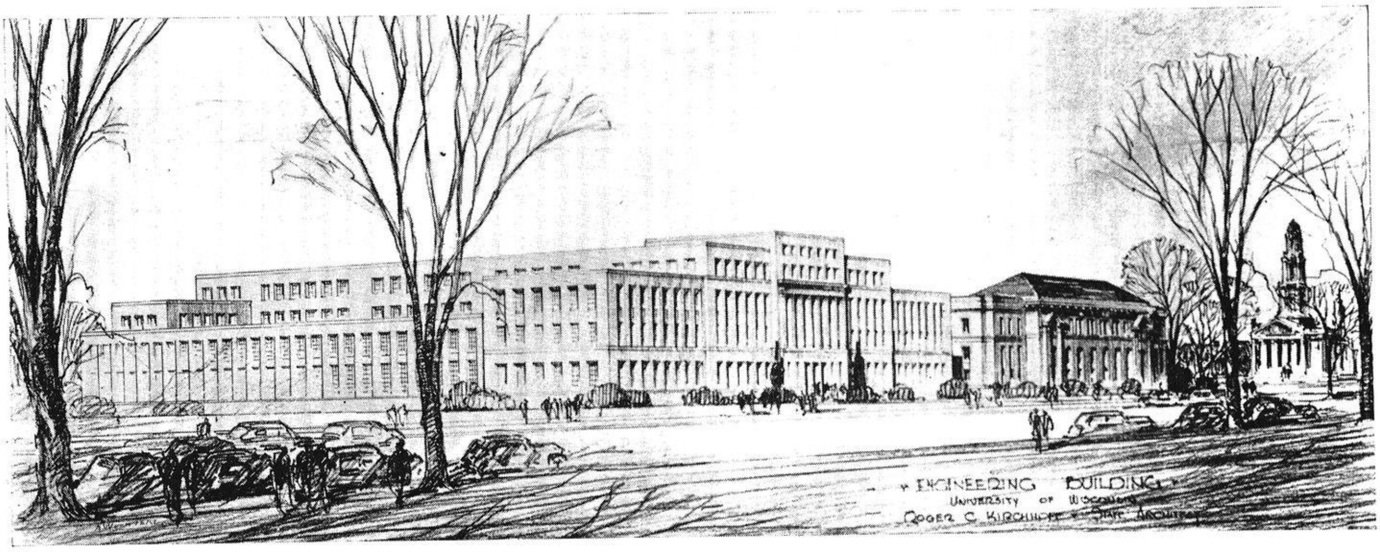
The assembly committee on education has approved this bill with relevant amendments. On the last day of April a hearing was held by the joint finance committee. Unprecedented action was taken at this meeting by Governor Heil, when he appeared before the committee to appeal for the legislative appropriation, not as governor of the state but as a taxpayer and citizen. Governor Heil has recognized the needs of the state educational institutions and is lending all his support to this project.

Although Dean F. Ellis Johnson and President Dykstra were present at the hearing, the board of regents have taken the responsibility of presenting the university needs to the legislature. One of the board devoted his entire presentation to the engineering school. No action has, as yet, been taken by the legislature as a body, but most observers seem optimistic about the outcome of this bill. President Dykstra says, "The Engineering College has long been in need of a new building, and now with Governor Heil's support I really believe it is on the way."

The bill before the legislature provides only for the appropriation. This is all that at present is in a completed, concrete form. Any details which may have been published to date must be entirely tentative. The departments of the engineering school have turned in estimates of the number of square feet of floor space necessary for the needs of each. From these sketches have been made, but they will not shape into reality unless the bill is passed.

As the consideration of a university rebuilding program took shape the problem arose of where these buildings should be located. This problem has been taken over by a group of men on the third floor of the state office building, the state planning board. This board is at present working on a systematic planning of the future university building layout with the idea of centralizing the colleges as much as possible. As yet their work is not ready for publication, but regardless of what form the present rebuilding project takes, the Engineering College will in the future develop in the region of the Mechanical Engineering building. This will provide not only for localization of the engineering school, but will also be within a reasonable distance from such science buildings as chemistry and Sterling hall.

At one time the regents of the university made a tentative sketch of the engineering campus providing the portion of Camp Randall north of Dayton street for new engineering buildings. The athletic department has expanded northward until they now utilize the land to Johnson street so if engineering buildings were located on this ground it would force them to find land elsewhere. The planning board has therefore confined their proposals for the Engineering College expansion to the area bordering University avenue.




*Sketch of Proposed New Engineering Building*

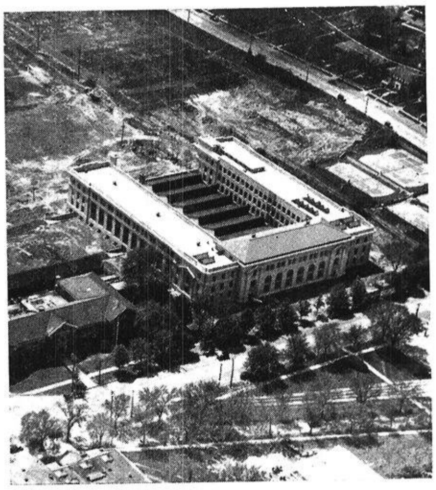
Of the $1,975,000 suggested appropriation somewhat over a million dollars are allotted to the engineering school, the largest portion of which is to be used for the building. There may be individual buildings constructed for the different engineering schools, such as chemical, electrical, civil, etc., but the most logical consideration to date seems to be one large building which will house all these departments. Roger Kirchhoff, state architect, has made a sketch of the proposed building as it will appear if it is placed where the Mining and Metallurgy building now stands. To erect a building of this size in the space west of the present Mechanical Engineering building would involve a topographical problem which would put the first floor so low in the ground that all it could be used for would be storage. Proposals have been made for tearing down the Mining and Metallurgy building or pouring a concrete slab under it and moving it to a new location, thus making this spot available for the new structure.

The new building will have to be larger than the Mechanical Engineering building and will have harmonizing architecture. During the past year Mr. Kirchhoff has visited similar buildings around the country, such as the famed new technical school at Northwestern University. From these he has obtained ideas on how this building should be constructed. Since this is being built to provide space and convenient facilities for the most efficient instruction of the engineering students and for research, the interior will be very plain, probably with very little plastering. A maximum of light, artificial as well as daylight, will be provided for the rooms. Mr. Kirchhoff says, "This building must be so constructed that if a steam main and low voltage power are desired on the fourth floor they can be made available in a half day, and six months later if they are not needed they may be removed with a minimum of work."

If less than the budgeted allotment is appropriated, quality will not be sacrificed in the building that is constructed. The structural work will be of steel and concrete, which for the durability expected of an engineering building, must be of the best quality. The outside will be of brickwork or some kind of blocking. If money is appropriated, difficulty may be encountered at present in obtaining materials such as steel, due to government priority orders. The actual construction of the building will take at least a year.

The tentative plans for this proposed building include total floor space enough for all departments, but definite space has not been designated. When the building materializes into something more than a bill in the legislature, these details will be worked out for maximum utilization of all facilities.

New equipment is necessary if the university is to carry out its threefold obligations to the state. Motor-generator units will be necessary for a power plant for the new building, and consideration has been given to the possibility of supplying the Mechanical Engineering building from the same plant.



The bill provides for moving equipment and for remodeling buildings. Present plans are for transferring the extension department to what is now the Chemical Engineering building, thus making the entire Home Economics building available for home economics. Vacating the old electrical laboratory will make this building available to the College of Letters and Science and the School of Education.

The assumption cannot be made that these new buildings will become an actuality, but the engineering school has reason to be more optimistic with regard to new facilities than they have in many years. The passage of this bill will be the first step out of the stalemate in which the state building program has lain since the depression.

*Adventure on the Dark Continent*

# DIAMOND HUNTING IN AFRICA

*by Winfred C. Lefevre, c'34*

Psst, me-o-ow, r-r-r-r, hist, crash, clackety, bang!!!!! What in Hades was going on? Don't think for a minute that I didn't wake up in a split second and grab for the flashlight that was under my pillow. It was the only weapon besides my hunting knife that I had in my little tent in northeastern Angola. My light went on and flashed out into the clearing, while I scratched around for my knife which was still attached to the belt of my shorts thrown carelessly over a camp chair. Suddenly the beam of light fell on two struggling animals and mirrored two pairs of vicious green eyes. The fighting ceased. One pair of eyes slipped silently away into the jungle. The owner of the other pair backed snarling and spitting into the tent, jumped up onto my bed and crouched down between my legs. I saw that it was Tom, my neighbor's cat, who had dropped in for supper earlier in the evening and met with a lively adversary on his return home. What a licking that wild cat would have handed him had I not so rudely interrupted by throwing both into the limelight!

I tucked my mosquito net under the mattress again, heaved a tired sigh, and was about to settle down to pleasant dreams when close beside my cot I heard a rattle. Jerking bolt upright, I glared into the darkness and saw Maugans, my native sentry, picking up my washstand, basin, and soap tray which had been upset in the rumpus. He blithely informed me that a bush cat, out looking for his midnight snack, had just paid us a visit, and that it was all his fault since he had fallen asleep and not kept up the fire. So I roundly cussed him out in English for scaring the living daylights out of me and told him to get back to his two wives and the camp fire. . . . Such was my introduction to camp life in tropical Africa.

Life in a tent was far from being comfortable with the sun beating directly down at noon and the sudden tropical downpours flooding you out in spite of storm trenches dug around the tent. Camping was OK but it seemed far from being a romantic adventure when a fellow saw his last pair of dry shoes float out from underneath the cot.

My work in connection with the construction of new mines was extremely interesting and more than made up for the discomforts caused by the heat, rains, long hours, and the loneliness. The forty hour week is only a pleasant day dream which will probably never come true for the Portuguese colonials. An eleven hour day for six days and a half day on Sundays was considered a good week's work regardless of the heat. For my part, I put in a long day surveying but being on my own and my own boss, I could arrange my day to suit the weather and the sun. After 11:00 A. M. the heat waves became so bad that I had to drop triangulation work requiring high precision and do some "topog" or cross sectioning for the remainder of the day. Rainy days found me reducing notes, mapping, or computing in my tent with my native boys smoking the world's foulest-smelling tobacco in the sentry's grass hut nearby. The main topics of the day were women, wages and white men. They were usually broke and wanting to tap me for a loan to buy a hat or a shirt or a pair of shoes. Payday meant a big splurge buying clothes to ape the white man's dress, and every day thereafter was a matter of borrowing to tide them over 'til the next payday.


On my return here everyone asked me questions as these: How do you mine diamonds? Do you pick them up off the ground? Where did they come from? How are they deposited? etc., etc., etc.

The origin of diamonds in Angola is probably the same as that of the South African fields; that is, they were extruded from pipes similar to those at Kimberly. Then these extrusions were carried and washed by the great rivers of the geological ages which transported tremendous quantities of materials during times of flood.

Those rivers flowed in courses quite different from the present African river system. Today the rivers and small streams have cut across the deposits of the former rivers and have redeposited that material in their valley bottoms. It is there that one finds the diamond as well as up on the terraces and valley walls.

Since the diamond in this area is usually found in beds of gravel just under the surface, open cut methods of mining are used. Native laborers shovel back the overburden where the depth is not excessive. Mechanical shovels open deep cuts and on hill sides where the overburden sometimes increases to great depths it is usually sluiced off into the exploited valleys. Depths up to 75 feet have been economically sluiced.

After the removal of overburden, track is laid through the cuts and the gravel is shovelled into mine cars which are hooked onto a wire cable and hauled to the treatment plant. At the treatment plant the seemingly hopeless task of finding "the needle in the haystack" begins. Gravel containing but one-third of a carat per cubic meter will pay costs of operation.

The mine cars are dumped into feeders which regulate the flow of material to the mills. Conveyor belts carry the gravel to the top of the plant where it is washed and sized in a large screening trommel. The minus 1 inch goes to the pans where rotating silicon steel knives cause a crowding action which could be called a slow centrifuge as the heavy concentrate consisting of iron ore, diamonds, heavy quartz, etc., is tapped out of the pan and the light materials called tailings are pushed and washed over a weir at the center. The tailings enter a second pan to be retreated. This treatment process is 98½% efficient and the concentration is about 100 to 1; that is, for every 100 cubic meters of charged material there remains but one cubic meter of concentrate.

