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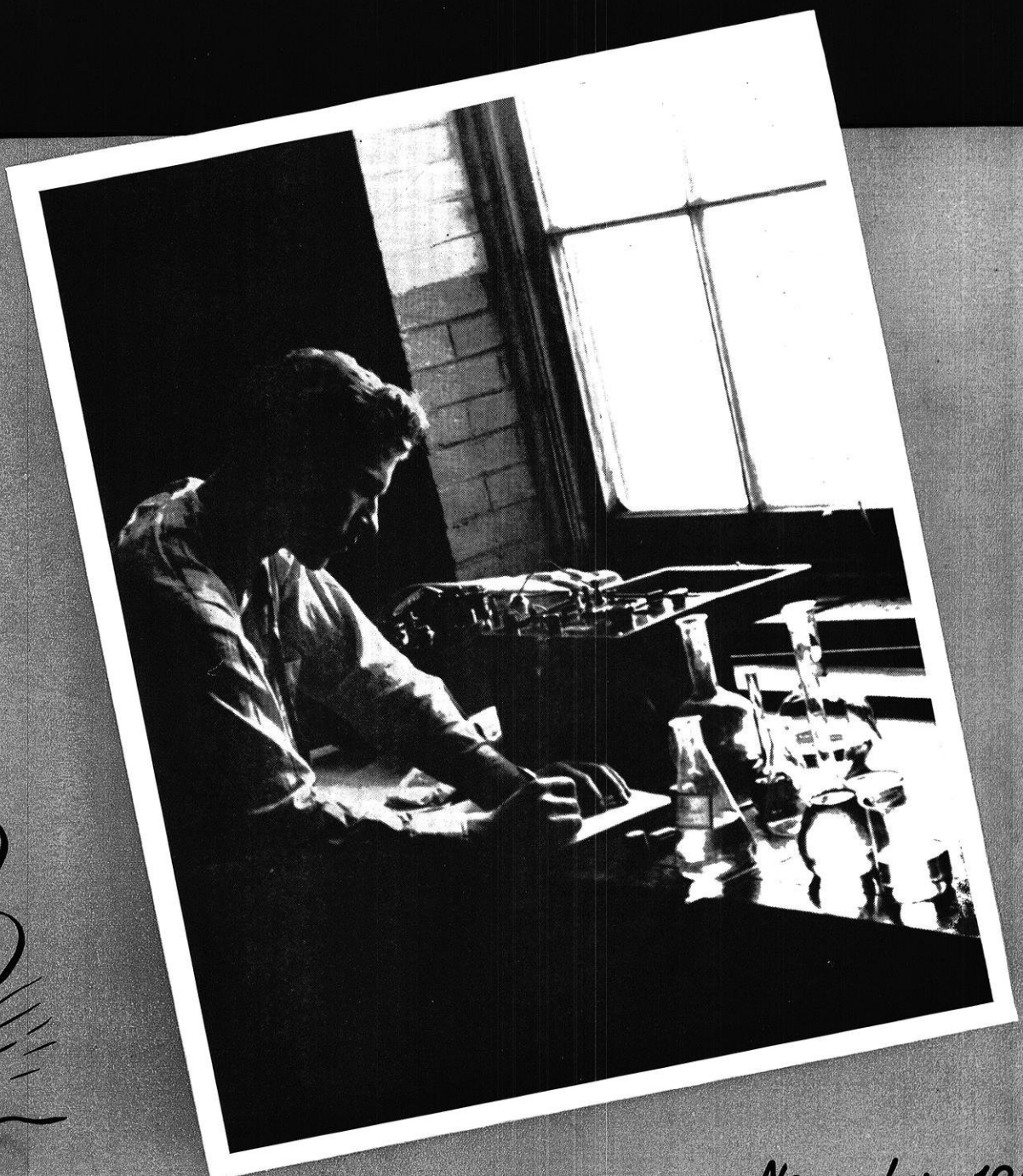
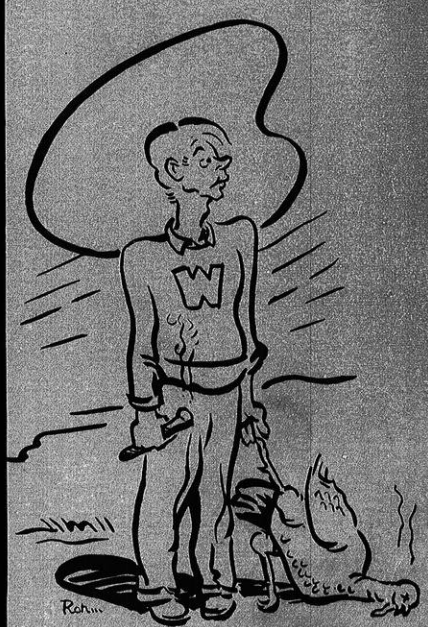
The WISCONSIN ENGINEER



Presenting

he Chemical Engineers

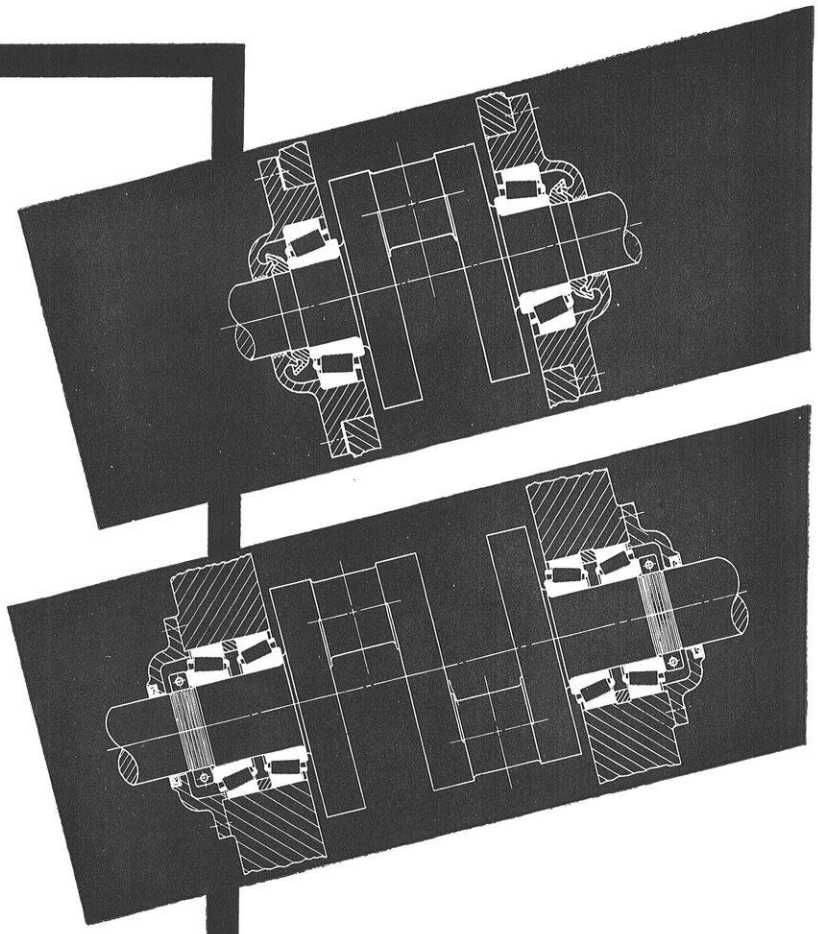


November, 1941

Plastics ★ *Mathematics* ★ *Societies*

COLLEGE MAGAZINES ASSOCIATED

WHAT BEARINGS WOULD YOU SPECIFY FOR THE CRANK SHAFT OF AN OIL FIELD ENGINE?



If you were called upon to design a gas, Diesel or steam engine for oil field work how would you support the crank shaft? If you knew your bearings you wouldn't have to think twice. You would do as most of the leading engine builders do; you would mount the crank shaft on TIMKEN Tapered Roller Bearings—single or double, according to the length of the shaft and the H.P. of the engine.

This would assure a smoothly-operating engine that would transmit its maximum power rating to the job, for main bearing friction would be eliminated. Full protection against both radial and thrust loads would be assured. Wear on the ends of the crank shaft would be prevented because all movement takes place within the TIMKEN Bearing itself. Main bearings would seldom, if ever, have to be replaced on account of wear. Crank shaft alignment would be maintained indefinitely.

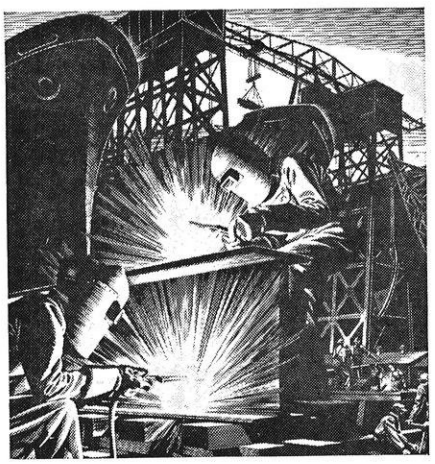
You can learn a lot more about crank shaft bearings and many other applications by studying the Timken Reference Manual. We will gladly send you a copy. Write for it. Know your bearings—be a better engineer.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN
TAPERED ROLLER BEARINGS

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

The ramparts we build...



AS OUR COUNTRY moves through perilous world events, national defense is uppermost in our minds. Is defense production fast enough? Is American industry turning out the goods? How are American engineers and production men meeting defense problems?

Here's how matters stand at Westinghouse:

We are engaged in building more than $300,000,000 worth of equipment for the national defense program. On our books are more than 3,600 defense orders. To meet schedules, we must produce $960,000 worth of apparatus every day—$40,000 every hour—between now and the end of 1941.

Every one of the Company's 26 manufacturing divisions is working on national defense projects; most of them on a three-shift basis.

Employment is at an all-time peak of 75,000, a gain of more than 25,000 since a year ago. One in three Westinghouse employees is new.

To avoid delays due to shortages in materials and to release metals needed for other defense projects, substitute materials committees have been organized in every Westinghouse plant to find ways to make use of new materials wherever possible. One result: our Merchandising Division alone has found ways to save 1,500,000 pounds of aluminum out of next year's manufacturing schedule. That's enough to build 130 Army bombers.

Many things we are making for the Navy, Army, and defense industries are military secrets, but we can mention:

Parts for control units on anti-aircraft guns.

Special land, sea, and air radio equipment for the Army and Navy.

High-speed X-ray equipment, capable of examining soldiers at the rate of one a minute.

Army binoculars.

Fluorescent lamps for "blackout" plants and others.

Secondary networks for defense plants. These are systems of power circuits and equipment so arranged that if one part of the factory is destroyed, current will continue to be available in all undamaged sections.

Some of the things we're making for air defense are:

Special meters and instruments for Army airplanes.

Lightweight generators and voltage regulators to supply and control electric power in Army planes.

Bomb fuses, now being turned out at a high rate. Production will be doubled again in a few weeks.

Plastic parts for aircraft, including Micarta pulleys and fair leads to guide the control wires inside planes.

Radio sending and receiving apparatus.

Lighting systems for airports and seadrome lights capable of converting open waterways into landing bases for seaplanes.