The pan concentrate flows to a classifying trommel which separates it into four sizes: the minus one millimeter which goes to waste after passing through a hydraulic classifier to prevent losses, a minus 2½ millimeter, a minus 5 millimeter, and the minus one inch. This breakdown of the pan concentrate is necessary to permit jigging. The jig concentrate is about 10 to 1 and in that there is little trouble in finding the sparkling diamond, for now there is an overall concentration of 1000 to 1 and the haystack has been diminished to a mere forkful.

The jig concentrates are handled and sealed by only one man, the mine operator, and he is held responsible for those concentrates until they are shipped into the central picking station. At the picking station the concentrates are reclassified and then pass over inclined grease tables. The virgin diamond has a great affinity for grease or oil and adheres to the glassy smooth surface of the shining black grease. The attendant skims off the diamond with a spatula and scrapes it into a small tin. When filled with all the similar sized stones from one mine, this tin is immersed in boiling hot water. The grease melts and floats off, leaving only the diamonds. These after drying are washed with acid and classified in a small hand shaker. The diamonds are then ready for weighing and storing away in the vault.

The remarkable feature of the whole treatment process is the fact that not a single human hand touches the gem from the time it leaves the pit until it is ready to be weighed. There is an unwritten rule in the company that an employee is never to touch a stone. Losses of diamonds by theft are remarkably low.

Nothing but diamonds and tailings slime leave the picking station. The tailings are ground to powder by a large ball mill. Any diamonds which might have been lost in the tailings are screened out at the ball mill discharge, for due to their hardness they remain unharmed.

The treatment process outlined in the foregoing paragraphs is in detail a bit more complex as different types of gravel present many problems. However, I would not advise any young graduate engineers to tackle those or any other foreign problems until the international situation has cleared up. But after World War II has blown itself to bits, the world will look to the United States for leadership, and it will be up to us young Americans to give it in all fields and professions.

• **WINFRED CORNELIUS LEFEVRE** graduated in civil engineering from the University of Wisconsin in June, 1934, and after a year of grad work in math and engineering accepted a Professorship in Mathematics in Brussels, Belgium . . . taught a year and then accepted a position as Civil Engineer with the Companhia de Diamantes de Angola Diamang-Dundo, Angola Portuguese West Africa . . . among his numerous duties were surveying, construction, and maintenance of roads, water supply, and power facilities, operation and supervision of diamond mine and plant structures . . . he was one of 165 white men in charge of 10,000 native workers . . . married and has a son, John, 19 months . . . returned to the States in February, 1941, and intends to stay here . . . speaks and reads French and Portuguese . . . present address is Kankakee, Illinois . . .

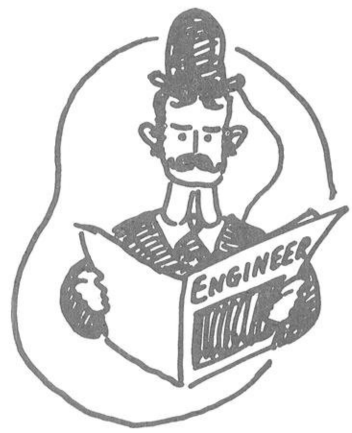
*Let's Talk Man to Man . . .*

# The New Subscription Plan

*By L. F. Van Hagan, Professor of Railroad Engineering, c'04*

THE REGENTS of the university will soon be asked to approve a plan whereby each engineering student will pay a fee which will be allocated to the support of the WISCONSIN ENGINEER. The backers of this plan feel that it is desirable to approach the regents knowing that they have the support of both the engineering faculty and student body. The faculty has already gone on record as favoring the plan. The next step is to hold a referendum of the engineering student body. This will be done as promptly as possible so that the plan, if approved, may be put into effect next fall. The purpose of this article is to explain the situation to those who will be called upon to express their opinions in the referendum.

The WISCONSIN ENGINEER, one of the oldest student activities on this campus and dating back to 1896, has been published under the same name and without interruption until the present time. This is a record matched by few of the student engineering magazines of the country and one which should not be tossed aside without better reasons than exist at this crisis. The magazine is an asset to the college.



Since 1896

Known from Coast to Coast

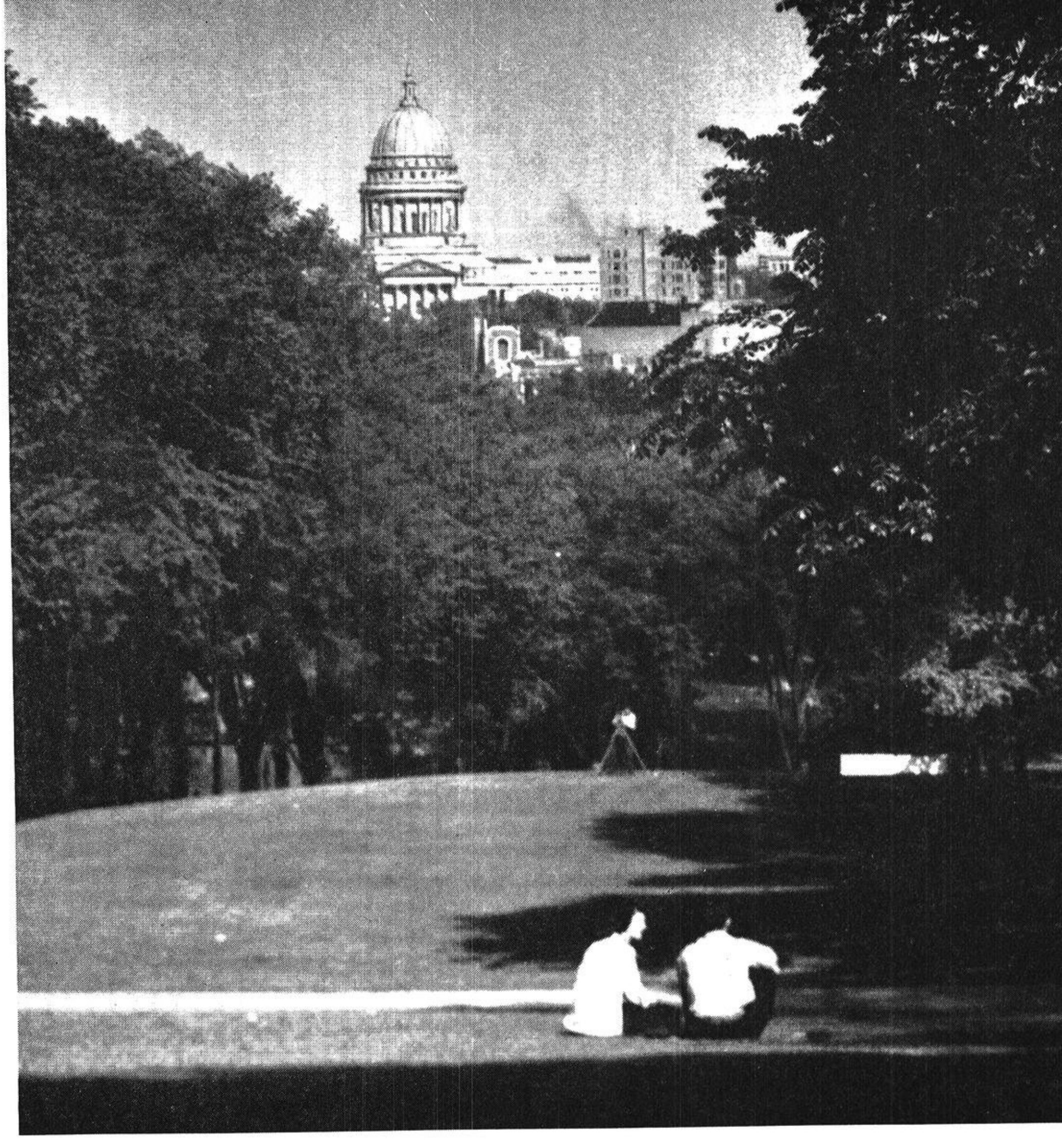
The fact that our engineering students publish a monthly magazine indicates that they have that abundance of energy and vitality that is at a premium in mundane affairs. So long as the engineering students of Wisconsin give evidence of having force and ability, the college will be healthy and vigorous — an attractive place in which to study and work. To abandon the publication of this magazine would be a step in the wrong direction. The opinion of the faculty and of the leaders among the student body is definite on this point.

"Do well whatever you undertake" is a motto which engineers are trained to respect, and one which the faculty and students of this college cannot ignore in considering plans for the future of the WISCONSIN ENGINEER. The magazine must be respected by all who are in a position to compare it with other student publications in its class. Being a member of ENGINEERING COLLEGE MAGAZINES, ASSOCIATED, a national organization composed of the country's leading student engineering magazines, our publication meets keen competition in securing advertising contracts through this medium. We want to continue to be represented in this group of top-notch magazines; to do so, our publication must receive fee-subscription support similar to competing magazines. Nothing else will satisfy Wisconsin ambitions.

A good magazine cannot be published with inadequate funds. Before the depression, the WISCONSIN ENGINEER had a budget of $4,000, all of which went into the magazine. Student subscriptions ran well over 50 per cent on a voluntary basis; faculty subscriptions were close to 100 per cent; and alumni subscribers outnumbered student subscribers. The strong subscription support made the magazine attractive to both local and national advertisers. That is the status we desire to win back.

The persons directly responsible for the publication of the WISCONSIN ENGINEER receive no remuneration of any kind for their services. From the time classes begin in September until they end in June, the staff members carry a load of responsibility. Every student has a real stake in this magazine, for it is contributing to the reputation of the college—a reputation to which most of them will owe their first jobs. Therefore, the staff members deserve the generous support of the entire college.

It is conceivable that a student may be opposed to the fee plan. Each man is entitled to his opinion. It is the sincere hope of the friends of this magazine, however, that no man will vote unfavorably on the plan. Failure of the plan to carry will mean that the WISCONSIN ENGINEER must continue to operate under conditions that make the publication of an adequate magazine difficult to the point of impossibility. A good magazine that has the cordial support of the student body will be an asset to the college. A poor magazine that lacks student support can scarcely find justification for being.



# TODAY'S TURMOIL

MODERN science has contributed inestimably to the happiness and convenience of men but it has also brought some amazing new problems, among which not the least are those that result from the impact of world events upon the individual. At times we are fascinated, spellbound by the news that streams in upon us over the radio; again we are made to feel helpless, small and confused. At the same time that we are surfeited with horror and thereby tend to lose our sense of compassion, we listen to billion dollar budgets and lose our sense of proportion in the small affairs of our everyday lives. With all the news of the present world crisis, it is time for the individual man to turn with a firm determination and resurvey his own responsibilities and the opportunities they offer him to make his own contribution to solving the world's ills. Happily, in a college of engineering both faculty and students may be stimulated by a sense of the importance of the things they can do. The growing insistence of both industry and the federal services for more and more trained engineers verifies the authoritative estimates that the need for such men is quadruple the supply. At least one Canadian college of engineering has found it advisable to graduate its June class in March, and an important college in the United States is now advertising the possibility of completing its four years training in three years by continuous attendance. Such pressure should give us both pause and poise.

We should all cooperate to maintain our standards of instruction; we should not gain speed of learning by sacrifice of essential material or drill but rather by most careful revision and improvements of methods. Great as the current emergency is, we must at all times remember that we are preparing for the long constructive years of peace as well. This means, of course, that we must not cater to immediate demands for specialists in narrow fields at the expense of that fundamental training which will guarantee the usefulness, possible accomplishments, and happiness of the student in the future. The exigencies of the times, while tending to motivate students to get results, should also because of the very character of the world's emergency cause us to be more interested than ever in how we get results. Both instructors and students should feel the challenge to all that is best within them. If our fight is to preserve the ideals of democracy and freedom we should make sure that within the sphere of our personal influence democracy be practiced and freedom be put to noblest uses. In simple words, this means that as at the close of one year we organize for the next we should do so with care and resolution.

The activities of our engineering societies and our Wisconsin Engineer should reflect by their character and dignity the acknowledged importance of the engineering profession these days. Next year every student should feel his responsibility to contribute some of his time and interest to make them successful.