Now at work on propulsion equipment for more than 100 Navy ships is the Westinghouse Steam Division plant at South Philadelphia.

Driving gear for 80 merchant vessels also is being made at this plant.

Besides helping to build our first lines of defense Westinghouse is supplying power equipment urgently needed for the speed-up of its own and other defense industries.

Our East Pittsburgh Works this year will *double* its 1940 production of generating equipment.

The Generator Division completed this year the three largest water-wheel generators in the world—108,000 kilovolt-ampere giants for Grand Coulee.

The Motor Division will produce enough motors in 1941 to develop 2,660,000 horsepower; enough power to drive all the machinery in 50 steel mills. Majority of these motors will be driving machinery for defense.

This, in outline, is the way the Westinghouse Company and Westinghouse engineers are doing their share in national defense.

Westinghouse

Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

The ★ WISCONSIN ENGINEER

Founded 1896

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MEMBER OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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In This Issue . . .

Your magazine went subjective this month and examined engineering as a profession, engineering education, and the engineering societies. We hope the subject isn't boring—it is your future.

The first of a series of introductions to engineering department heads appears on page 5. This is the chemicals' month, so Professor R. A. Ragatz, new chairman of the chem engineering department, lets us know what's happening in the chem engineering building.

Plastics are the topic in many chemical circles today. On page 6 Bill Gehrke begins an easy-to-read survey of modern plastics. Why let phenols, polystyrene, polyvinyl, and co. stop you . . .

Please don't skip by the next article, "Mathematical Bridges." Author Specht was a brilliant math instructor here the last few years and tells an enthralling story of three mysterious numbers on page 8. Here's a chance to use your mathematical education for reading enjoyment.

Remember "Is Engineering a Profession?" in last month's ENGINEER, in which a lawyer said no? This issue carries a reply — "The Qualities of a Profession," on page 10, which defends our professional status.

For each initiation Tau Beta Pi, engineering equivalent of Phi Beta Kappa, requires essays from its pledges. On page 12 is the best essay from the spring initiation—"Is an Engineer Educated?" by Alfred Ingersoll.

On the next page Professor Jesse B. Kommers recalls the misspent days of his youth. It is encouraging to think that even our professors stayed up mornings doing mechanics problems . . .

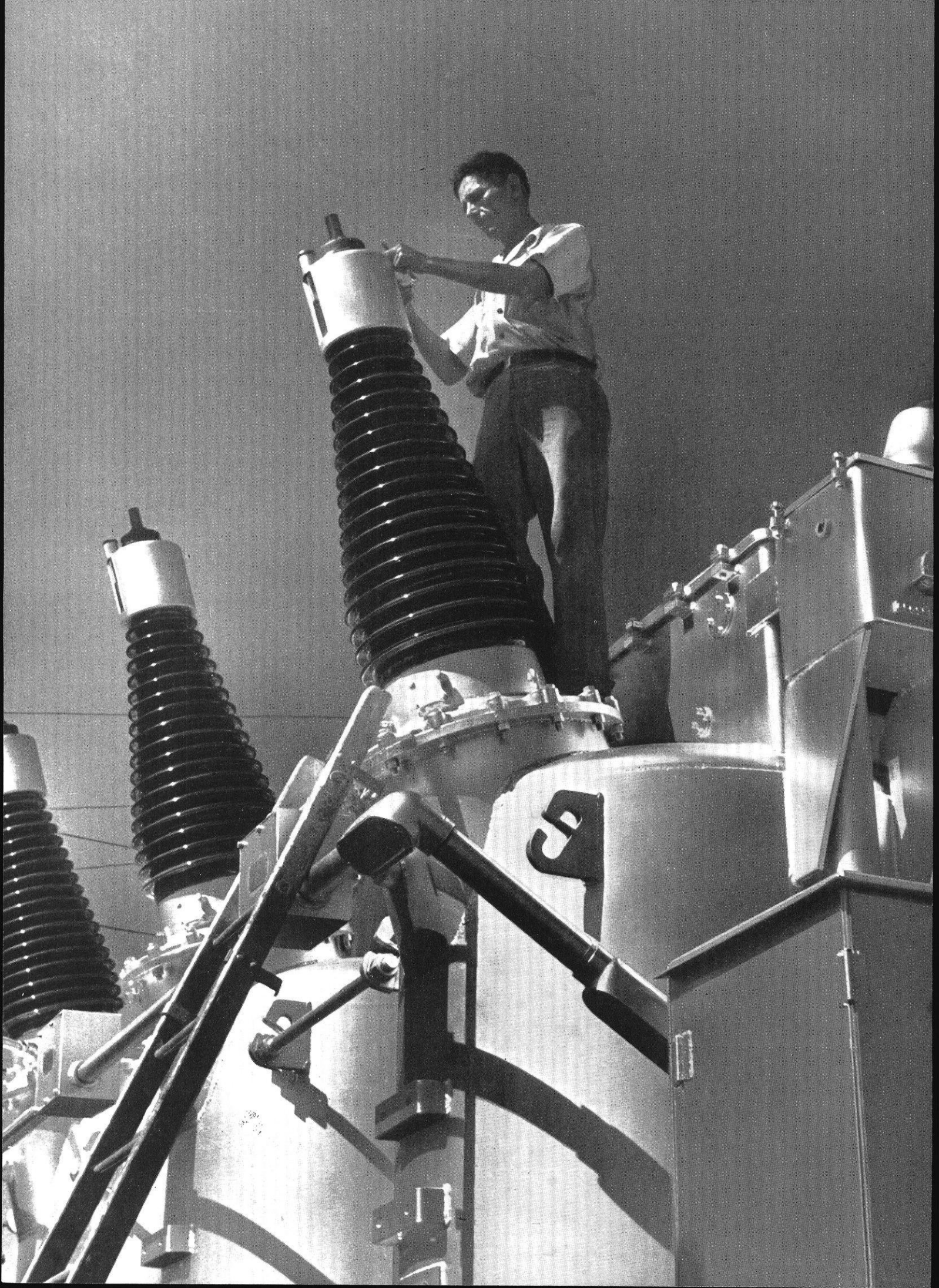
Specially featured this month are the professional engineering societies. Starting on page 14 are the descriptions of the six societies with all pertinent information as gathered by Blake Wheeler. Every student engineer should at least read about his own society.

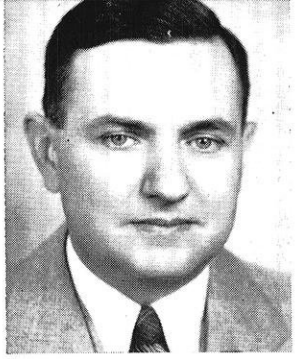
Polygon Board decided with the approval of most anyone involved not to hold an exposition this year. Read on page 16 what various students think should be done this year as a spring activity . . . something to get our minds off the lawyers . . .

Past the center of the magazine are the regular monthly features — Campus News, Alumni Notes, and Static. And we do mean Static.

The chemicals had the cover this month, with a picture of a student making a cobalt analysis. Next month it's the civils' turn to grace our pages.

The frontispiece, by courtesy of the Allis-Chalmers Electrical Review, shows a new high capacity oil circuit breaker receiving a final check-up.





The department-of-the-month . . .

CHEMICAL ENGINEERING

by Professor R. A. Ragatz

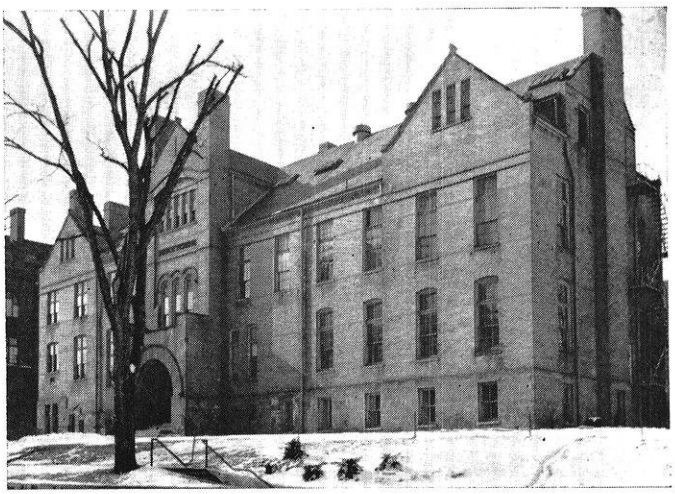
Chairman, Chemical Engineering

CHEMICAL ENGINEERING is the youngest of the five major branches of engineering. Its growth was slow during the first twenty years of the present century because of the relative unimportance of the chemical industry in our national economy. The first World War furnished a powerful stimulus to the chemical industry, both because of the heavy demand for explosives and because of the cutting off of the supply of important chemical materials from foreign sources. In the post-war years, instead of the decline which might have been expected, a continuous and healthy growth occurred. This took place largely because of the vision and foresight of corporations which pursued a policy of investing for the future by underwriting a large-scale program of research. The increased importance of the chemical industry in the post-war years resulted in a great demand for men trained in the field of chemistry, and this brought about an increase in enrollment in the departments of Chemical Engineering throughout the country. The situation at the University of Wisconsin paralleled the nation-wide trend. While the Chemical Engineering Department ranked fourth for many years from the standpoint of enrollment, it now holds second place, and is exceeded only by the Department of Mechanical Engineering.

The present course in Chemical Engineering at the University of Wisconsin is the outgrowth of a four year course in Applied Electrochemistry which was given under the jurisdiction of the Electrical Engineering Department. Under the guidance of Professor C. F. Burgess, an independent department was organized in which options in Chemical Engineering and Applied Electrochemistry were offered. Adequate quarters for the new department were secured by moving into the present Chemical Engineering Building, which up to that time had been occupied by the Department of Chemistry. After a number of years, Applied Electrochemistry was discontinued as a separate option, though some instruction in that field was given and still is being given to all students enrolled in Chemical Engineering.

Under the leadership of Professors Burgess, Kowalke, and Hougen, the Department of Chemical Engineering achieved and maintained a good standing amongst the schools of Chemical Engineering in the United States. When the American Institute of Chemical Engineers instituted its accrediting program a number of years ago, the University of Wisconsin was placed on the accredited list and has remained there continuously. The graduates of the department have been successful and have established an excellent reputation of accomplishment in the chemical industry.

An increasing emphasis, though not to the detriment of undergraduate instruction, is being placed upon graduate study and research. The Department of Chemical Engineering was fortunate in securing a grant of $10,000 per year for a period of ten years from the Wisconsin Alumni Research Foundation, and this will make it possible to conduct a more extensive program of research in the coming years. In order to get the program of research off to an effective start, Professor O. A. Hougen was appointed to hold a Research Professorship for a period of two years, and at present, he is devoting most of his time to organizing the various research projects that are being financed by the grant. The Department of Chemical Engineering is severely cramped for space at the present time, and difficulty is being experienced in providing adequate space for the increased undergraduate enrollment and for the enlarged program of research. It is hoped that adequate quarters will be provided by appropriations made at the next session of the legislature.