Personally, Nazism challenges the individual. A proper response can be emphasis upon the refinement of the individual. Therefore as civilian engineers let us permit no military smartness of uniform to exceed the smartness of our personal appearance. Let no military salute rival the gentle thoughtfulness of real courtesy. And, in essence, let us learn to prove effectively that no efficiency can approach the efficiency of free men working one for all and all for one.

F. Ellis Johnson

# FREQUENCY MODULATION

*by Robert F. Holtz, e'40*

**Fellow in Electrical Engineering**

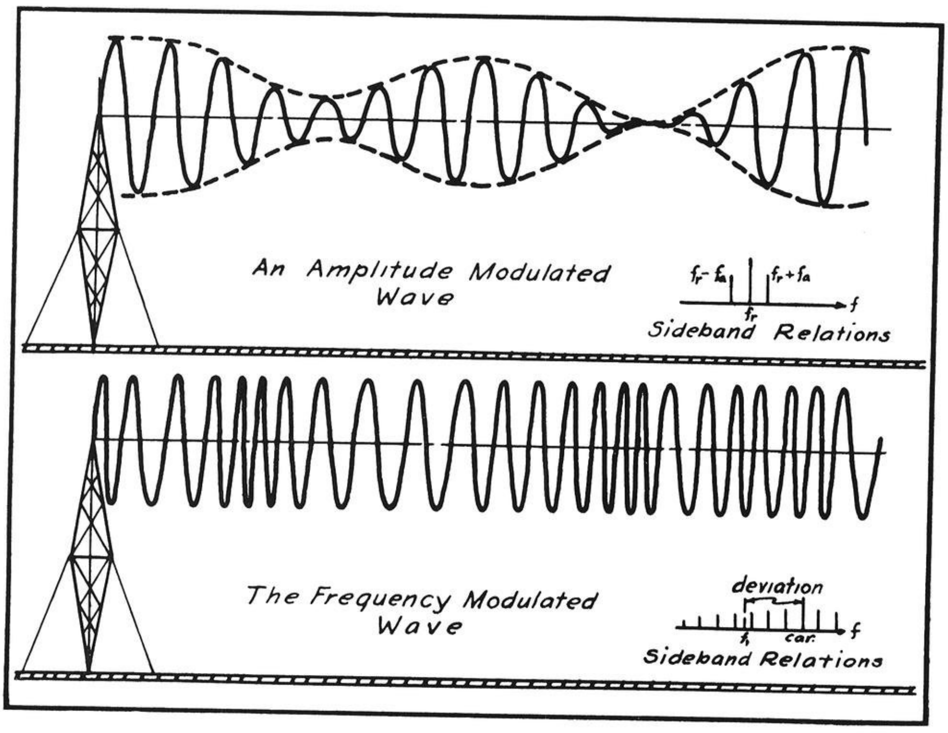
THE RADIO broadcasting industry is in the midst of a period of technical modernization involving changes as revolutionary as the changes in Henry Ford's automobile when he first introduced the V8 engine in 1932. It is not happening so rapidly that your radio will become obsolete overnight, but the next time you invest in a good broadcast receiver for your home you will want to consider whether this new principle in broadcasting, this frequency modulation as it is called, should be investigated.

In order to do this with any degree of intelligence you must know at least the What, the How, the Why, the When, and the Where of this recently applied development. Radio has been running along in a satisfactory manner for the last fifteen years, but it is only satisfactory because nothing better has been introduced. Let this article, in terms as strong as the printed word can convey, introduce you to a new kind of broadcasting; a static-free, high fidelity, technically simpler kind of broadcasting.

WHAT is frequency modulation? It is a radically different method of introducing intelligence into a radio signal. At present, with the so-called amplitude modulation, the strength of the radio signal is varied according to the strength of the intelligence to be transmitted and at a rate equal to the frequency of the intelligence to be transmitted. In frequency modulation the strength of the radio signal is kept constant, and its frequency is varied back and forth about some mean frequency. The amount by which the frequency of the radio signal shifts depends upon the strength of the transmitted intelligence, and the number of times the frequency swings back and forth per second depends upon the frequency of the transmitted intelligence.

At first glance it may seem a little complicated, but it is as simple as this: a radio wave has two qualities which we associate with it; it has amplitude or strength, and it has frequency or rate of change of amplitude with respect to time. Now where in the past the intelligence has been introduced into the radio wave by varying its amplitude, in the new system the intelligence is introduced into the radio wave by varying its frequency. Hence the name: frequency modulation.

Consider a concrete example: at the present time the University's station WHA operates on an assigned frequency of 970 kilocycles which is kept fixed at this value within very narrow limits. WHA has a power output of 5000 watts, but when someone speaks into the studio microphone the power increases by an amount depending upon the strength of the speaker's voice. The power may increase to as much as four times the normal value and then decrease to zero and back to normal. The power or strength of the signal will vary this way at a rate depending upon the frequency of the sound which is spoken into the microphone. If a pure tone of 400 cycles per second is whistled into the microphone, then the station's power will increase above normal, drop an equal amount below normal, and return to the normal value; and will be repeated 400 times per second. Consider now what would happen if WHA were a frequency modulated station. The frequency would be assigned as before at say 970 kilocycles but it would not remain fixed at this value. The power output would again be assigned at say 5000 watts, and this would not vary at all. If a pure tone of 400 cycles per second is whistled into the microphone as before, the power would remain at 5000 watts; but the frequency would change from 970 kilocycles to some value above this, back to 970, down an equal amount below this, and back to 970. This would be repeated 400 times per second. If the whistling was twice as loud the frequency would swing twice as far above and below the assigned value of



*Courtesy General Electric Co.*

**Receiving an FM transmission through electrical interference**

970 kilocycles. So much for what frequency modulation is.

HOW is frequency modulation produced and received? Actually the transmitter for frequency modulation consists of less costly and less complicated equipment than is used in an amplitude modulation transmitter of the same power. For a simple but not very satisfactory scheme, connect a condenser microphone across the tuned circuit in the transmitter's oscillator. Then, as the microphone is spoken into its capacity changes, and when the capacity in the tuned circuit of an oscillator varies its frequency varies. A refined extension of this system is employed in one of the common practical methods of producing frequency modulation. Instead of connecting the microphone across the oscillator's tuned circuit a vacuum tube is connected across it. The tube is so operated that it acts like a condenser, and if the microphone is connected to the tube it will vary the amount of capacity which the tube puts across the tuned circuit. The amount that the capacity varies depends upon how loudly the microphone is spoken into.

Another common method commercially employed to produce frequency modulation is due to Major Edward Armstrong, and it makes use of a different principle. In his transmitter a part of the output of the oscillator is amplitude modulated and then recombined with the rest of the output to produce a type of frequency modulation. As far as a receiver is concerned, it is exactly the same sort of wave, but it is produced differently.

To receive a frequency modulated signal with any degree of satisfaction a special receiver is needed though an ordinary receiver will give some results. The new receiver will have just one major change: just before the second detector there will be inserted what is commonly called a discriminator, a device which converts frequency changes into amplitude changes. Several other minor changes must also be incorporated in the receiver for best results. The bandwidth of the intermediate amplifier stages must be much wider, actually about 150 kilocycles wide; the quality of the audio system must be better, extending from 50 to 15000 cycles; and one of the intermediate frequency amplifier stages must operate in a saturated state in order to effectively eliminate noise components picked up by the receiver.

WHY was frequency modulation introduced? This may be summed up very briefly by stating that a frequency modulation system of transmitting intelligence has noise discriminating characteristics not found in the present system of broadcasting. As a matter of fact before this characteristic was recognized, as it was by Armstrong in the early 1930's, this method of broadcasting was investigated and analyzed by various men in the field and was condemned as having "definite disadvantages with no compensating advantages whatever." It is true the system has some disadvantages, the most serious of which is the fact that a frequency modulated signal occupies a much larger part of the already crowded frequency spectrum than an amplitude modulated signal. However, the advantages more than compensate for disadvantages.

Furthermore, provisions were made to multiplex two forms of intelligence on the same radio wave. For example, it will be possible to transmit pictures and printed matter along with the regular sound channel, using but a single transmitter to do so. Along with its remarkable noise discriminating characteristics, frequency modulation may be credited with being able to eliminate almost completely objectionable interference from other stations on the same or nearby channels.

WHEN the principles of frequency modulation were first introduced, there was no indication of what the future held in store for them. The initial application came in the old time Poulsen arc generators which were used to send code signals across the Atlantic in radio's early days. The advent of the vacuum tube brought the Poulsen arc to an abrupt end, and so ended this first application of frequency modulation.

The literature records no further practical application of frequency modulation until the early 1930's when Major Edward Armstrong began his work applying frequency modulation to radio broadcasting. He recognized what

(continued on page 27)

# SALESMANSHIP FOR ENGINEERS

*by L. E. Falk, Salesman-Engineer*

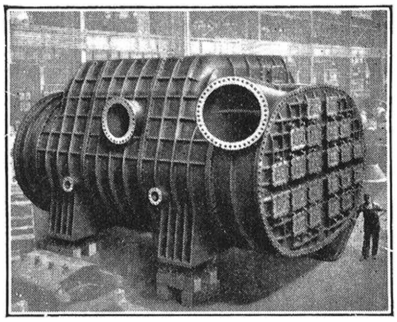
WE ALL have to try our hand at selling whether we are salesmen or not. We have to sell somebody on the idea of giving us a chance at some job. We have probably sold some girl on the idea of going to a dance or social affair. So, as we go through life, we have to do a certain amount of selling.

If you are studying engineering and expect to graduate this year, you will have to sell somebody on giving you a job. On the job, you will have to sell somebody on your ideas and way of doing things. We can make our work easier and progress faster if we will take some time to study some of the facts about selling.

Salesmanship, like engineering, is a science because it requires the organization of facts, ideas, and other information into a systematic plan so that it can be presented in an interesting manner to the prospect. However, unlike engineering, it is not an exact science, because you are dealing with the human element with all its variations. You may be the best salesman in the world and have a chance to work on the most likely prospect in the world, and still you cannot tell in advance how much of a sale you will "ring up" or whether, indeed, any sale at all will reward you for your efforts. Although salesmanship is not an exact science, there is no reason why you cannot borrow the methods of science to increase your sales ability. Modern sales methods show that you can develop a formula that will give you better results than a "hit-and-miss" method, but this formula will **never click every time** because we are dealing with human nature, and we talk to a different type every time. If a scientific, well-planned approach helps you to put across a particular type of sale seven times out of ten instead of three times out of ten with the "hit-and-miss" plan, isn't it just good sense to use the scientific method?

If an engineer were put behind the counter in an appliance store with the assignment to sell particular appliances, and if he were a good engineer and used his early training, I believe he would go about it like this:
this:

1. He would first gather all the information he could about the appliance; he would find out how it works; what it is supposed to do; what the advantages and benefits are to the buyer; how it compares with other appliances in the same competing class. In other words, he would **know his merchandise.**
2. He would work out a sales talk covering these important points:
   - a. Tactful Approach.
     - (1) Advanced information regarding the prospective purchaser
     - (2) "Use the User" or sell satisfied customers additional equipment
     - (3) "Over-the-Counter" Selling — spectacular demonstration and tactful mention of additional items



It takes an engineer to sell engineering equipment

   - b. An Intelligent Presentation
     - (1) The Need (you may have to sell the customer the idea that he needs your product)
     - (2) The Thing to fill the need (**your** product does the job)
     - (3) The Source (your store or your company is the place to buy)
     - (4) The Price (the customer must agree the price is satisfactory)
     - (5) The Time (**now** is the time to buy it)
   - c. Direct Effort to Close
     - (1) Double Question Method (do you want the large size or the small size?)
     - (2) Summary Method (summarize the strong selling points of your product and ask for the order)

As this engineer-salesman becomes more experienced, he will learn some of the elements of showmanship to get attention and to prove his points. The longer he works on selling and tries the various methods, the more he will realize the importance of using the right words—especially in the approach. Elmer Wheeler, founder of the Tested Selling Institute and author of "Tested Selling Sentences," says that the first ten words are worth more than the next 10,000, and he has demonstrated many times over the magic that lies in the right words at the right time. Just what the right words are, you will have to find out for yourself by making a systematic and patient effort to uncover them. When you find the right words that click with you, you can use them in many presentations with little variation.