Chemical Engineering Building

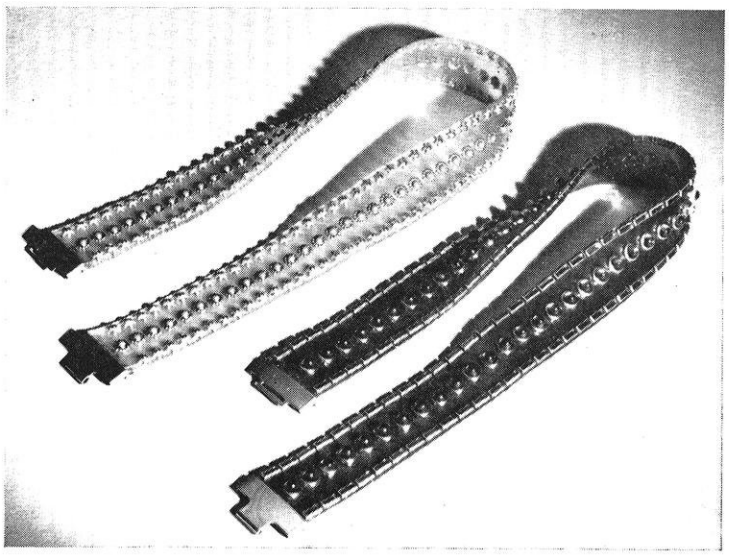
DEVELOPMENTS IN PLASTICS

by Willard Gehrke, ch'42

THE recent shortages of certain metals and the demand for speed in production has focused the attention of the world upon "Plastics." The magic of the words Plastics and Synthetic Resins has fired the imagination and is held by many as being the solution to our present metal shortages. Even the Office of Production Management has requested that plastics be substituted wherever possible for strategically important metals such as aluminum and magnesium. However, it is well to remember that plastics are not universal substitutes. They will be used only when and where they can do a job equally well or even better than the present materials doing the job; whether the material be metal, glass, stone, or wood. Fortunately we as yet acccept only those things that are economically sound, and only when plastics have proven themselves either chemically, physically, or economically will they replace metals or any other material.

Tremendous strides have been made in the plastic industry since its birth but a scant thirty years ago. Until recently the industry was growing at the rate of 30% a year. Materials that existed during the last war have been greatly improved through chemical research and better production methods. A whole host of new materials have been developed with a wide range of properties and characteristics. Designing engineers are fast becoming conscious of the specific properties which plastics make available, and are applying them successfuly.

Plastics are usually classified according to the synthetic resin base used in its manufacture; such as phenolic, cellulose acetate, cellulose nitrate, polystyrene, polyvinyl acetate, and urea. No attempt is made here to discuss in detail all the different types of plastics, but rather to present some of the more interesting and common ones.



Belts of elasticized Vinylite . . .one of the countless applications of plastics.
—Courtesy Industrial and Engineering Chemistry

Phenolic Resins are important both from the standpoint of total weight produced and in the versatility of the product. The resin is formed in large vacuum kettles according to the reaction.

$$C_6H_5OH + HCHO \longrightarrow \text{Resin}$$

Phenol Formaldehyde

The phenol may be either phenol itself, cresols, xylenols, etc., while instead of formaldehyde may be used other aldehydes or ketones. Catalysts may be used that change the nature of the reaction, and the degree of polymerization. Added to these variables are the effects achieved by changing the filler and pigment used—a finished molding powder is usually about 50 per cent resin and the remainder being filler and pigment. The wise manipulation of these variables has resulted in the development of many different types of phenolic molding materials; a few of which are heat resistant, high impact, high dielectric, moisture resistant, and acid and alkali resistant.

Some of the uses of this plastic are found in radio cabinets, telephone receivers, adding machine cases, camera cases, impregnating materials for electric windings, plywoods, etc. Prices range from 12 to 60 cents a pound.

Henry Ford's plastic car that his men have been developing for the past 12 years has a phenolic resin base. Ford, however, uses 70 per cent filler which he obtains from cotton, wheat, corn, and soybeans. The use of this plastic has reduced the weight of the car from 3000 to 2000 pounds, and is claimed to be superior to steel in everything but tensile strength. In fact, the plastic is said to have ten times the impact strength of steel. A favorite publicity stunt of Ford's is to make several sharp blows with an ax at the plastic rear deck cover of his car, without causing any apparent damage. Due to the low tensile strength of the plastic the framework of the car is made of tubular steel, with a body of 14 plastic panels fastened to it. Even the windows will be made of a crystal clear plastic, not phenolic base, however. Ford hopes for limited production by 1943. This coming year the Ford Company is building four plastic autos for road tests.

Cellulose nitrate is one of the oldest plastic materials on the market. However, it has not been faring very well in recent years, losing out to newer materials because of its flammability. Production reached a peak in 1923 and since then has been dropping off. Some uses at the pres-

ent time are for combs, fountain pens, and as a base in nitrocellulose lacquer coating.

The development of cellulose acetate rapidly replaced the nitrate in many applications, because of its superior color stability and because it is not inflammable. The acetate is obtained from cotton linters by reacting with acetic acid and anhydride and hydrolyzing. If a mixture of acetic acid and butyric acid is used, a product called cellulose aceto-buryrate results. This has much better water resistance and somewhat better impact strength than the ordinary acetate. The new models of Chrysler and Ford automobiles are using large quantities of this plastic for interior trim.

Cellulose nitrate was the first plastic to be used in making safety glass, but it turned yellow upon exposure to sunlight and weathering. Upon the development of cellulose acetate, its superior color stability soon resulted in it capturing the safety glass trade. The acetate in turn has now been almost entirely replaced by polyvinyl butyral, whose superior impact properties warrant its use in spite of higher cost.

The variety of the available vinyl compounds permits the preparation of many different vinyl resins of widely different properties. Some of the outstanding properties are their high resistance to oil, water and fire; along with the fact that they are odorless, tasteless and are not oxidized under the influence of sunlight and air. The principal chemical reaction is:

$$\underset{\text{Acetylene}}{CH{\equiv}CH} + \underset{\text{Acetic Acid}}{CH_3COOH} \longrightarrow \underset{\text{Vinyl-Acetate}}{H_2C{=}CH{-}O{-}C(CH_3)O} \longrightarrow \underset{\text{Acetate}}{\text{Polyvinyl}}$$

Polyvinyl butyral has in the last two or three years replaced cellulose acetate as an interlayer for automobile safety glass. In spite of a cost of about $1.25 a pound, it is estimated that 75 per cent of all interlayer material during 1940 was of this resin. The reason is its superior ability to withstand impact and its adhesion for the glass once it becomes broken.

Vinyl resins are receiving much publicity as a result of their use for wearing apparel. Many of the plastic belts, wrist watch bands, suspenders so popular at the present time are of this type. Filter cloth made from these resins is fast becoming popular for use in handling industrial chemicals. Other uses include metal laminations, bullet proof gas tanks, phonograph records, dentures, beer can coatings, and insulation for wire cables.

Although polystyrene was first produced nearly one hundred years ago, polystyrene resins were first made available in 1937, and promise to become one of the most important. The principle reaction is:

$$\underset{\text{Benzene}}{C_6H_6} + CH_2{=}CH_2 \longrightarrow \underset{\text{Ethylene}}{C_6H_5CH_2CH_3} \longrightarrow C_6H_5CH{=}CH_2 \longrightarrow \text{Polystyrene}$$

It gives a final product of clarity and brilliance that cannot be achieved with other plastics. It is the lightest of all commercial plastics, and its resistance to water, acid and alkalies is unsurpassed. Furthermore it is superior to other resins with respect to heat insulation, dielectric strength and resistivity.

Uses for polystyrene include television coil forms, high and low frequency radio insulating parts, closures for mineral acids, liquor dispensers, clock crystals, aircraft instrument panels, dishes and costume jewelry. Prices are somewhat higher than for phenolic resins; ranging from 45 cents to 60 cents a pound.

During the present emergency much has been heard about substituting plastics for strategically important metals. However, plastics should not be regarded as mere subsitute material. Many such substitutes made during the present emergency will be permanent, for plastics are frequently superior. There are no less than 12 separate groups of plastics, covering a wide range of characteristics. Established materials are constantly being improved and new ones developed in this promising field for the chemical engineer.

Urea resins have been enjoying an increase in sales every year for the past three years, due largely to their increasing use in the field of baking enamels. Here is a plastic that can literally be made from coal and air. The chemical recation is:

$$CO_2 + NH_3 \longrightarrow \underset{\text{Urea}}{(NH_2)_2C{=}O} + \underset{\text{Formaldehyde}}{HCHO} \longrightarrow \text{Resin}$$

Urea resins exhibit the highest tensile strength of any plastic, and also possesses the greatest hardness. They also have excellent color stability and are high in dielectric strength. A large outlet for urea resins is in liquid form to be used in baking enamels. The smooth white coating on the electric refrigerator is probably derived from a urea resin. The liquid resin is also being used as an adhesive for plywoods in the furniture and aircraft field. Prices in the powder form are between 27 and 35 cents per pound; somewhat lower than for polystyrene but compete with the higher priced phenolic resins, finding applications as lighting fixtures, buttons, tableware, and display containers.

Probably the newest plastic and the one being followed with the most interest at the present time is "Cafelite," a plastic made from the coffee bean. For years Brazil has been seeking uses for its surplus coffee, and now a young New York chemist has developed a process for making plastics from the coffee bean. Brazil has set up a pilot plant capable of producing 4,250,000 pounds of molding powder a year, along with by-products of caffein, coffee oil, cellulose and furfural. The sale of the by-products, it is believed, will be sufficiently profitable to permit the selling of the Cafelite plastic for from 7 to 10 cents a pound. This is about one-half the price of the cheapest plastic now on the market. Furthermore, Brazil has awarded tentative contracts for machinery to turn out 100 times its present plant capacity, or more than half the world consumption of plastics at the present time. It is no wonder the Cafelite is being watched with a great deal of interest upon the part of the plastic industry in this country.

A short story about three numbers—Pi, i, and e

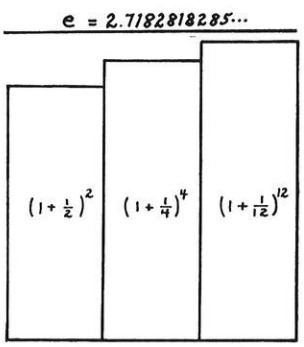
MATHEMATICAL BRIDGES

by Robert Specht

Department of Mathematics, University of Florida

A MATHEMATICIAN, both wise and waggish, once defined mathematics as "The subject in which we never know what we are talking about, nor whether what we are saying is true." Without arguing either the meaning or the justice of this definition, we shall exploit another aspect of many-sided mathematics — that aspect implied in the zany's definition of mathematics as "that subject in which, whatever one is talking about, he is talking about something else." For example, the engineer can solve the problem of bending a steel girder by playing with soap bubbles. Exactly the same mathematical machinery can be used to describe the tension in a pulley or the healing of wounds. When I describe to you the random walk of a drunk, I am also telling you about the diffusion of a lump of sugar through a cup of coffee. And I can talk either about the cooling of that same cup of coffee in a breeze or about casualties in infantry warfare merely by changing the names of the characters in my mathematical story. Both the biologist and the gambler can use the binomial expansion of $(a+b)^n$, the one to study heredity, the other to describe the fall of coins or the rolling of dice. Mathematics, then, forms bridges between many seemingly unrelated subjects. The first bridge we shall cross is a number.

Suppose, by a bold stretch of the imagination, that we have found a bank that pays 100% interest a year. If we deposit one dollar and if the interest is compounded annually, then at the end of the year our bank balance is two dollars. If, however, the bank reckons its interest every six months, then at the end of twelve months we have, from the formula $S=P(1+i)^n$, $(1+\frac{1}{2})^2$ or $2.25. (In this formula, S is the bank balance at the end of n interest periods due to a deposit of P dollars that draws interest compounded at a rate of i each interest period.) If the bank compounds interest quarterly, then our dollar will grow to $(1+\frac{1}{4})^4$ or $2.44, while if the teller figures interest once a month, our bank book will show a balance of $(1+1/12)^{12}$ or $2.61 at the end of the year. Let us imagine this process continued and the interest compounded not each month but each week, each day, each hour. If we were to attempt to carry this out in practice, we should, of course, drive the poor teller insane. We can continue it, however, in our imagination, and think of our bank balance growing by jumps as the interest is added each minute, then each second, and so on. If the process is carried to its limit and the interest is compounded continuously, shall we be able to retire at the end of the year?

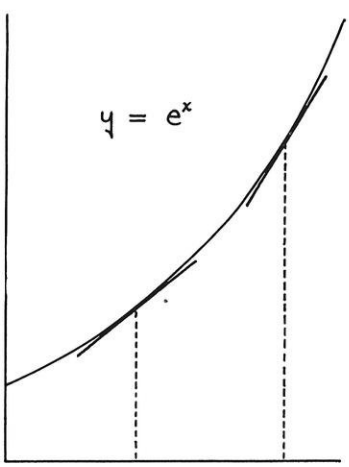


Unfortunately, no. We shall have to our credit only $2.7182818285 . . . , assuming that our tireless teller also keeps books to ten decimal places. This number appears so often in mathematics, and, indeed, in such unexpected places, that we shall invent a special name for it; we shall refer to it as *e*.

Let's look first at some of the more orthodox appearances of our friend *e*. We met it above as the limit of the sequence $1+1$, $(1+\frac{1}{2})^2$, $(1+1/3)^3$, $(1+\frac{1}{4})^4$, . . . , or

$$e=\lim_{n\to\infty} (1+1/n)^n.$$

It makes an appearance also in the answer to the question: what function has a graph whose slope at any point is equal to the height of the curve at that point? In fewer words, what is y if $dy/dx=y$? The only curve that has this very nice property is $y=ke^x$, where k may be any number whatever. These two properties of the ubiquitous *e* account for its occurrence in a great many "growth-and-decay" problems of which we shall look at a few.



For a certain period of its development, most communities, either of men or microbes, exhibit a population growth that is exponential. From 1790 to 1890 the census figures of the U. S. followed approximately the relation

$$\text{population (in millions)}=3.9\ e^{0.028\,y},$$

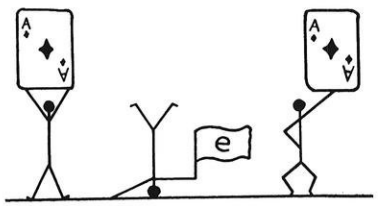
where y is the number of years after 1790. On the other side of the picture, anthrax spores treated with a 5% solution of phenol were found to exhibit a similar population pattern but with a negative number replacing the 0.028 above so that the history is one of decay rather than growth. In each case the rate of increase or decrease of population at any time depends upon, and in fact is proportional to, the population at that time.

The pressure of the atmosphere grows less as we rise above sea-level, and the intensity of sunlight that has filtered through water decreases as it penetrates to greater depths, and in each case the decay is exponential.

We met our ubiquitous acquaintance *e* originally as the limit of the sequence $(1+\frac{1}{2})^2$, $(1+1/3)^3$, $(1+\frac{1}{4})^4$, $(1+1/5)^5$, and so on; *e* can also be evaluated by adding up as many terms in the series

$$e=1+\frac{1}{1}+\frac{1}{1\text{x}2}+\frac{1}{1\text{x}2\text{x}3}+\frac{1}{1\text{x}2\text{x}3\text{x}4}+\ldots$$

as one's patience allows. Only fifteen terms of the series are required to give the first ten decimal places correctly. Given somewhat more patience and two decks of playing cards, one can calculate *e* in a less respectable manner. The two shuffled packs of cards are placed side by side, and two cards, one from each pack, are drawn repeatedly and discarded. No card is replaced, and the trial is completed when a pair is drawn (e.g., two Aces of Diamonds) or when the decks have been exhausted without coming upon a pair. Then it is not difficult to show that, as the total number of trials increases, the fraction (total number of trials) ÷ (number of trials in which no pair was found) approaches more and more closely the number *e*. (To be more precise, the limit of the fraction above is *e* only when each deck has not 52 but infinitely many cards. The inaccuracy in the statement above, however, does not affect the first 69 decimal places, and we shall not quibble over it.)



Finally we notice that *e* forms not only a bridge between playing cards and barometer readings, it connects not only radio-active decay with the growth of a tree, but it also ties together the base of the complex number system, $i=\sqrt{(-1)}$, with another number which, like *e*, plays a fundamental role in mathematics. The relation in question is the wonderfully simple one:

e to the $i\pi$ power $= -1$.

We met π in grammar school as the ratio of circumference to diameter of any circle. But π, like *e*, appears in many places in mathematics, and circles form only a small part of its repertory. Let us look at a few of the formal patterns in which numbers may be arranged to yield π.

Just as we added more and more terms in the previous series to approximate more and more closely the value of *e*, so too we can write down an infinite series for π:

$$\frac{\pi}{6}=\frac{1}{2}+\frac{1}{2}\frac{(\frac{1}{2})^3}{3}+\frac{1\text{x}3}{2\text{x}4}\frac{(\frac{1}{2})^5}{5}+\frac{1\text{x}3\text{x}5}{2\text{x}4\text{x}6}\frac{(\frac{1}{2})^7}{7}+\ldots$$

If in the series

$$\pi^2/6=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots$$

we drop out every other term, we get

$$\pi^2/8=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$$

We have also

$$\pi^2/12=\frac{1}{1\text{x}2}+\frac{1}{2\text{x}4}+\frac{1}{3\text{x}6}+\frac{1}{4\text{x}8}+\ldots$$

$$\text{and } \pi^4/90=\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\ldots$$

In terms of products rather than sums, we have the curious relations

$$\sin\theta=\theta\left(1-\frac{\theta^2}{\pi^2}\right)\left(1-\frac{\theta^2}{2^2\pi^2}\right)\left(1-\frac{\theta^2}{3^2\pi^2}\right)\ldots,$$

$$\cos\theta=\left(1-\frac{2^2\theta^2}{\pi^2}\right)\left(1-\frac{2^2\theta^2}{3^2\pi^2}\right)\left(1-\frac{2^2\theta^2}{5^2\pi^2}\right)\ldots,$$

$$\frac{16}{3\pi}=\frac{4\text{x}5\text{x}5\text{x}6\text{x}6\text{x}7\text{x}7\text{x}8\ldots}{2\text{x}4\text{x}4\text{x}6\text{x}6\text{x}8\text{x}8\text{x}10\ldots}$$

$$\text{and } \frac{\pi}{2}=\frac{2\text{x}2\text{x}4\text{x}4\text{x}6\text{x}6\ldots}{1\text{x}3\text{x}3\text{x}5\text{x}5\text{x}7\text{x}7\ldots}$$

If we admit not only double-decker fractions (a/b) and triple-decker ones $\left(\begin{smallmatrix}a\\b/c\end{smallmatrix}\right)$ into mathematical citizenry, but if we also allow infinite-decker or continued fractions into polite society, then we can write

$$\frac{4}{\pi}=1+\cfrac{1^2}{2+\cfrac{3^2}{2+\cfrac{5^2}{2+\ldots}}}$$

The total area between the curve $y=1/(1+x^2)$ and the x-axis turns out to be just π square units, while the area under $y=e^{-x^2}$ (try sketching both of these curves) is $\sqrt{(\pi)}$.

We found that *e* could be evaluated with the help of two decks of playing cards. A similarly daft scheme can be applied to calculating the value of π. This time we need only a matchstick and a surface ruled with equidistant lines (e.g., the cracks on the floor). We drop the match (of length m) on the floor and note whether or not it comes to rest touching a crack. If "a" is the distance between the parallel lines on the floor, then, as we continue our experiment longer and longer, the quantity (2m/a) x (total number of times match is dropped) ÷ (number of times match touch a line) will approach π. If we lack the match and floor, science need not come to a standstill. We have merely to choose a set of numbers at random and write them down in pairs. Each pair is now examined to see whether the two numbers have any common divisors. We calculate the quantity 6x(total number of pairs) ÷ (number of pairs that have no common divisor) and find that as we examine more and more pairs this quantity approaches π^2.

We have left many other mathematical bridges uncrossed, bridges connecting such unrelated subjects as the spectrum of methane and the number of ways in which the number four can be written as a sum of positive integers (4, 3+1, 2+2, 2+1+1, 1+1+1+1), bridges from the path of a toy wagon pulled along the street by a child

(Continued on Page 24)

THE QUALITIES OF A PROFESSION

Last month the Wisconsin Engineer *printed an article entitled "Is Engineering a Profession?" The article here, while not written from the diametric point of view, brings out a number of points in support of the belief that engineering is a profession. The author, Vannevar Bush, is an electrical engineer and a fellow of the AIEE. This material is a condensation of the original article, "The Qualities of a Profession," which appeared in the April, 1939, issue of* Electrical Engineer.

HERE I wish to develop the relationship of engineering to the other professions, the professional traditions which engineers inherit, and the outlook for the engineering profession in view of its unique relationship to society.

I will run through the history of professions briefly, but through the history runs a thread which should be particularly emphasized.

In every primitive tribe there was some sort of a medicine man. He was a man apart, the advisor of the clan rather than its titular leader. He spoke, in his field, with authority, and this rested on a special knowledge which he was supposed to possess. The medicine man was the progenitor of the professional man today.

The descent of the engineer from the medicine man has been highly involved; and it will clarify some obscure relations if we trace part of it; for there is a central thread which runs through the tale.

The medicine man, and the members of the pagan priesthood which succeeded him, was characterized by numerous attributes. He had a strict code of conduct. He trained neophytes, subjected them to a long period of apprenticeship, initiated them into the mysteries, and inculcated them with pride in the cult, and rigid discipline in its formulas. He severely restricted his members by intellectual hurdles to be surmounted. He spoke a special language. He sat as advisor in the councils of the mighty. But, more essential than all of these, he ministered to the people.

This was the first professional group, and all others have been derived from it; not every attribute has been maintained as new professions have emerged, but to a surprising extent their counterparts can still be found. In every one of the professional groups, however, will be found the central theme intact—they minister to the people. Otherwise they no longer exist as professional groups.

Ministry needs a new definition for our purposes. Ministry is not service; ministry carries with it the ideas of dignity and authority; it connotes no weakness, and offers no apology. There is no fog of subservience surrounding the concept. The physician who ministers to his client takes charge by right of superior knowledge of a highly personal aspect of the affairs of the individual. The attorney assumes professional responsibility for guiding the legal acts of his client, and speaks with the whole authority of the statutes as a background. It is in this higher sense that we trace the thread of ministry to the people.