Salesmanship is not confined only to the selling of a product or of a service. Its scope is much broader as it enters every phase of life. Examples of men who achieved success by applying the principles of salesmanship are Walter Chrysler, Henry Ford, Charles Schwab, C. E. Wilson, president of General Electric Co., Fred Zimmerman, secretary of state of the state of Wisconsin, and many others. These learned the art of presenting their product or proposition in a simple, forceful, and interesting manner. An engineer is required constantly to explain his plans to others, and a knowledge of salesmanship will certainly be of inestimable value to him.

# City of Midland '41

## *New Two Million Dollar Super Carferry*

*by Al Loeffler, me'43*

REPRESENTATIVE of the most up-to-the-minute marine engineering and the very latest improvements in nautical design, the new two million dollar "City of Midland" is acclaimed to be the most modern carferry on the Great Lakes. Steaming as flagship of the Pere Marquette Railway Company's carferry fleet, she will extend freight, auto, and passenger service across one of the busiest traffic lanes in the country—Lake Michigan.

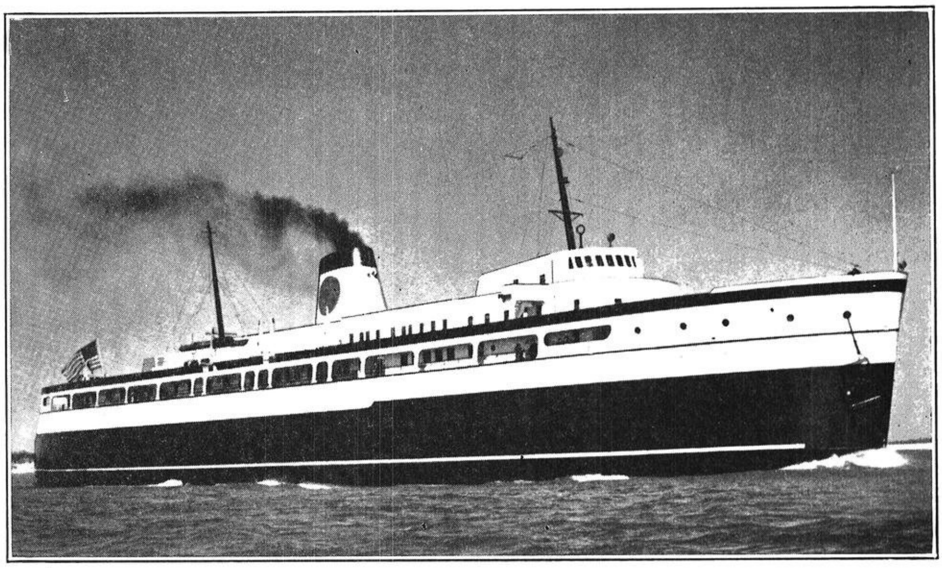
Built in Wisconsin by the Manitowoc Shipbuilding Company, the "City of Midland" slid broadside down the greased launching ways last September 18, just six months after her keel had been laid. She left Manitowoc on her maiden voyage March 12, and will be later assigned to the Manitowoc to Ludington, Michigan, route, destined to travel 100,000 miles a year.

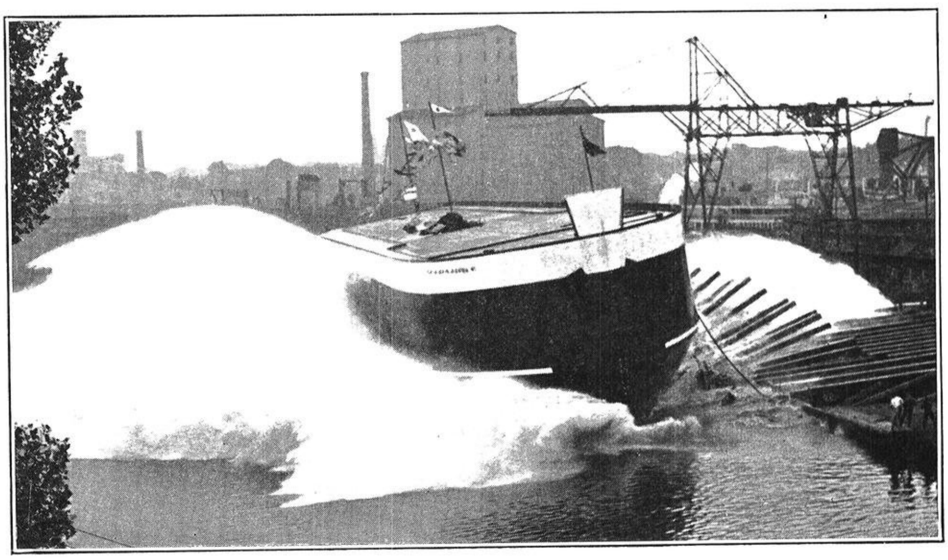
The distinctive feature of all carferries similar to the "City of Midland" is the manner of carrying their cargo—not crated freight—but regular rolling stock of any standard gauge railroad. When being loaded, the ferry's stern "apron" is locked onto a ship-to-shore, counterbalanced "slip." Railroad cars are then rolled onto the boat through the vessel's open stern, and distributed over the four tracks mounted on an enclosed deck extending over the entire horizontal section of the ship. The "City of Midland" can carry 34 loaded cars, as well as accommodate 375 passengers and 50 tourists' automobiles carried on a separate auto deck. Incidentally, the Manitowoc-Ludington crossing spans the gap in U. S. highway 10 across Lake Michigan.

One special feature used in the construction of the 406 foot hull is the reinforced double bottom built extra rugged to enable the "City of Midland" to smash her way through ice for year round traffic. The bow is plated with one and one-quarter inch steel with ribs of extremely heavy section spaced 18 inches between centers. The remainder of the hull is covered with five-eighths inch plate, ribs 24 inches between centers. Besides that, the hull is subdivided into 10 watertight compartments, an entirely new practice in carferry construction. Approximately 6,000,000 pounds of steel, 700,000 rivets, 25 miles of electric wire, 450 light fixtures, about two miles of piping, and 6,800 feet of rail all helped to create this lake giant of 3,969 gross tons and a displacement of 8,200 tons.

Buried beneath rows of loaded freight cars lies the powerful heart of this year-round servant—the twin screw main engines built by the Skinner Engine Company of Erie, Pennsylvania. Designed to operate on 325 pounds

(continued on page 28)





**Above: Streamline design, accentuated by white side-striping adds sleekness to the "City of Midland." Right: A perfect broadside launching.**

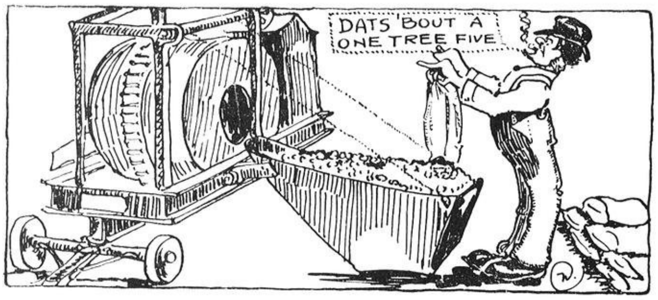
*Cuts Courtesy "Keel Block"*

# RETROSPECTIVE SCENES F

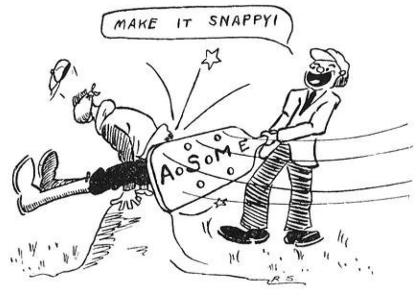

*Orientation week . . . green . . . timid freshmen . . . how sweet and innocent we were . . .*

*Chem 1a . . . and Kahlenberg . . . he will live forever with us . . . woe to the man who fell asleep in lecture . . .*

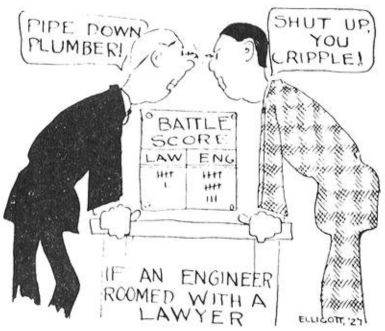

*Stick . . . stuck . . . . and all the j was five feet off . . . and no*




*Mechanics under Wendt and Co. . . . that's what I liked about the course . . . it was so concrete . . .*

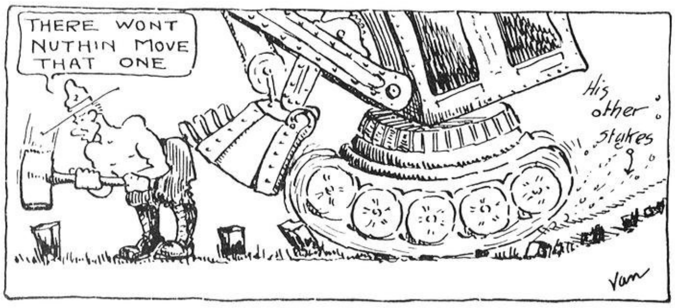



*Fraternity initiations . . . hell week left a hell of a weak week left a hell of a week end . . . we groaned but we loved it . . .*




*The St. Pat parade of '38 . . . ala omelette and pickled fruit . . . those were the days . . .*

*. . . and then the highly successful Expos under Albers and Erickson . . . we even forgot about school those weekends . . . how we worked . . . and how we beamed . . .*




*Liz Waters r e a r s its shapely forms . . . and so the plane table farm had to go . . . but many engineers still do their s u r v e y i n g around there . . .*

## *and in closing, may I say . . . ju*

*"I had no shoes and I whimpered,*
*Until I saw a man who had no feet."*

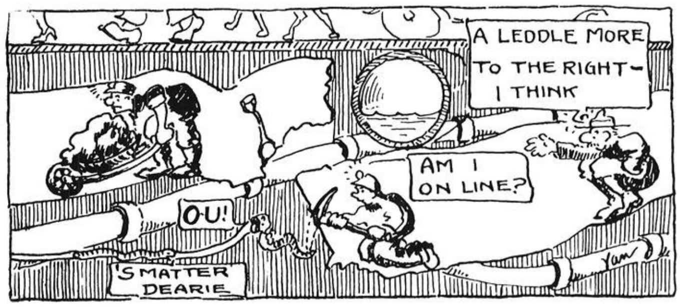
I don't know who wrote the above quotation but to me it has always been a source of spiritual inspiration, especially at times when it seemed as if the whole world had united for the sole purpose of tormenting me . . . but it does seem strange that some of us who moan and gripe and rant all the time over such insignificant things never stop to realize that in spite of temporary setbacks, in spite of our present failures and disappointments, at least we have two hands that can work . . . and two feet that can walk . . . and two eyes that can see . . . and a mind that can think . . . and with these faculties at our command . . . how fortunate we really are . . .

this is the last column I shall write as an undergrad and I want to say a great many things . . . I want this page to stir up memories for the seniors . . . expectations for the younger men . . . and a deep sense of humility in all of us . . . I want to express my appreciation to those individuals who bore the brunt of our inane jests . . . those students and

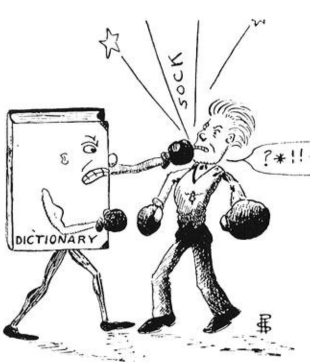
# OM A SENTIMENTAL SENIOR

you see me now
surveying . . . I
first level line
at me . . .

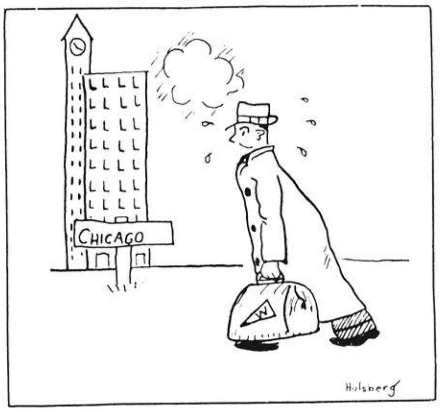
*Studying blissfully on the shores of Mendota . . . or six serene weeks at Devils Lake . . .*




*The miners invade Shullsberg . . . ah . . . those lucky high school girls . . .*




*Wrestling with Seminar . . . we were always tossed for a loss . . .*




*Junior and Senior trips . . . Chicago and all points under . . . the table . . . many an engineer was dimmed by the b r i g h t lights of State Street . . .*

## bit of homely philosophy . . .

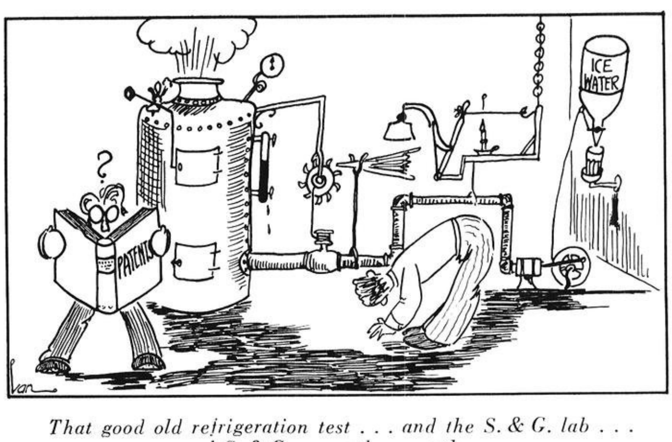
aculty members alike who smiled and
ook it all with a grain of salt . . . you've
maintained my faith in human nature . . .

when I was a member of the Junior
Optimist in Milwaukee 'way back when,
e recited a creed which ended thus:
66 muscles are required to produce a
rown; only 16 to smile, so wear a smile
nd save the difference" . . . when I
ook over the page last year, I expressed
he hope that I might be able to develop
he human side of our engineering edu-
ation . . . to bring to light the more
umorous aspects of our academic exist-
nce . . . I wanted you to smile . . . well,
nce in a while . . . just so you don't
orget that there still are things on this
arth worth smiling at . . . you know to
mile is the easiest thing in the world . . .
nd sometimes it means so much . . . to
ll of us . . .

and so, I hope you've enjoyed and
benefited by reading our conglomera-
ion of "cartoons, used humor, and flag-
ant distortion of the King's English" . . .
nd now good bye and the best of luck
to all . . . —*Nathan Itzkowitz*


*. . . and when in '39, the Engineering school moved out to the Sticks . . . oh how the Langdonites griped . . .*

*Contracts and Specs . . . and a bit of human engineering . . . and a grand old man . . . D a n i e l W. Mead . . .*


*That good old refrigeration test . . . and the S. & G. lab . . . and S. & G. . . . ugh . . . ugh . . .*

*Prof Cottingham, Red Wagner, and R. R. Benedict are blessed . . .*

# MACHINED SURFACES

*by Bob Short, met'42*

ONE of the odd abilities of man which has been an important factor in the development of our civilization has been his ability to make use of things without a complete understanding of how these things work. So it has been with the cutting of metal. During the past hundred years or so, man has learned the use of cutting tools without knowing exactly how they work. Much has been learned about cutting speeds and rates of feed, but in order to meet the demands of production for a finer quality of finish, it has become necessary to become better acquainted with what actually happens during cutting.

In spite of many investigations, there are still some erroneous ideas held of what happens during cutting. Probably the most common of these is the comparison of the tool action to the action of a hatchet splitting a piece of wood. This theory says that the metal splits off ahead of the tool point in the same manner that a chip of wood splits off ahead of the hatchet. This explanation is often used to account for the wear on the tool face some distance behind the cutting edge.

If paraffin is cut with a metal tool it increases in opacity in that portion which is stressed by the pressure of the tool. Two fundamental things happen: first, there is a compression of the material at the tool point accompanied by a flow of the material up the face of the tool; second, there is either a rupture or a plastic flow of the material in a direction perpendicular to the face of the tool. It is this rupture or plastic flow which determines the type of chip formed during machining. Rupture occurs in the case of brittle materials, forming a so-called discontinuous chip. The whole compressed section breaks off when the rupture occurs. Plastic flow occurs with ductile materials forming a continuous chip. This type of chip has a fairly uniform structure, depending upon the machining conditions.

It has been found that there are two kinds of continuous chips, one which has a compressed layer of continuously escaping material next to the face of the tool, the other having a "built-up edge" on the face of the tool.

The ideal continuous chip forms if we cut ductile, crystalline material. Plastic flow takes place along planes of easy crystallographic slip. A comparatively large deformation is permitted without rupture. With some materials, however, a continued motion in one plane causes an increasing opposition to this motion producing what is known as work hardening. If the increasing opposition in one plane causes a transfer of the stresses to the adjacent planes, as in the case under consideration, the successive planes yield as the work advances and the chip is gradually forced upward out of the path of the tool.

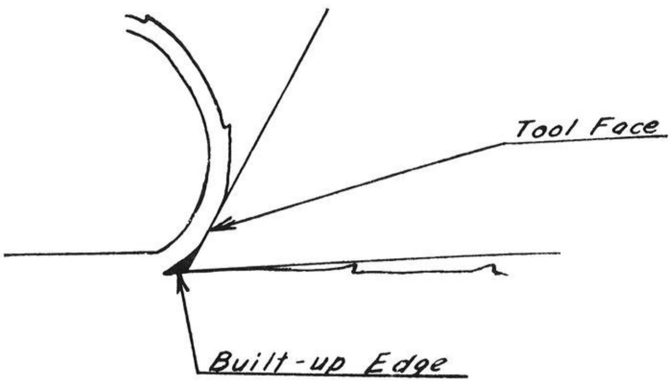



Fig. 1—Sketch of ordinary tool action

In actual practice the so-called ideal chip is seldom produced. The high friction between the compressed layer and the tool face, together with the high temperatures and pressures and the natural tendency for metals to seize, causes a part of this layer to adhere to the tool face, forming a built-up edge. This portion of the material, adhering to the tool face, is still continuous with the workpiece, and as the work advances, the amount of material sticking to the tool increases. Finally the edge is built up to such an extent that it becomes unstable and breaks off. As pieces of the edges are torn off they escape, part with the chip and part with the workpiece. It is these fragments on the surface of the work which causes the "roughness" of a machined surface. Fig. 2 shows a machined surface with roughness caused by the adhering fragments

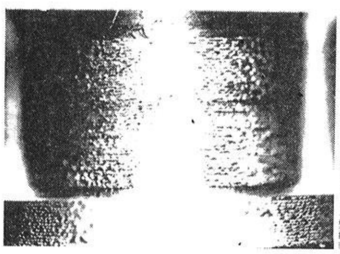


Fig. 2
Roughness caused by built-up edge

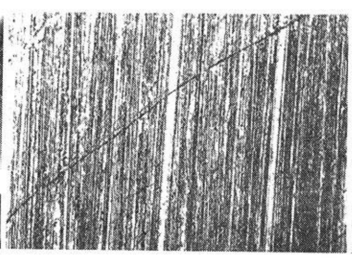


Fig. 3
Ordinary ground surface

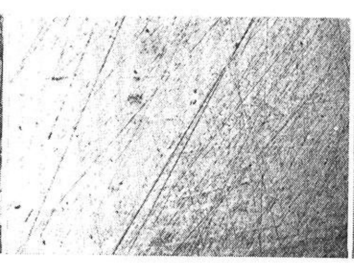


Fig. 4
Superfinished surface

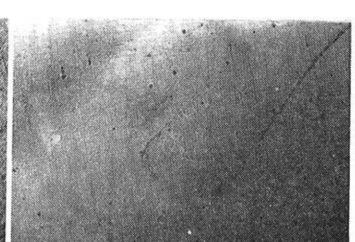


Fig. 5
Metallographic surface

torn from a built-up edge. Fig. 1 is a sketch of the tool and chip showing the built-up edge and the pieces torn from it as the work advances.

The purpose of fluids used in cutting is to reduce the adhesion between the chip and the cutting tool. There is a clear distinction between the action of these fluids and the action of lubricants. In lubrication the opposing surfaces are kept from rubbing by oil films produced between them. In cutting, the temperatures and pressures are so high that it is physically impossible to produce such films. It has been found that the action of the cutting fluid is to produce a layer of low shear strength material between the face of the tool and the chip. Also, agents which have proved to be most effective as cutting fluids are those which are very unsatisfactory as bearing lubricants. In cases where the action of the cutting fluid is very effective, it has been possible to identify the compound formed by such action. Carbon tetrachloride has been the most effective of the fluids tested and chlorides of the metals being cut have been found.

These foregoing principles of fluid action and chip formation apply not only to cutting tools, but also to abrasive grains. The new superfinish process consists of cutting away the rough particles on the surface with a very fine grained abrasive. Many short strokes of the abrasive material are necessary in the process to continually replenish the film of cutting fluid. Reduction of the force applied to the abrasive and an increase in the pressure of the cutting fluid are necessary as the process proceeds. It was formerly thought that the new surface was produced at the original surface by merely removing the irregularities. Experiments have proved that the new surface is actually produced below the deepest irregularity in the original surface.

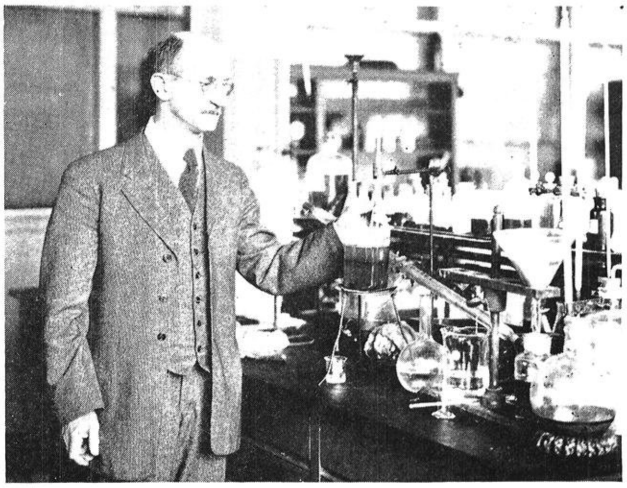
The use of many new high-speed machines have made smoother surfaces necessary so that friction may be reduced. Superfinish has proved that there is a reduction in friction as the smoothness of the surface increases.

Rough edges on machined surfaces cause tearing when these parts rub together. For this reason it is necessary to break in an automobile or any other engine slowly. This slow breaking-in period prevents this tearing and polishes the piston and cylinder walls to a very high degree. This produces surfaces which will last longer because of the ease and thoroughness with which they can be lubricated. If the engine is not run in slowly, the sharp edges on the cylinder and piston walls tear each other in much the same manner that built-up edge is formed on a tool. Instead of the irregularities being smoothed, the metal is seized and deeper scratches are produced.

The most accurate method of measuring surface irregularities is with the profilometer. This consists of a tracer with a very sharp point. By a system of levers the tracer is attached to a marker. The lever system accentuates the movement of the tracer. As the point of the tracer is dragged over the surface the marker records the irregularities on a paper. From the scale on the recording, the magnitude of the irregularities can be determined. Meas-

(continued on page 28)

# Louis A. Kahlenberg



On March 18, 1941, Professor Emeritus Louis A. Kahlenberg of the Chemistry Department died at the age of 71 at Sarasota, Florida.

Kahlenberg's lectures were different. When he strode into the room, he took charge of it as a captain takes charge of his ship. A loud, enthusiastic skyrocket from an alert audience which had neither a notebook or pencil in evidence were typical of his lectures.

For over twenty years his text book in chemistry was used. His researches have led him into various fields, such as studies in osmosis, dialysis, colloid chemistry, and electrochemistry. His colloidal gold for cases of malignancy, and the new skin surgical suture material, "equisetene," are used by the medical profession.

Unlike many men, he realized that things, which seem obvious to him, often require a detailed explanation to make them clear to his students, and therefore he spared no pain to make his presentation clear and ample, without appearing bored, or, what is just as important, boring the students who had already grasped the idea.