This is the fuel which has kept alight through many ages the professional spirit. Every time the fuel has become exhausted the light has gone out. It has not mattered how much was retained of trappings and mysticism, nor what the profundity of utterances, there has been no true profession that has not with dignity and authority advised and counselled the people; that has not guarded the commonweal. For a true profession exists only as long as the people allow it to maintain its prerogatives by reason of confidence in its integrity and belief in its general beneficence.

The monastic orders, under divers religions, springing up as outgrowths of the simpler system of priestcraft, have exemplified the theme in two ways. Some have preserved, adorned, and extended the knowledge of their time and place. These have their modern counterparts in the scientific and learned groups, the custodians of our culture, and the source from which flows new knowledge for the use of man. Other orders carried to great heights the direct ministry to those in misfortune and distress; often at great sacrifice, as did the early Jesuits among the Indians of our West. Both groups have remained high in the esteem of the people and both have endured. Occasional groups have lost the thread, and have, for example, become military orders devoted to self aggrandizement; and these have disappeared.

A very early offshoot was the profession of medicine, for ministry to the ill was a very primitive need. It has had a long and distinguished history. Utilizing the fruits of science, it is today in full tide of accomplishment for the benefit of mankind.

The profession of medicine, by reason of its very nature, has preserved many of the attributes of the ancient forms. It selects its neophytes by rigorous intellectual elimination, trains them over many years, and seeks to endow them with the philosophy of the profession. It severely restricts its own numbers, perhaps too severely in view of the task before it. It preserves itself apart, by a special language.

Through long ages it has held well to its ideal of simple ministry to the people, and has disciplined under its codes those who would use its special privileges for other ends. It has guarded the people against their own folly, and has been properly militant in maintenance of its sphere in the common sphere.

To treat the origins of the professions of law, its countercurrents and codes would require an article in itself. Here is a field in which the preservation of the true of the true philosophy of a profession is intricate indeed. En-

dowed with special privileges under the law, it largely regulates its own conduct. Never quite successful in the recruiting, training, and indoctrination of its neophytes, its maintenance of adherence to a high code of conduct is rendered more difficult. Counselling with the government, and by the nature of its mission, participating directly therein, it is a great power for good or for evil. It certainly strives, as an organized profession, for the public welfare; but its zeal in this regard is not always such as to cause it to disregard the special welfare of its own group, and the two are sometimes hard to disentangle. It ministers to those in legal distress with great effectiveness; but the distressed often appear in pairs. It is hardly judged as a whole by the public. Certain it is, however, that those of its membership, on the bench or at the bar, who have risen to the highest position in their devotion to professional ideals, are respected and honored by the public. Certain it is also, that should this respect falter, we, as a democracy, would soon be in a sorry state.

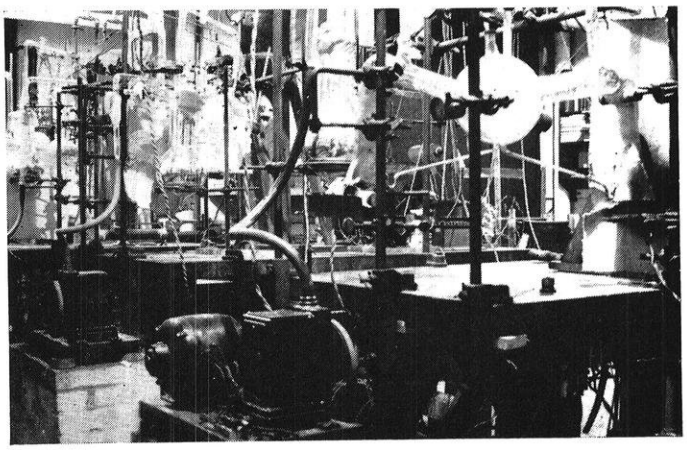
But our principle concern here is the engineering profession, and we first inquire, what is the engineering profession; is it a profession at all; and if it is, will it develop into the full stature to which the importance of its works entitle it to aspire.

It is relatively young. The military engineer appeared in the first steps of the mechanization of warfare, when forts began to take shape. His counterpart in peaceful affairs was called the civil engineer. With the Industrial Revolution, and especially with the spread of mechanization from the factories into every walk of life, engineering has become extremely diversified. Applying science in a broad economic manner to the needs of mankind is its broad field. Its disciplines are spread over all the sciences as they become thus applied, and embrace also portions of economics, law, and business practice which are integral parts of the process of application. It is somewhat loosely organized as professions go. To a minor extent only, it limits its numbers; but the very strictness of its essential disciplines provides some selection of its neophytes.

Until recently it has done very little in an organized fashion to inculcate its younger members to the philosophy of the profession, leaving this largely to those of its individuals who are also members of the teaching profession. That branch which represents the consultant and others to a degree, have drawn codes; but there is no body of codified principles which is accepted and applied by the profession as a whole. It has no highly distinct language or jargon, for it must continually work with laymen. These, however, are incidentals. The important point is this: Does it have a central theme of ministering to the people? Most certainly it serves the public in many ways, but are its individual members activated primarily by the professional spirit of dignified and authoritative counsel and guidance?

In order to inquire into this weighty question, we need to digress a moment to consider another large group of the population, the modern men of business who have derived from the ancient traders and merchants. The merchant class has not usually been a professional grouping in the true sense; and engineering, which has derived its philosophy from this source as well as from science, naturally partakes of the heritage of both groups. Business has served the public, of course, but its main theme has been the profit motive, a salutary object when restricted by law to the ethical procedures in its pursuit, but not a professional objective.

One of the most encouraging signs of the times is the gradual emergence in our day of the truly professional man of business. Scattered, not organized, with no sign of professional trappings, they are nonetheless possessed of a high mission, which needs only formulation and recognition in order that they may constitute a new and strong profession. Out of this trend, as competition for industrial existence becomes tempered, should emerge a new profession with its own traditions and beliefs, which is capable of managing prosperity so that it will be conducive to the health of a nation; and there is grave question whether this objective can be reached in any other way.



" . . . from the quiet cloisters of science . . . "

Engineering, however, derived jointly from the quiet cloisters of science and from the turmoil and strife of aggressive business, and it is no wonder, therefore, that it should wobble a bit as it seeks to evolve its own professional philosophy. Just as it is not reasonable to expect the young neophyte to grasp the idealism of his calling, so it is perhaps not reasonable to expect a profession which is so young and which has grown so fast to have found itself in this regard.

The period of initiation into any profession should extend into maturity. Only when members reached the full bloom of manhood did the ancient orders entrust the mysteries to their care. The young tyro served his apprenticeship under constant tutelage and close guidance by mature minds, and this we still find in every profession. As apprentice, as employee, he is called upon to prove himself, before he enters into that relationship where his opinions are controlling in his special field; and some there are that never emerge from the close control and mere exercise of technical proficiency. In the engineering profession this emergence usually is circumscribed by the fact that most engineers operate as members of industrial

(Concluded on Page 24)

Is an Engineer Educated?

Tau Beta Pi prize-winning pledge essay

by Alfred C. Ingersoll, c'42

FOR sake of brevity the title of this essay reads, "Is an Engineer Educated?" The real question is: "Is the engineer graduating from any one of the engineering courses at the University of Wisconsin an educated man?" The answer to this question rests entirely upon the definition of education with particular reference to the engineer.

There is no question that the graduating engineer has received a technical training and that presumably he knows a good deal about a certain field in the realm of applied science. At this point there must be a clear line drawn between training and education. Training means skill or proficiency in a specialized field of endeavor. A seal can be trained to balance a ball on its nose but it obviously is not educated. Education implies the possession of a particular skill plus a general knowledge and appreciation of a great many other fields.

An engineer may design a structure of wood. He knows the exact values for the allowable stresses in tension, compression, and shear, for every kind of wood but does he have the faintest idea of how a tree actually grows and why some wood is better than other wood? He is completely surrounded by living things but does he have any conception of the mysteries of plant and animal life that comprise the study of biology?

An engineer uses the English language every day of his life. He learns, or should learn, how to use it accurately and how to convey his messages with a minimum of effort and a maximum of clarity. But does he realize that aside from being a powerful tool the English tongue can be a thing of beauty? In fact can he recognize and appreciate beauty when he comes in contact with it? The chances are that he vaguely remembers from his high-school days such names as Shakespeare, Byron, and Keats, but few indeed are the engineers on this campus who choose a course in English literature as an elective.

An engineer may conceive, design, and construct a machine or a part of a machine. He knows the exact purpose, function, and value of this part and its integration into the whole machine or system of production, but does his scope reach farther than this? Does he have a clear conception of the place of this and other machines in our modern civilization? Does he have any idea of the sweeping changes wrought throughout the world by the industrial revolution and subsequent developments? Does he grasp the tremendous significance of Oliver Goldsmith's "Deserted Village"? Indeed, has he ever heard of it?

An aeronautical engineer is working day and night over a drafting board. He is designing aircraft to help fight for the cause of democracy in the present war. He undoubtedly has a clear idea of a democracy and of a dictatorship but does he fully realize just why the war is being fought? Does he have a knowledge of the factors which have led to the installation of these governments in various countries? Does he have an appreciation of the history and background of the people for whom and against whom he is pitting his strength? In short does he know for what real purpose he is designing this aircraft?

The answer toll of the foregoing questions is: Yes, he can if he wants to. He can learn about all of these things, either on his own or with the help of the institution. If he is the average student engineer the chances are small that he has done anything about it. It is likely that he has filled his electives with technical courses leading to a specialization in one narrow field. The principal argument for this is that one should take advantage of the instruction offered by the school to get the difficult technical courses, while the other material may be absorbed by reading and personal study. While this is true enough, the number of student engineers who avail themselves of the opportunity for self education is small indeed.

The educational policy of the California Institute of Technology states that "the undergraduate course in engineering shall be of a fundamental character with a minimum of specialization in the separate branches of engineering. It shall include a thorough training in the basic sciences and a large proportion of cultural studies. It shall include professional subjects common to all branches of engineering. It is hoped in this way to provide a type of collegiate education endorsed by leading engineers—one which avoids on the one hand the narrowness common among students in technical schools, and on the other hand the superficiality and lack of purpose noticeable in many of those taking academic college courses."

It is my contention that if the University of Wisconsin were to adopt a similar policy and introduce into the engineering curriculum such studies as history, sociology, biology, and English literature, the graduating students would in reality be educated men, and they would eventually find their way into higher walks of engineering and social life than they do under the present system.

Gray hair on our pages . . .

OH, TO BE YOUNG AGAIN!

by Prof. J. B. Kommers

Department of Mechanics

WHEN people grow older they have a fondness—one could almost raise it to the dignity of calling it one of their great indoor sports—for talking about the times when they were young. There must be something glorious, alive, and romantic about being young; otherwise older people would not be addicted to this habit to the extent that they are.

I do not claim to be an exception to the above charge. One of the things that I remember especially about my high school and university days is the great number of times we seemed to have something to laugh about. Perhaps in those days there were more things to laugh at than there are at present, but I prefer to think that it was largely due to a certain mischievous and impish quality that resided in us.

Prof. J. B. Kommers

In our university days I suppose we did all the traditional things that students do to each other. However, we also allowed events and circumstances to guide us and stir our imaginations, as the following incident will show.

In my sophomore year my room was on the second floor and there were also some students occupying rooms on the floor above me. One of the men on the third floor differed from the rest of us by getting up at about six o'clock in the morning. We didn't object to early rising if it was done quietly, but he had a persistent habit of bounding down the stairway to the second floor bathroom, like a young cyclone practicing its stuff.

We decided that this noisy habit should be curbed somewhat, and that our upstairs friend should be given a slight hint that we preferred to sleep in the morning.

One evening, therefore, after we were sure that our bounding bearcat had gone to bed, we removed the pins from the hinges of the bathroom door, and left the door slightly ajar. We then arranged that everyone would be awake in the morning to see what happened. The next morning, as usual, our friend came rushing down the stairs and burst into the bathroom. The last we saw of him was when he was frantically clawing his way up the door as it fell in.

That same year I had a freshman for a roommate, and next door to us lived a junior engineer, older than the average junior because he had spent several years in practical work. This man seemed to take a fatherly interest in us, and it was his habit to come to our room at about nine or ten o'clock in the evening for a little chat.

We decided that it might be interesting to try a little experiment. We filled a tin cup with water, and placed it on the top edge of the outer end of the door, the latter being left slightly ajar. The mechanics of the idea was that if the door were opened somewhat suddenly, the frictional force on the bottom of the cup would be insufficient to give the cup the acceleration that the door had, with the result that the cup would fall on the person entering. The resulting waterfall, while small, would still be wet.

Because of the personal characteristics of our prospective visitor, even in this little experiment the incidence of the unexpected almost wrecked our hopes. Our friend finally arrived, but because of his unhurried disposition, he opened the door so slowly and deliberately that the cup of water remained quite undisturbed. For a few moments we thought the laugh would be on us. Fortunately for the purposes of the experiment, when he got inside the room he very slowly backed against the door to close it. This allowed the lintel of the doorway to shove the cup off, and after that gravity acted in the usual way.

One day in freshman English, while studying one of Wordsworth's poems, we encountered the line: "The child is father of the man." The instructor inquired whether anyone in the class could quote a somewhat similar line. He was probably thinking of the saying: "As the twig is bent the tree is inclined." One of the boys, an Irishman, raised his hand. He was sure he knew of a similar line. He set the class in an uproar with the saying: "Necessity is the mother of invention."

And so the years roll along, and you arrive at a time of life when most men can comb their hair with a towel. At that time you take a certain amount of pride in the very thing that worried you when you were young, that is, looking younger than your years. I suppose there isn't a man living—or a woman either—that doesn't think that he carries his years well. It certainly is wonderful to be young!

THE BIG SIX

on the Engineering Campus

MEN entering the field of engineering logically have similar interests. It is also logical to expect that these men should be organized into groups representing their professions. In the engineering world the five major branches, mechanical, electrical, chemical, civil, and mining and metallurgical, are each represented by a professional society. In addition the automotive industry has instigated the creation of a sixth important group largely within the mechanical engineering field. These six organizations are, respectively, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Chemical Engineers, the American Society of Civil Engineers, the American Institute of Mining Engineers, and the Society of Automotive Engineers.

On the Wisconsin campus there is a student branch of each of these societies, fulfilling professional and social relationships for engineering students. Students, with the aid of a faculty advisor, organize and administer these branch societies.

ASME

The American Society of Mechanical Engineers offers a varied program designed to bring the student closer to industry into which he will likely emerge, and in addition the program committee attempts to bring in a non-technical factor so that the society may be valuable to all from freshmen to seniors. A popular type of entertainment is to have speakers from industry address the group. Frequently the student branch of ASME meets with the Rock River Valley Section. On November twenty-seventh one of these meetings will be held, at which time Mr. Koehring of the General Motors Corporation will speak on "Powdered Metallurgy."

Occasionally speakers are drawn from the student group, as in the case of the discussion of the smoke meter by one of the seniors last year. Also last year the ASME held a dance in the Mechanical Engineering building lobby. Its huge success warrants another trial this fall. And, of course, every spring the boys have their annual picnic.

Although local membership may be secured for a one-dollar fee, it is more practical to pay three dollars and become a part of the national organization. This not only entitles the student to a monthly copy of the magazine, "Mechanical Engineering," but relieves him of the ten-dollar initiation fee assessed those entering the organization after completion of school. Each year the national society sponsors a contest for the best technical paper.

Don Jelinek, a junior from Milwaukee, is chairman of the local student chapter. Last year he assisted the Polygon board by working on the ticket committee for the exposition and decorations for the dance, besides finding time to attain sophomore honors. There is no doubt in Don's mind with regard to his chosen work for he says, "I like everything about engineering."

The American Institute of Electrical Engineers under the leadership of Roger Robbins sponsors much the same type of programs as the ASME. Meetings are scheduled once a month at which some faculty member, representative of industry, or student provides the entertainment. After the program, refreshments are provided. This group is fortunate in that there is a local section of the AIEE here in Madison which invites the student chapter to its monthly meetings. Students are usually also invited to attend a dinner preceding the meeting. In the social line there is a great deal of fellowship following the meetings, and the society does hope to promote a dance this year in addition to a picnic next spring. It has already managed a picnic during good weather this fall.

In this organization students may be national members for a fee of three dollars per year and receive about the same advantages as the ASME members; i.e., a monthly issue of "Electrical Engineering" and no initiation fee after graduation. This chapter makes an appeal especially to the lower classman with a local membership requiring only a fifty-cent per year fee.

Roger Robbins is a senior electrical engineer from Belmont, Massachusetts. A large part of his time away from studies has been spent working with the Congregational student group. Last year he was president of that organization, and this year he succeeds Howard Boorman as president of University Religious Council. In the physical line Rog has participated in practically all intramural sports and in Hoofers' Club. When asked for any comments which he might make as a senior in the engineering school, Rog says, "We still need a new Electrical Engineering building."

The American Institute of Chemical Engineers maintains a local chapter on the Wisconsin campus, but the membership is purely local. There is a one-dollar membership fee which provides refreshments for the meetings and any other expenses that the organization might incur. Very active in its membership drive, the group already has about 130 members of the 400 enrolled in the department. Attendance at the last meeting of the AIChE was 170, which distinguishes this society from some of the others which can scarcely get enough of a turnout to justify obtaining a good speaker. Since the Chemical Engineering building auditorium is now too small this society engages a room in the Union for its meetings, which are held as nearly as possible on the second Wednesday of each month. The business meeting is followed by some

sort of program, after which refreshments are served and the boys sit around talking "shop or otherwise." Here again a large part of the talks are based on subjects related to the field of chemical engineering in varying degrees of technicality. At other times the program may be light and humorous. Instead of speakers, movies may be presented for entertainment. Students and faculty members occasionally report on the progress of projects being carried out within the school.

Under the leadership of Les Massey this local society is attempting many new things this year. Although still in the tentative state some of the suggested projects are an honorary fraternity for chemical engineers, a handbook printed by the AIChE for Wisconsin chemical engineering freshmen, and a correspondence arrangement with all graduates from the school. A list of the locations of all alumni could be made and sent to all grads so that they might correspond with each other.

Chairman Les Massey has maintained an outstanding scholarship record, having obtained bids to join Tau Beta Pi, Phi Lambda Upsilon, and Phi Eta Sigma. In his freshman year Les won the drawing contest sponsored for first year men, and on the basis of his first two year's work was awarded the AIChE Sophomore Award. He is already commissioned as an ensign in the Naval Reserve. Although thoroughly a chemical engineer, he still has especially enjoyed thermodynamics.

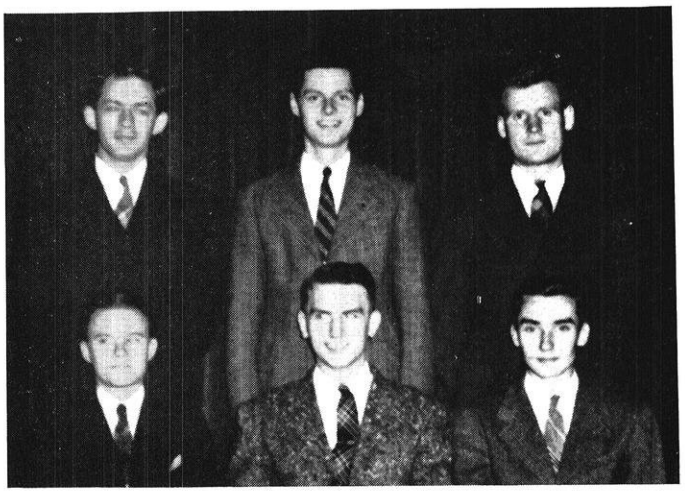
The American Institute of Mining Engineers student society forms the nucleus of the organization for mining and metallurgical students. It has expanded into what is called the Mining Club and every student enrolled in the school is considered a member of the Mining Club. This organization has the distinct advantage of representing the smallest school so that participation on the percentage basis is much higher, but the faculty and students must be given credit for the excellent work in promotion of activities. The fellowship between students and professors is exceptional. Of course in addition to the fellowship the society brings education, contacts with industrialists, and entertainment to its members by much the same means as the other societies. One very unique feature of the organization is the dinner connected with each monthly meeting. Chefs are elected as officers to carry the responsibility of seeing that a meal is prepared and served for each meeting. In December there will be the annual Christmas party, a turkey dinner for thirty-five cents. At this time Bradley H. Booth, metallurgist for the Jackson Iron and Steel Company, will speak on "Silvery Pig Iron."

The nearest affiliation that this chapter has with a senior society is the Chicago Section of the AIME. In May of this next year this Chicago section is to be the guest of this student group at a banquet and an inspection tour of the University.

Bob Bemm, a little blonde fellow from Wauwatosa, guides the activities of the Mining Club. His hobbies are varied, including photography, pistol shooting, music, and a very specialized interest in a very certain girl. Pi Mu Epsilon, Tau Beta Pi, and Phi Eta Sigma each have a key hanging from Bob's watch chain, and he has still found time to work on orientation and the exposition.

The American Society of Civil Engineers student society is comprised of a local membership, with a fee of one dollar per member. The chapter then pays a ten dollar fee to the national organization, making it a part of the ASCE. The national organization offers slides for the local chapters to use for their entertainment, and publishes a bulletin on recent trends in the civil engineering field.

In addition to speakers for meetings the funds obtained in membership fees are used for general expense such as refreshments, Badger picture, and for conducting projects for the benefit of the civil engineering department. In addition to the type of programs used by the other societies the ASCE has had great success with musical entertainment, drawing the personnel from their own ranks. A joint meeting is planned with the Marquette student chapter and the Wisconsin section of the ASCE on November sixth. This student section already has 80 members and its goal is 100, which is truly commendable for a department with a small enrollment.



Back: Massey, Robbins, Warzyn.
Front: Bemm, Rogers, Jelinek.