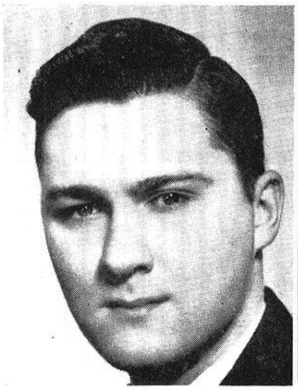
Professor Kahlenberg was born at Two Rivers, Wisconsin, in 1870, and graduated from the Two Rivers High School at the age of 15.

After graduation from the Milwaukee Normal School, he came to the University of Wisconsin and obtained his B.S. degree in 1892. From 1892 to 1893 he had a fellowship in Chemistry, in 1893 received his M.Sc. degree, and in 1895 his Ph.D. degree, summa cum laude, from the University of Leipzig in Germany. Professor Kahlenberg had originally intended to teach philosophy but found that the sciences, especially chemistry, were far more interesting.

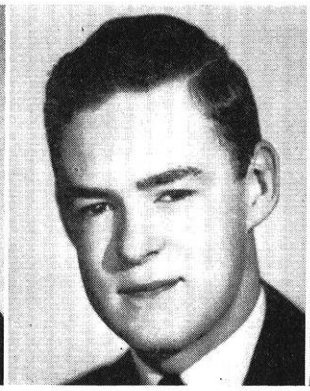
He was active in numerous societies, having been vice-president of the A.A.A.S., president (1906-1909) of the Wisconsin Academy of Sciences and Arts, president of the American Electrochemical Society (1930-31), associate editor of The Journal of Physical Chemistry (1899-1923), chairman of the chemistry department and director of courses in chemistry at the University of Wisconsin, and a member of Phi Beta Kappa.

# *Exuent*

## 1940-41 WISCONSIN ENGINEER HEADS



BEN BENNETT



PHIL DESCH

JOE O'NEILL

### BEN BENNETT

**Ex-Editor**

Ben is the boy who bore the brunt of criticism for our mistakes this past year. If there's credit to be given, however, Ben insists that he and Phil Desch were really co-editors and should be considered as such. That's like Ben. He seems to have stood the gaff well enough, though, for both General Electric and the army are reported to be clamoring for his services.

It all began in Martin's Ferry, Ohio, where as a high school student, Ben was on the basketball team, in the school band, and where he developed an unnatural interest in math and science. This latter accounts for Ben's choice of engineering, and that it was no mistake can be seen in the record he has made.

Membership in Eta Kappa Nu, Kappa Eta Kappa, Alpha Tau Sigma and Pi Mu Epsilon tell a big part of the story of his college career. In addition Ben belongs to Chi Phi and the A.I.E.E. And that's not all. He also was elected to the Polygon Board, joined the band, took part in intramural athletics and handled the engineering news in the Daily Cardinal in addition to his work on the Engineer.

Last year Ben and Phil Desch built the kissometer for the expo, but this year the publicity chairmanship fell to Ben and he found himself with little time for either misses or kisses.

Summers Ben worked for the Carnegie - Illinois Steel Corp. at Martin's Ferry, for the Gary Steel Works, and even as camp counselor for a YMCA group in the Pennsylvania mountains. The latter probably accounts for the paternal outlook.

Ben intends to steer clear of research or design work and hopes to get into sales, advertising, or production. If the past is the future, then it's probably a bit superfluous to wish you luck, but we do just the same, Ben.

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### PHIL DESCH

**Ex-Associate Editor**

Work on the **Wisconsin Engineer** was far from the first of Phil's literary career. He was the editor of the Wisconsin High School annual in '37 and worked for three summers in the registrar's office preparing material for freshman orientation. The last two years Phil was in charge of this work and edited the Freshman Handbook. That, then, explains why we usually went to Phil with our problems and why he could be counted on to have an answer.

While at Wisconsin High, dramatics and forensics were also included in Phil's extra-curriculum, but upon coming to the University he found himself much too busy a boy to give these interests any more attention. And no wonder. Phil was busy turning in the kind of work that netted him membership in Tau Beta Pi, Eta Kappa Nu, Alpha Tau Sigma, and Phi Kappa Phi. And to this impressive list we must add the fact that he was president of Alpha Tau Sigma and is holding the chairmanship of the A.I.E.E.

Phil is chiefly interested in public utilities and manufacturing and he has a position with General Electric upon graduation this spring. He confided in us, however, to the extent that he is considering patent law after a few years' work in industry, much as he hates the sound of the word.

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### JOE O'NEILL

**Ex-Business Manager**

If you should ever have any business with Joe, we would advise that you start trying to locate him at least two weeks in advance. With the possible exception of Pres. Dykstra, Joe stands out as the most difficult man on the campus to catch up with.

While attending the Dodgeville High School, Joe kept himself busy too. Besides belonging to the chorus and band, he took part in forensics, was the business manager of the annual, and led cheers for the local sport enthusiasts.

Then to the university, where he plunged into electrical engineering, became a member of the A.I.E.E., Kappa Eta Kappa, and was elected to Scabbard and Blade. At the same time Joe was earning about 25% of his expenses.

Joe is especially interested in manufacturing, communication and power utility. This summer, however, he expects to be serving in the army signal corps. Now a lieutenant in the U. S. Reserve, Joe selects his ROTC training as one of his most enjoyable activities while in college.

# ALUMNI NOTES

*by Roy McIntosh, met'42*

## *Chemicals*

**ABRAMS, RALPH B.**, '22, general manager of the Flavor Service Co., manufacturers of flavors for the ice cream trade, has moved his business from Chicago to Milwaukee.

**HARVEY, LYLE C.**, '22, has been elected president of the Bryant Heater Co. of Cleveland, Ohio.

**COLBURN, ALLEN P.**, Ph.D.'29, was a guest speaker at a series of lectures held at Purdue University. Dr. Colburn, acting head of the division of chemical engineering at the University of Delaware, is an authority in the field of convective heat transfer, and was formerly research investigator on heat transfer for the Du Pont Co.

**KOEHLER, JOHN W.**, M.S.'29, has been given a disability discharge from the U. S. Army and is now employed by the M. W. Kellogg Co. of Jersey City, manufacturers of oil refinery equipment.

**GURDA, ARTHUR B.**, '36, has been given a temporary leave of absence by the Catipillar Tractor Co. to serve in the Chemical Warfare Service of the U. S. Army. He is stationed at Fort Custer, Mich., and is the chemical officer of the camp, having the rank of first lieutenant, C.W.S.

**SUTTON, MAC.**, Ph.D.'39, and Betty Crowe were married March 1, 1941, at Whiting, Ind. He is in the research department of the Standard Oil Co. of Indiana.

**RINDT, DONALD W.**, '40, and Ruth Marie Wilson were married March 15, 1941. They will make their home in Gary, Ind., where he is employed by Carnegie-Illinois Steel.

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## *Civils*

**ROHERTY, JOHN N.**, '10, died at Bismarck, N. D., on November 27, 1940, following several months of illness.

**BENNETT, J. GARDNER**, '18, professor of civil engineering at Robert College, Istanbul, Turkey, writes under date of February 3, "The war does seem close now—right in our back yard, so to speak. We have occasional air raid drills and blackouts to keep tuned up for it."

**ZANDER, ARNOLD S.**, '23, president of the American Federation of State, County, and Municipal Employees, was appointed to serve on the five-man labor advisory committee of the National Youth Administration early in March. The committee will represent the A.F. of L. in all NYA matters.

**BREIVOGEL, MILTON W.**, '24, city planning engineer and WPA director at Racine, has been appointed city planning engineer of Los Angeles, Calif. He has resigned from his Racine positions.

**SALTZSTEIN, IRVING D.**, '26, is engineer in the plant engineering department of the A. O. Smith Corp., of Milwaukee, designing plant layouts and placement of new departments.

**ZOLA, STANLEY P.**, '27, who has been division engineer in Milwaukee for the Great Lakes Dredge and Dock Co., has joined the Civil Engineering Corps, U. S. Navy, as lieutenant, assigned to active duty with the Bureau of Yards and Docks.

**NEWLIN, CHARLES H.**, '31, resigned from the Wisconsin Highway Commission staff early in March to join the staff of the bridge department of the Southern Railway at Knoxville, Tenn.

**De YOUNG, KENNETH D.**, '33, is first lieutenant in the U. S. Army at the Elwood Ordnance plant at Wilmington, Ill., near Joliet.

**McDONALD, ROY S.**, '33, who has been with the Wisconsin Highway Commission since graduation, is now senior inspector for the War Department on construction at the Kankakee Ordnance plant at Kankakee, Ill.

**LARSEN, JAMES H.**, '33, has been appointed city planning engineer for Racine, Wis., to succeed Milton Breivogel.

**ULRICH, EARL E.**, '34, is with the A. E. McMahon Engineering Co., of Menasha. He has been on the Manawa sewer and water project.

**STANEK, EDWARD R.**, '35, is with Greeley & Hanson, consulting engineers of Chicago, on the construction of a cantonment at Tullahoma, Tenn.

**ZACK, JOSEPH**, '35, died in Milwaukee on April 22, following a long illness.

**HENRY, J. EVERETT**, '36, city engineer at Wheeling, W. Va., has been called to active service with the War Department in the Zone Constructing Quartermaster Office at Columbus, Ohio.

**SCHNEIBLE, DOUGLAS E.**, '38, is junior mathematician with the U. S. Coast and Geodetic Survey at Washington, D. C. He announces the arrival of a son, Dennis Edward, born June 7, 1940.

**SPERLING, ARTHUR F.**, '38, has been promoted to the rank of assistant engineer (structural) and attached to the office of the Construction Quartermasters at Fishers' Island, N. Y. He has charge of all engineering work constructed by the Construction QM at Ft. H. G. Wright, Ft. Michie, and Ft. Terry.

**SCOVILL, NORMAN D.**, '38, since April 4 has been estimator for the Sill Construction Co., of Chicago, on industrial buildings.

**DOLLHAUSEN, JOHN L.**, '40, has resigned as engineer with the Soo Lines to take a position as maintenance engineer in the R&H Chemical department of the Du Pont de Nemours & Co. at Niagara Falls, N. Y.

**HERRIED, IRVIN C.**, '40, began work on March 14 as an apprentice engineer in the gasoline department of the Phillips Petroleum Co., at Phillips, Tex.

**PETERSEN, ARTHUR H.**, '40, is with the General Engineering Company of Portage.

**WELLER, MARVIN E.**, '41, is chainman with the Illinois Central Railroad at Champaign, Ill.

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## *Electricals*

**INBUSCH, WALTER H.**, '05, died last October 23 at his home in Glencoe, Ill. For the past twenty-five years he had been employed as an electrical engineer with the Illinois Bell Telephone Co. in Chicago.

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## *Mechanicals*

**HINRICHS, CHRISTIAN**, '90, died last September 26 at his home in Madison, N. J. He began work for the Associated Illinois Steel Co., and the Cramp Ship Yards; later he was with the New York Ship Co., the Seattle Dry Dock & Construction Co., and Todd Ship Yards. He was a member of the Society of Naval Architects and Engineers.

**HIGSON, CHARLES R.**, '07, died at his home in Salt Lake City. After graduation, he was employed by the General Electric Co., and after two years he returned to the campus as an instructor in electrical engineering. He held this position for four years. In 1912 Mr. Higson went to Salt Lake City to work for the Utah Power & Light Co. as a substation operator. During his twenty-eight years with this company he became superintendent of distribution over their entire system. Due to ill health, he gave up his position in January, 1941, but continued with the company as a consulting engineer.

**ROBERTS, J. F.**, '18, will present a paper entitled "Francis-Turbine Installations at Norris and Hiwassee" at the spring meeting of the A.S.M.E. to be held at Atlanta, Ga., March 31 to April 3. Mr. Roberts is principal mechanical engineer for TVA, Knoxville, Tenn.

**RIETOW, LINCOLN A.,** '23, is now sales engineer with the Control Corporation at Minneapolis, Minn. He was formerly in the sales division of the Allis Chalmers Co., Milwaukee.

**CASBERG, C. H.,** '24, is chairman of the Session on Manufacturing Processes, and **STEWART, F. C.,** '30, is chairman of the Session on Laboratory Instruction at the conference for mechanical engineering teachers to be held at Purdue, June 29 to July 3. Mr. Stewart is associate professor of mechanical engineering at Penn State College, and Mr. Casberg is professor of mechanical engineering at the University of Illinois.

**PLAENERT, CAPT. ALFRED B.,** '25, has just recently been appointed constructing quartermaster in charge of construction at Fort Custer, Battle Creek, Mich.

**CLARK, HENRY L.,** '26, is employed with the Braden Copper Company at the plant in Sewell, Chile. He previously spent five years in the business of mining sodium nitrate, and then returned to Madison to take his master's degree. In 1934 he returned to Chile to work with the company in which he is now employed.

**SCHEFE, FRED K.,** '30, is now with the Carnegie Illinois Steel Corporation as plant engineer. He visited Madison recently to look for prospective seniors.

**JAMES, JOHN W.,** '34, has been serving as secretary of the A.S.M.E. Sectional Committee Z32, which has been establishing new American Standards of Graphical Symbols used in heating, ventilating, air conditioning and piping.

**MERCK, R. A.,** '38, who was formerly with the Johnson Service Co., is now with the Dravo Corp. in Pittsburgh as a development engineer.

**CHRISTMAN, MATT,** '40, who was formerly with the J. D. Wilson Co., is now employed by the Douglas Aircraft Co. in Santa Monica, Calif., as a designer of jigs and fixtures.

**KINOST, ALBERT J.,** '40, who was with the Barber-Coleman Co., is now with Boeing Aircraft Co. at Seattle, Wash.

**KAISER, ELMER R.,** B.S. in M.E. '34 and M.S. '34, assistant to the president of Battelle Memorial Institute, Columbus, Ohio, spent the week of February 23 in a series of four talks at Champaign, Peoria, Rockford, and Elgin, Ill., as part of the stoker school conducted by the Illinois Coal Merchants Association.

### *Miners and Metallurgists*

**GALLISTEL, ALBERT F.,** M.S.'36, formerly field engineer with the Leeds & Northrup Co., is now metallurgist at the Thomas & Skinner Steel Products Co., Indianapolis, Ind.

**FELBER, WALTER J.,** '37, has been transferred to the Milwaukee office of the Inland Steel Co.

**DOUGLAS, JOHN E .,** '40, until recently with the Wisconsin Steel Co., stopped in Madison with his wife on their way to Butte, Mont., where he has a position with the Anaconda Copper Co.

**MELCHER, NORWOOD B.,** '40, formerly a metallurgist in the blast furnace department of the Columbia Steel Co., Provo, Utah, is now in the Bureau of Mines Experimental Station at College Park, Md.

**SCHUKNECHT, GEO. G.,** '40, has resigned his position as mining engineer with Cia Huanchaca de Bolivia, Pulacayo, Bolivia, S. A., to take a position in the Canal Zone doing general engineering.

**GUBBINS, RUSSEL C.,** '40, is now located in Milwaukee, working in the Ordnance Division of the War Department as an assistant inspector. At the present they are inspecting 105 mm. howitzers.

**ROSENOW, MONROE,** '39, is doing general engineering with Ampco Metals, Inc., Milwaukee. He formerly did inspection with the same company.

# Campus News

*by Bob Diehl, e'43*

### EXPOSITION DOPE

Well, another Wisconsin Engineering Exposition—engineered by Polygon—is over and we might as well give you a few facts about how things turned out. It was a success. And it clearly illustrated that sincerely interested students in engineering can put on a worth while display. As proof, ask any of the 9,000 people that crammed and jammed the corridors of the Engineering and M. & Me. Buildings to see the exhibits that totaled nearly a hundred and a quarter in number. Of all St. Pat's patrons, 88.888% paid admission; the others really got something for nothing.

Probably the boys that worked the hardest on their exhibits took home the money. In the non-Polygon society exhibits, Triangle Fraternity took first prize of 25 dollars for building a miniature Panama Canal. An explanation of why the Tacoma bridge collapsed netted fifteen crisp "ones" for Chi Epsilon. Testing electrical appliances brought Eta Kappa Nu third prize of a "ten spot." In the individual exhibit competition, Florian Yanikoski, ME-4, took a fifteen dollar first by befriending the slipstick. Jim Ancell, EE-4, placed for a ten dollar purse by representing sound pictorially. Sending music through a light beam brought five dollars to exhibitors Bert Zarky, EE-4, and Vic Richard, EE-3.

By now you're probably wondering whether there'll be an Expo next year. Perhaps not: some figure it would be better psychology to make it a bi-annual event—there'd be a new turn-over of wide awake managers to run the affair, and the public's interest would be held better. But on those alternate off years, something would have to take the place of the Expo. That something might be an engineers' convention with other colleges, a series of top-notch lectures, or some sort of technical convocation. There are a lot of possibilities, and certainly we engineers can find something to keep us busy.

Almost forgot, the total ticket and button sale brought in over $2,100. When the net profits have been figured out for the final time, the Polygon member societies will receive part, and the remainder will be used for worthy projects as the Polygon Board sees fit. Last year saw the lobby furnished with the proceeds from the first expo.

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Dean Johnson says 45,000 jobs are open for 12,000 engineering graduates this June. No trouble for the seniors to find jobs this year.

### BRAINS!

Nine engineers numbered among the eighty-one seniors who were inducted into Phi Kappa Phi on March 11. Phi Kappa Phi is an honorary fraternity for senior men and women who have been outstanding in both academic and extra-curricular work. The engineers who were selected are:

Burton E. Clark, M.E.
Donald A. Curry, C.E.
Philip F. Desch, E.E.
Raymond A. Erickson, Ch.E.
Paul Fluck, C.E.
John O. Pritchard, Ch.E.
Frank B. Roberts, M.E.
Milton A. Suckow, M.E.
William F. Tice, E.E.

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### POLYGON BOARD

The new officers for Polygon for next semester are Henry Schmalz, Ch.E. 3, chairman; Paul Sodemann, C.E. 3, secretary; and Jim Rogers, M.E. 3, treasurer. Polygon Board is composed of student engineers, and is the guiding hand for most of the extra-curricular functions of the engineering college during the school year. The exposition and the various dances and smokers are some of the activities which the board sponsors.

A financial report for the year is given below.

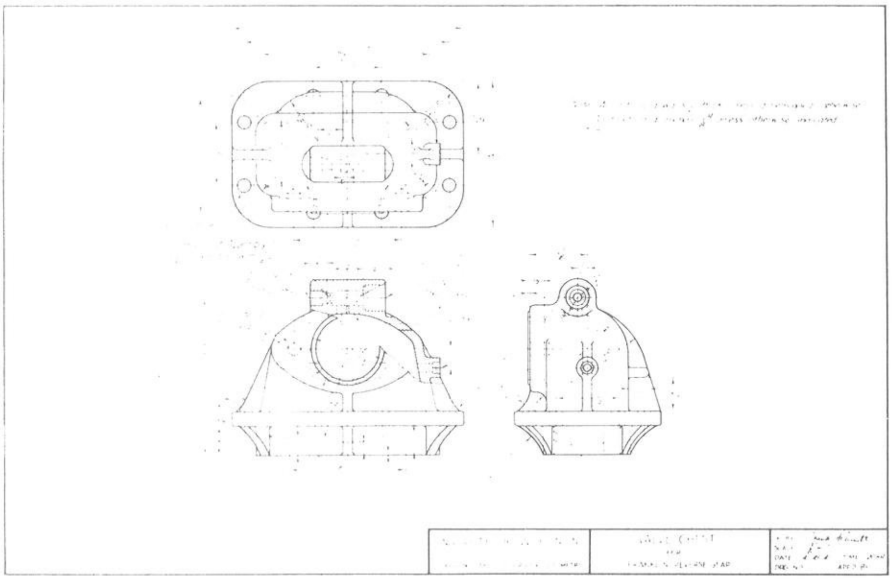
| | Disbursements | Income |
|---|---|---|
| **POLYGON BOARD:** | | |
| Balance on Hand May 1, 1940 | | $ 485.92 |
| Smokers | $ 87.12 | |
| Dances—Income | | 393.50 |
| Dances—Expenses | 346.59 | |
| Transferred to Contingency | 87.43 | |
| Incidentals and Miscellaneous | 67.18 | |
| Totals | $ 588.32 | $ 879.42 |
| Balance on Hand April 29, 1941 | | $ 291.10 |
| **EXPOSITION BOARD:** | | |
| Buttons and Tickets | | $2,166.52 |
| Expenses by Committees | $1,276.92 | |
| Miscellaneous | 36.03 | |
| Totals | $1,312.95 | $2,166.52 |
| Balance on Hand | | $ 853.57 |
| **STATEMENT OF POLYGON ACCOUNTS:** | | |
| Balance on Hand April 29, 1941 | | $1,605.99 |
| Polygon Account | $ 291.10 | |
| Exposition | 853.57 | |
| Contingency | 300.00 | |
| Societies | 158.92 | |
| Faculty Research Council | 2.40 | |
| Total | $1,605.99 | |

Respectfully submitted, April 29, 1941
—DANIEL H. LAMB

### DRAWING CONTEST

For two weeks before spring recess, the second semester freshman engineers labored steadily, sweating and doing some high class swearing over the annual drawing contest. After all the drawings were handed in and looked over carefully, thirty of the best were placed before the scrutinizing eyes of the three judges: W. S. Cottingham, assistant professor of the structural engineering department, Thomas P. Colbert, instructor of machine design, and R. J. Harker, instructor in machine design. In the hands of these three lay the hopes of the three hundred fifty freshman engineers.

April 30, Pi Tau Sigma, honorary mechanical engineering fraternity, the sponsors of the contest, announced the winners. First prize, a slide rule, went to Frank Schmidt, second, a chemical engineer's handbook, to Bill Zumach, and third, an engineer's scale, to R. J. Burger.



The drawing of a Valve Chest for a Franklin Reverse Gear was selected by the drawing department.

### TRIP

The miners, and of course a few civils, this year took the annual surveying trip during spring vacation. Place honored by the Engineering college this year was Shullsburg, Wis., a small town in the southwestern part of the state, rich in tales of the old days. Shullsburg was the site of the base camp for the five day trip, but most of the work was done at the Ida Blende mine, several miles east of Benton.

The twenty-five civils and miners ran both underground and surface surveys of the mine under the supervision of Professor Shorey of the Mining school, who was in charge of the trip. Highlights of the excursion included inspection of the old lead mine beneath the village of Shullsburg, experimenting with carbide in the hotel rooms, and the usual relaxations of an engineer on a trip.

## BANQUET HEADS

Three mechanical engineers, Herbert Stone, Madison, Francis Bouda, Two Rivers, and Marvin Dundore, Beloit, are among the 50 students who are serving on committees making plans for the annual Parents' Weekend to be held May 23, 24 and 25.

Herbert Stone is serving on the Finance committee and Francis Bouda and Marvin Dundore are working on the Banquet plans.

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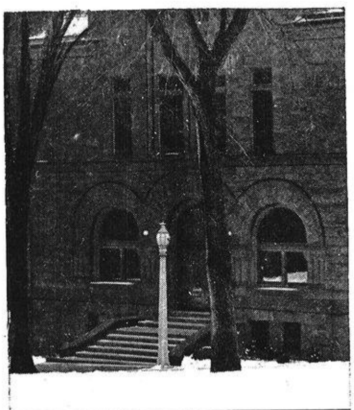
## KESSLER APPOINTED TO COMMISSION

Prof. Lewis H. Kessler '22 was recently appointed to the Madison Metropolitan Sewerage Commission to fill the vacancy caused by the death of Mr. Seastone.



Who Kidnapped Oscar?

## FRESHMAN HERO

One often reads about heroes in newspapers, magazines and books, and wonders just what the person is like. Well, at last there is a chance to find out, for at the University we have a hero of our own in the person of John St. Germain, a freshman engineer. The story of his heroism in rescuing t h r e e men from drowning in northern Wisconsin last fall is probably well known to everyone by now. To add to his recognition, it has been learned that John may go to New York in the near future to appear on the "We the People" program. We sincerely hope that he gets this chance, for valor of the type that John St. Germain has shown certainly deserves recognition.