Chairman Willard Warzyn finished high school in South Milwaukee in 1936. His liking for outside construction work led him to choose civil engineering for his field. He has also indicated another liking by giving a glittering stone to a member of the fairer sex. For a little relief from the routine of engineering, Willard plays in the band.

The Society of Automotive Engineers is open to all engineering departments but is primarily active in the field of transportation. A comparatively young organization, it has set many of the standards in recent years. The members all belong to the national organization, paying the three-dollar fee to receive the "SAE Journal" as well as all other advantages received from belonging to a national organization

(Concluded on Page 17)

Put in your two-bits worth . . .

POLYGON NEEDS IDEAS

TO SAY that Polygon Board is merely a coordinating body for the general activities on the Engineering Campus does not give a true or complete picture of the activities of the board.

Polygon Board during its existence has undergone several reorganizations, the last of which came two years ago and under which the board now operates. The board consists of 6 members, one from each society during the fall semester and 12 members in the spring semester. Each man on the board represents his society in the general interests of the Engineering College.

Henry Schmalz
Polygon President

The regular social functions of Polygon are well known. The smoker and dance in the fall and also in the spring are regular events which have become traditions. In the spring of each year, in the days gone by, Polygon used to sponsor the St. Pat's Parade, which in many cases involved not only engineers but the university in general. In the past two years, Polygon has altered its program somewhat in presenting an Engineering Exposition along with its St. Pat's celebration and spring dance. The success of the latter program has been measured not only in terms of the tangible profit which went to the student organizations but also in terms of the constructive attitude which now exists among our student body. It is the intention of the board to utilize this attitude in planning for this coming year.

Already the suggestion has been made to the members of the board to consider the publishing of a freshman booklet to aid new men in becoming better acquainted with the department and college in which they intend to spend their next 4 years. A venture of this kind can only be carried out, however, with the aid of the societies which support Polygon.

What shall we have in place of an engineering exposition? That was the question asked by members of the Polygon Board, and the answers are printed here in hopes that they will start discussion among the engineers with some decision at the end. The quotations below were secured by Polygon officials with an attempt to reach all groups and departments. However, many, particularly lower classmen, had no contributions. It is hoped that the following will start the ball rolling.

The president of the Polygon Board, Henry Schmalz, speaks first:

"This year, with an exposition definitely off the calendar, the Engineering College along with Polygon Board faces the big question of what to do for a spring event. A spring activity of distinction has been a tradition on the Engineering Campus and has shown that the engineers as a group are wide awake. In the last two years its character has changed from the annual St. Pat's Parade to the more constructive Engineering Exposition. The returns, everyone agrees, have been much more worth while in the latter case and Polygon Board must have some constructive ideas before any plan of attack is adopted for the year. To accomplish this, the Wisconsin Engineer has taken the initial step in publishing these opinions. It is hoped that herein will be the stimulation for an open discussion of the problems which must be decided soon."

Harold Peterson (ChE) tells why there is no exposition planned, and starts the ball rolling with the first suggestion:

"The general theme of an exposition is the same each time it is held so the attraction to the public will diminish if held too often. In regards to industrial exhibits, it probably would be quite difficult to get companies to send exhibits because of the national defense program. Some experience was encountered along this line even at the last exposition."

"I consider it wise to plan some other function or project for next spring instead of the exposition. Some possibilities are: (a) A minstrel show put on by the whole engineering school, (b) A large banquet with some nationally known speakers, (c) Construction of a model structure, such as a house, with the part taken or performed by each of the five engineering departments emphasized and brought before the public."

Note Harold's emphasis on **nationally** known speakers. That would assuredly keep it out of the commonplace category, and would keep up interest.

Jim Rogers, president of the S.A.E., is next on the list. He says, "I suggest that the engineer school put on a carnival next spring. Have it devoted to amusements and not technical material as the exposition has been in past years." Can't you just imagine selling rides on the crane in the steam and gas lab for ten cents per head? Or letting youngsters sit in the Curtis Helldiver for five? But to be more serious, something like that would be fun to make and would really go over big.

Pi Tau Sigma president and Triangle vice president Bob Zoellner has another idea. To quote, "I think it would be a good idea for the engineering school to devote a week end next spring to the entertainment of its graduates. This could be worked up as an 'Engineering Homecoming,' with a program climaxed by a 'Reunion Banquet' on either Saturday evening or Sunday noon. The spring engineering dance could be worked into the same week-end." For that matter, maybe some of our illustrious grads could tell us how they got to be illustrious. That would be interesting—and would probably put plenty of us into our places by making us realize how little we know of all there is we have to know.

Now it isn't necessary for you to follow in these footsteps, as for example see what Lester Elmergreen (EE 4) has to say:

"I don't believe that we need a substitute for the engineering exposition. The exposition has so many possibilities that two years is not too great a time to spend in preparation. I favor, therefore, no major undertakings for the college of engineering for this year except perhaps bigger and better attended engineering dances, smokers, and professional society meetings."

There is something to mull over. An exposition which had two years of planning behind it should really be good. And it would have to be plenty good in order not to be a let down from last year's.

An official's point of view is always of note, so we present two of them here. It is of interest to notice that not even they have the problem solved as they hold opposite views.

First, Professor E. R. Shorey: "I believe nothing should be done during the year between expositions. Any endeavor equivalent to an exposition constitutes a great deal of time and work by the students, and it would be better to spend this work and time in study."

Professor George Barker, on the other said, "We should have a joint meeting of the Wisconsin Society of Engineers and the national societies of the various engineering schools on the campus. Also have papers presented by students at these meetings. For a meeting of this sort, the Wisconsin Society of Engineers would postpone its fall meeting until spring."

Back to the students, this time Roger Robbins, chairman of the A.I.E.E., who states, "I favor some kind of mammoth engineers' convention, to which we could invite student engineers from mid-western colleges. It could consist of a series of lectures by prominent engineers who are contributing to the advancement of engineering and who have a thorough knowledge of modern engineering problems and practices. Lectures could be of several types to suit the interests of the various engineering groups and could be held over a period of three days—Thursday, Friday and Saturday. The final evening could be devoted to a large banquet and engineers' dance. Students from out-of-town could be accommodated by fraternities and independent rooming houses, and we could provide them with dates for the Saturday night festivities."

Roger thought of everything and gave us some thought to chew on. When you have it pretty well ground up, send the Engineer your opinions on this and other ideas with any others you might have or even just trimmings for these.

Back to the chems. Bill Gehrke (Ch 4) sends this contribution: "I think it would be bad to let things slide for a year. Perhaps we could adopt something that has proven a success at other engineering schools. Carnegie Tech, for instance, has a carnival. This might prove successful on our campus."

There you have a start—but **only** a start. We want an avalanche of ideas and suggestions. Don't forget—if it can be done, the engineers can do it!

A Few Scheduled Events of Interest

(Watch the Bulletin Boards)

Mining Club

November 12—J. R. Van Pelt, Technical Director of the Museum of Science and Industry.
December 10—Bradley H. Booth, Metallurgist of The Jackson Iron & Steel Company.
May 16—Inspection trip to this campus by the Chicago Section of AIME.

ASME

November 27—Joint meeting with Rock River Valley Section. Mr. Koehring of General Motors Corporation.
December—Party Dance.

SAE

December—Joint meeting with ASME. Movie sponsored by Curtiss Wright Corporation.
January—Speaker on Modern Trends in Automotive Field.

AIEE

November 24—J. O. Perrine, Associate Editor of Bell System Technical Journal.
December 15—General Electric House of Magic.
January 7 — Colonel James Walsh speaking on "Engineers Against Time."

ASCE

Talk by Frank Lloyd Wright.
Illustrated talk on Boulder Dam.
Joint meeting with Marquette Student Chapter.

AIChE

Meetings on the second Wednesday of the month.
Programs unannounced as yet.

THE BIG SIX . . .

(Continued from Page 15)

of men in a common profession. The Wisconsin student chapter has an enrollment of 35 members. The chairman, Jim Rogers, is an extremely enthusiastic fellow, and believes absolutely that the SAE can be the best student society in the school. Of course this year this society runs into the same difficulty as all the others, that of obtaining speakers from an industry which is already operating at more than 100% capacity. Besides the speakers, movies, and entertainment provided for its members the SAE arranges field trips to points of interest. On the seventh of November the Senior SAE of Milwaukee acted as hosts to this student branch, providing it with a banquet, transportation and a trip through Waukesha motors. Every month some of the students go to Milwaukee to the meetings of the senior section; G. C. Wilson of the Mechanical Engineering staff being chairman of that society. Meetings of the student chapter are held once a month.

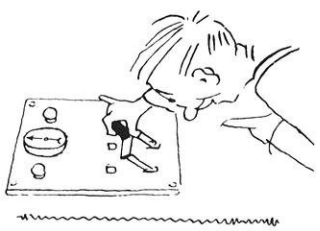
Jim, a senior mechanical engineer, is a member of Phi Kappa Sigma and social chairman of that fraternity. He would enjoy sales and personnel work but, at least in the immediate future, will probably not go into this field for he will receive his commission in the Reserve Officers upon graduation. Three years of his college career he participated in the band as well as Hoofers' and Camera Club. At present he is treasurer of the Polygon board. Jim says his pet theory is that engineers waste too much time studying. He then goes on to explain further that he believes that three things are of prime and very nearly equal importance in the life of every man. First, his job, second, his home, and third, his relationship with people.

CAMPUS NEWS

MEN AND MACHINES

Each year the senior engineers in all divisions make an inspection trip through several large factories in the mid-west. The main reason for the tour is to give the seniors an idea of the variety of jobs which are open to them, and of the types of plants, the working conditions and the situations they will meet in the future.

This year the electricals toured as follows: Milwaukee, Allis-Chalmers and Allen Bradley; Beloit, Fairbanks Morse; Chicago, Carnegie-Illinois Steel Mills, Western Electric Co., the Nash plant at Kenosha, and the Chicago Lighting Institute. The mechanicals, all 80 of them, also took in Fairbanks Morse and the Wordward Governor company in Rockford.



This year the fellows took a great interest in labor—wages and hours, the safety measures, rest periods allowed, the feeling toward jobs, and the general physical make-up of the average worker in each plant. This interest was particularly noted in the Western Electric where even the phone numbers of some of the employees were inquired after (Naaah—no luck!).

Perhaps the most impressive sight was the huge steel mill, millions of invested dollars, with its mammoth furnaces, spouting Bessemers, and huge overhead crane complete with papoose.

There's hours of burning work in smoke-heavy air for the slaves who feed the maws of those snarling monsters, but there's money in the hard blue steel that the monsters spit back.

We never fail to marvel at the fine work the plug-chewing lathe operators in their filthy denims do. From the solid steel block which has been roughly mashed into shape by the forge hammers, accurate, shining crankshafts and spindles are spun out between spats, the long, turning-to-blue chips rolling smoothly off, in a symmetry of geometric pattern.

Gratifying to the engineer was smoothness and efficiency with which manufacturing and assembling operations were carried out in all plants. Everywhere were evidences of the tremendous amount of thought and attention to detail that went into the design, organization and application of the factory layout.