## RADER WRITES ON ROADS

In the design of a low-cost road, the subgrade, the base, and the surface must be treated as a unit, Prof. L. F. Rader states in an article on "Selecting Asphaltic Surface Types," that appears in the March issue of **Better Roads.** The article is based on a paper which Prof. Rader presented at the National Asphaltic Conference last December. The paper presented the technical and economic considerations involved in the building of low-cost roads surfaced with asphalt.

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## 'TIS HUMAN TO ERR

. . . but divine to forgive. In our March issue, we made an unfortunate error in saying that the Forest Products Laboratory was designed by Frank Lloyd Wright, whereas it was designed by the firm of Holabird & Root, of Chicago. In any case, it was a job well done.

## CALL TO THE COLORS

The nation's far-reaching call to the colors has drawn upon the personnel of the Engineering College and at least two faculty members will soon be shaking off the dust from chevrons and epaulets.

From the M.E. department, assistant professor R. A. Rose has been called to duty as engineer officer. aboard a Diesel gunboat 'way down at Tampa, Fla. Professor Rose had been a lieutenant commander in the U. S. Navy Reserve.

Another instructor in mechanical engineering, J o s e p h J. Peot, has been assigned to service in the R.O. T.C. here at Madison. Peot holds the rank of first lieutenant.

First Lieutenant L. G. Schneider, M.E. instructor, was called to duty some time ago, but his commission has been deferred until the end of the school year. Schneider was to serve in the Coast Artillery School at Fort Monroe, Virginia.

**FM—** (continued from page 11)
the mathematical treatises on this subject did not bring out; namely that in this system of broadcasting could be incorporated an interference eliminating device which would not at the same time eliminate the intelligence carried by the signal. Armstrong's early work was carried out in the Marcellus Hartley Research Laboratory at Columbia University. Later he was aided materially by the Radio Corporation of America and the National Broadcasting Company when they put at his disposal a transmitter in the laboratories on top of the Empire State Building in New York City.

Tests were conducted for a period of several years from this location with receiving points located as far away as Philadelphia. Records kept show conclusively that signals from the 2000 watt frequency modulated transmitter were at all times superior to those from the regular 50,000 watt broadcast transmitters in New York City. A published account of Armstrong's work appeared in the Proceedings of the IRE in May, 1936, and shortly thereafter work proceeded rapidly on the eastern seaboard. Broadcasters in the New England States supplemented their regular broadcast service with an experimental frequency modulation service. They banded together and formed the "Yankee Network," which was the first chain hookup of frequency modulated transmitters. The Middle West and Far West lagged behind the East in the installation of frequency modulated transmitters, and it remained for the Milwaukee Journal station WTMJ to inaugurate the first experimental frequency modulation service west of the Appalachians.

Recently applications other than for an improved broadcast service have been developed for frequency modulation. Police radio transmitters are being converted to this system because it discriminates very effectively against the bad noise conditions often encountered by police cars. The commercial airlines are investigating a similar application for the same reason. Frequency modulation is even being applied to the transmission of television pictures.

WHERE are frequency modulated stations located? At present it seems likely that a frequency modulation service will only be available to the urban population in the larger cities. New York City already has seven stations, Chicago has five stations, Philadelphia has four stations, and forty-three other cities throughout the country have one or more stations.

The University of Wisconsin is engaged in the development and construction of a 1000 watt transmitter to be used to supplement the program service provided by the present station, WHA. The work is being done under the grant received from the Wisconsin Alumni Research Foundation. The transmitter will first be used to make field strength measurements in and around the Madison area to determine the characteristics of a frequency modulated signal over this local terrain. It is expected to have a satisfactory receiving area at least as large as that within a 35 mile radius around Madison, and to provide high fidelity, noise free radio service to people living within this region.

## CARFERRY— (continued from page 13)

gauge pressure, 640 degrees F. total steam temperature, and 26 inches of vacuum, these unaflow poppet valve engines are the largest of their type ever built. Each of the five 25-inch bore vertical cylinders carries a piston with a 30-inch stroke, their connecting rods being close to 10 feet long. The combined normal horsepower rating is 6,000 at 120 revolutions per minute with 94.2 per cent mechanical efficiency. However, overloads in excess of 7,000 shaft horsepower can be reached, thus driving the "City of Midland" across Lake Michigan at an easy cruising speed of 18 miles per hour.

The combination of the simple unaflow cycle with steam-tight poppet inlet valves and cut-off control permits the engines to run at all speeds with the main steam valve wide open. Speed is controlled by lengthening or shortening the cut-off; the engines can even be stopped, started, and reversed with the throttle wide open.

The engines have an extremely neat appearance, being entirely enclosed in a jacket trimmed with polished stainless steel. All moving parts in the engines, with the exception of the pistons, are lubricated by a common pressure oiling system—oil cups of any kind are absent. The cylinders are oiled by injectors at the inlet ports and also by an atomizer which emulsifies the oil with the throttle steam.

Four coal-burning, stoker-fed boilers of the Foster-Wheeler "D"-type design supply steam to the unaflow engines. Consisting principally of two horizontal drums 13 feet 3 inches between centers and joined by vertical banks of water tubes, each boiler will normally generate 26,125 pounds of steam per hour, delivered at the superheater outlet at 335 pounds pressure and at a temperature of 650 degrees F. An all electric system insures the best combustion conditions by controlling the forced draft mechanism and the coal stokers. Another instrument indicating carbon dioxide readings from any one of the boilers guards against fuel or heat loss due to incomplete combustion. These steam generators are mounted in batteries of two measuring 38 feet long, 12 feet wide, and 17 feet high. The ship can function normally using only three of the four boilers.

Not only is the "City of Midland" a sturdy commercial carrier, but also a ship fitted with luxurious accommodations that would make any water-faring tourist as comfortable as if he were living in a floating hotel. On board are 74 staterooms in addition to 12 master staterooms with private shower and toilet. Furniture is of latest metal styling, making the boat almost fireproof. Fluorescent lighting, leather covered doors, decorative rubber floors, and smoking rooms partitioned from the main lounge by glass—even dog kennels—all add to the finery of the "City of Midland."

Besides being notable for her size and speed, the ship is one of the safest afloat. Although almost entirely fireproof, she still carries an automatic sprinkler and fire alarm system.

The steering gear, a product of the Manitowoc Shipbuilding Company, is engineered to swing the rudder through a 90 degree arc in 24 seconds when the ship is traveling at cruising speed.

## SURFACES— (continued from page 17)

urements are made in micro-inches or fractions thereof. A micro-inch is a millionth of an inch.

Fig. 3 and 4 are photomicrographs of an ordinary ground surface and a superfinished surface respectively. They show a large number of scratches still present on these surfaces. Fig. 5 is a metallographic surface which has been almost completely polished. The dark spots on this surface are due to the non-metallic inclusions in the specimen. Before the specimen can be used for metallographic work, even the very minute scratches seen on the surface must be removed. This polishing is done with very fine abrasives on billiard cloth. The surface offers a comparison, showing the magnitude of the scratches in surfaces which may appear to be free of scratches, when seen with the naked eye. Even optical lenses may contain some scratches which cannot be noticed.

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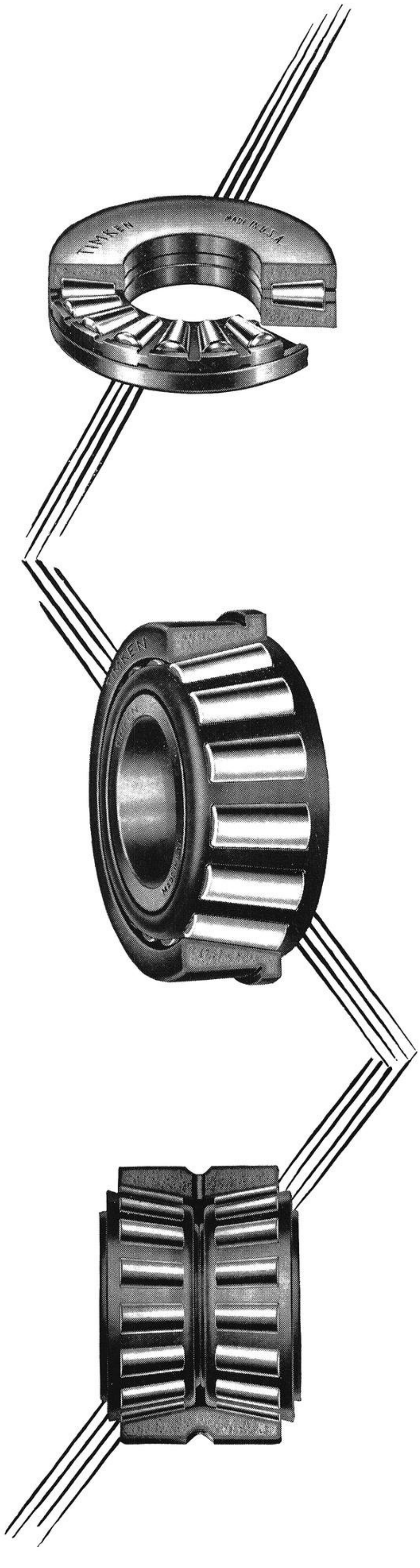
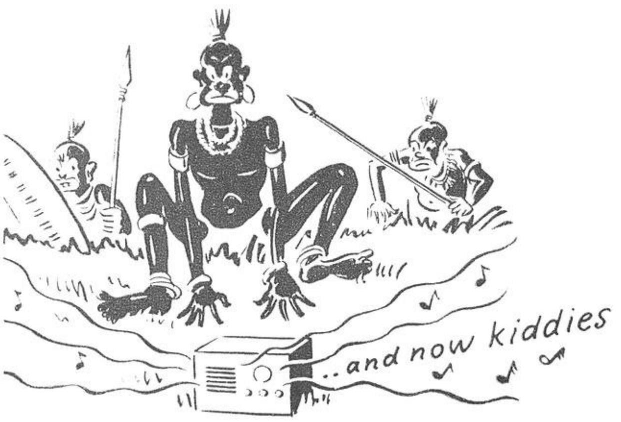
ACKNOWLEDGEMENT

**The material contained in this article was gathered largely from papers prepared by Hans Ernst, who has done much work on machined surfaces. He is a member of the research staff of the Cincinnati Milling Machine Company.**



# G-E Campus News




## JUNGLE JIVE

MISSIONARIES working among a newly discovered tribe of savages in Netherlands New Guinea, which has many times been called one of the "earth's remotest spots," had a strange experience.

They invited natives into their bamboo hut and turned on their short-wave radio. The tribesmen looked at one another in frightened amazement. Rev. C. Russell Deibler, one of the missionaries, says this of what happened: "As they heard voices coming from the receiver, they crouched over close and jabbered back, utterly bewildered where the strange voice was coming from."

The missionaries wrote their experience in a letter to Station KGEI, G.E.'s short-wave station in San Francisco, which sends its radio signal into Asia, using special directional antennas.

## PRESTO!

THREE tiny 1000-watt mercury lamps, mounted in the new television floodlight developed by G-E laboratory engineers, yield as much light as 225 ordinary 60-watt bulbs. For the same amount of illumination these powerful little lights produce only one-fourth as much heat as do incandescent lamps. Water cooling dissipates much of the heat and so makes possible the very small size.

The new lights are equipped with motors and gears for remote control, so that they can follow the movements of studio performers.

These tiny lamps were developed at G.E.'s Lamp Department at Nela Park, Cleveland, which each year selects promising young engineering-college graduates from "Test" to train them in the lighting game.


## SPIDERCRAFT

COULD you spot-weld wire one quarter as thick as a human hair?

That's the problem G-E engineers faced in producing filaments for thermocouples, those little super-sensitive devices used in measuring high-frequency alternating currents or voltages. These dainty filaments are 1/2000 of an inch in diameter—so small that they are almost invisible—and have to be welded into a "K" shape.

The work is so fine that it must be done under a microscope, using a pair of tweezers to hold the wires.

At Schenectady there's a whole section of the G-E Industrial Department devoted entirely to welding. Practically all the men in this section are graduates of the G-E Test Course. General Electric Company, Schenectady, N. Y.

**GENERAL ELECTRIC**

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