Everything considered, this year's trip went off very well. Much credit must be given to L. A. Larson, J. W. Watson, G. C. Wilson, Gus Larson, Pat Hyland, and Sandy McNaul for the job of planning they did. The only difficulty was with the guides, who were mostly uninformed and hard to hear. In Kenosha, Len Sweet attempted burglarizing Bus "A" of a handsome sign originally swiped from Greyhound "B." This necessitated the detention of Mr. Sweet, while his trousers traveled in "B." Scott Cameron was almost appropriated by the lads in "A," but a wide-spread street brawl saved his dignity and his pants.

CONTRARY TO SOME

Opinions, the Engineers do attend dances, and that is just what the entire engine college is cooking up for the evening of November 29. Polygon board is in charge, and has announced that Ralph Miller, a top band from the brew city, will provide rhythm for dancing. Each professional society will construct some sort of a Rube Goldberg invention, with prizes amounting to ten dollars to be given to the most realistic and impractical machines.

To tell the awful truth, it sounds to us like a very good deal, and should warrant a hundred percent turnout. We'll see you there!

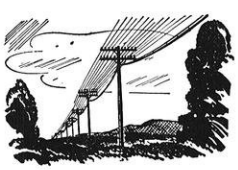
FRESHMAN AWARDS

At the Freshman Engineering Lecture on Friday morning, October 17, in the Chemistry Auditorium, two sophomore engineers were honored.

Each year Tau Beta Pi, the honorary engineering fraternity, offers an award to the sophomore who during his freshman year makes the highest scholastic average. Harold E. Peterson, ChE 4, president of Tau Beta Pi, presented a slide rule to Gerhardt A. Gohlke, ChE 2, who made a grade point average of 2.886 at the close of his freshman year.

Chi Epsilon, the honorary Civil Engineering society, offers annually a Civil Engineering Handbook to the sophomore Civil Engineer who during his freshman year makes the highest scholastic average for freshman civil engineers. Melvin C. Ree, CE 4, president of Chi Epsilon, presented the Handbook to Lester E. Christensen, CE 2, who was highest freshman civil engineer last year with a grade point average of 2.824.

Here come *life lines* of national defense



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CAMPUS ELECTIONS

During the past several years, there has been agitation for a polling booth readily available to all in the engine school. For the coming student board, Cardinal board, and class presidency elections Tuesday, November 18, a voting system will be set up in the lobby of the Mechanical Engineering Building. In line with our continued effort to create interest in student government, campus activities and the like, we are presenting excerpts from briefs filed by the candidates for senior class presidency, as this contest is likely to be the closest of all.

GRANT HILLIKER

The (following) list of activities will demonstrate my ability to perform the duties of president of the senior class. I believe that I possess the necessary executive ability for success in this office . . . The main responsibility of any Senior Class President is to provide seniors with the necessary information and machinery to help them get the right position upon graduation. I have prepared myself to do the best possible job at this by studying job-getting methods and the present employment situation. I have had experience with enough dances to be, I believe, fully capable of managing a successful Senior Ball.

University Activities: School of Journalism, Phi Eta Sigma, Alpha Delta Sigma, Advertising Manager of the Daily Cardinal, President of Wesley Foundation, etc.

BURLEIGH JACOBS

I believe that it is imperative that a candidate for the position of Senior Class President have the . . . administrative experience to perform his duties for the betterment of the students of that class. I submit the following qualifications of my executive ability: President of Phi Eta Sigma, President of Phi Delta Theta, Beta Alpha Psi, Beta Gamma Sigma, Iron Cross, Varsity Golf captain, Sports Editor of the Badger, President of the Badger Board, General Chairman of the 1941 Homecoming.

It is my sincere desire to have a study made by senior council of the placement problem today; the information to be collaborated in booklet form to explain the position of the graduating senior in the National Defense program. Emphasis is to be placed on specific positions for men and women in industry, the armed forces, and government administration.

WARREN JOLLYMORE

If elected, I intend to set up a clearing house for placement of seniors. This will supplement and render more efficient the existing service maintained by the University. I plan to inaugurate an all-representative Executive Council consisting of six seniors, one each from the Residence Halls, the lodging houses, the fraternities, and the sororities. This Council would handle all administrative jobs of the Senior Class, while matters regarding policy would be referred back to the regular Senior Council.

As I am a student worker myself, I realize the necessity for a rise in student wages to meet the rising cost of living. I feel that I have the experience of working with my fellow students, and the determination, to enable me, with help of the many capable class members, to set up, administrate, and maintain a coordinated Senior Class organization.

However you may feel toward this race and others, the opportunity to express your feelings and opinions is here . . . make use of it. Let's all get out and vote!

THE CANDIDATES

SENIOR PRESIDENT
Grant Hilliker, Independent
Burleigh Jacobs, Phi Delta Theta
Warren Jollymore, Beta Theta Pi

JUNIOR PRESIDENT
Thomas Murphy, Independent
Ralph Theiler, Sigma Chi

SENIOR MAN, STUDENT BOARD
Robert Vergeront, Independent

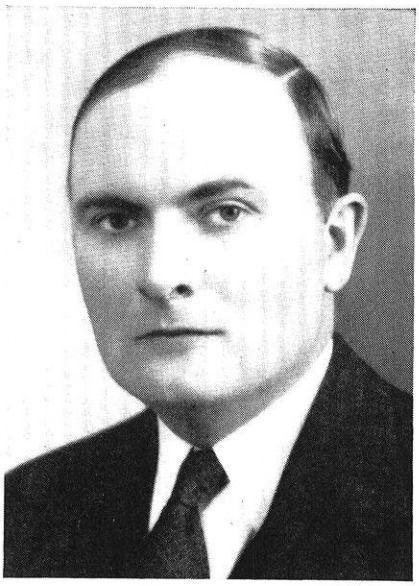
JUNIOR MAN, STUDENT BOARD
Michael Harris, Zeta Beta Tau
Robert Halvorson, Independent
Tom Rogers, Independent

JUNIOR MAN, CARDINAL BOARD
Alex Dworkin, Independent

SOPHOMORE WOMAN, CARDINAL BOARD
Arlene Bahr, Independent
Betty Berry, Alpha Phi

SOPHOMORE MAN, CARDINAL BOARD
Robert D. Bohn, Independent
Robert Charn, Sigma Phi
Harmon Lewis, Phi Gamma Delta

RADER ON DUTY WITH NAVY AT NEW ORLEANS



Dr. Lloyd F. Rader, professor of civil engineering in the University of Wisconsin, has been on active duty as a reserve officer in the Navy at New Orleans, La., since July 17, 1941. Professor Rader is a senior lieutenant in the Civil Engineer Corps of the Navy, and is assigned as Public Works Officer at the U. S. Naval Station at New Orleans, La., in charge of construction and maintenance of physical facilities at the station. A program of rehabilitating the station buildings and the waterfront structures on the Mississippi river is in progress. New barracks buildings for the receiving station are being built, and new roads and railroad tracks are being constructed throughout the station.

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EVEN PROFS LEARN

Professor Glenn Koehler, of the department of Electrical Engineering, is spending several weeks at the Massachusetts Institute of Technology where he is attending a preparatory conference and a short course for instructors in ultra-high frequency devices. This course is being given in connection with Engineering, Sciences and Management Defense Training. As a result of these conferences, Professor Koehler will offer, during the second semester, a four credit selective ESMDT course.

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To assure the maximum efficiency from this modern production tool, Airco has developed a complete line of machines and apparatus. Airco has increased its manufacturing of oxygen and acetylene and distributing facilities to meet the accelerating demand. So that the Airco Oxyacetylene Flame may be used most efficiently and economically, Air Reduction offers industry the cooperation of a staff of experienced engineers, skilled in the use of this modern tool.

An interesting booklet, "Airco in the News", tells a picture of this Airco production tool and the numerous ways in which it is aiding the defense program. If you want a copy write to the Airco Public Relations Department, Room 1656, 60 E. 42nd St., New York, N. Y.

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ALUMNI NOTES

by Roy McIntosh, met'42

Chemicals

BRADLEY, HARLOW, '14, has been appointed to the post of supervisor of foreign dealers for the Allis-Chalmers Manufacturing Co. His headquarters will now be in Milwaukee.

VELGUTH, WALDEMAR, '20, recently appointed assistant chief metallurgist, of the Buick Motor Division, General Motors Co., died suddenly in the Hurley hospital in Flint, Mich.

CHYLE, JOHN J., '24, an engineer at the A. O. Smith Corp., is also a member of the board of directors of the Smith Steel Foundry Co., Milwaukee, Wis.

FORRESTER, JAY H., '28, is now directing research on all types of plant refining units for the Standard Oil Company of Indiana, Whiting, Ind.

DORMER, GEORGE G., MS'32, presented a report on "Experiments with a Nine-Foot Reversed Flow Water Gas Machine," at the Mid-West Gas school, Ames, Iowa.

HAUGEN, JOEL O., '36, has resigned his position as research engineer with the Pan-American Refining Corp., Texas City, Texas, to accept an instructorship in Chemical Engineering at the University of Minnesota.

MERRIAM, JOHN B., '37, formerly with the Celon Co., Madison, is now with the duPont de Nemours Co., in the T.N.T. division, Joliet, Ill.

GUELZOW, RICHARD, is with the Joseph E. Seagram & Co. at Lawrenceburg, Ind. He was married on August 9 to Maxine Lake. They are living at 36 Tebbs Ave., Lawrenceburg, Ind.

BROWNE, WILLIS G., '40, and his wife, Virginia, became the proud parents of a baby girl, Barbara Helen, September 3.

DONALDSON, GEORGE R., '40, was married to Maren Speerstra, October 5, 1940, at Whitehall, Wis.

KOEHLER, JOHN, is now working at the Madison Gas and Electric Co. in Madison, Wis.

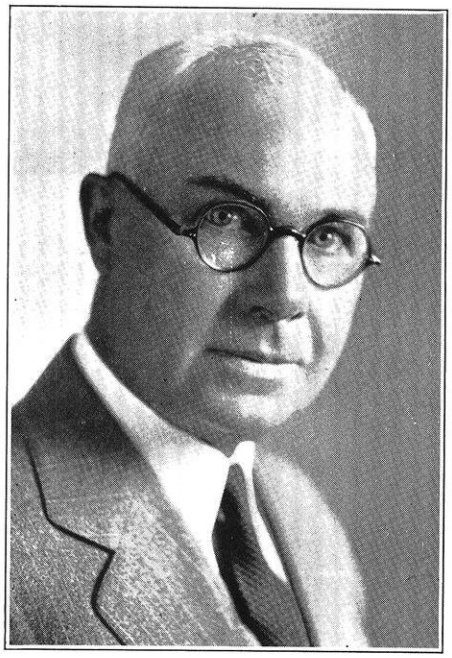
RINDT, DONALD W., '40, was married to Ruth Marie Wilson, March 15, 1941, in Madison. He is with the Carnegie-Illinois Steel Co. at present.

ERICKSON, RAYMOND A., '41, married Ruth M. Vinger, of Argyle, Wis., October 24, 1941, in Glendale, Calif. He is with the Standard Oil Co. of El Segundo, Calif. They will make their home at Hermosa Beach, Calif.

NICHOLS, GEORGE S., '41, and Anita Alyce Kemmerer were married in Madison, June 21, 1941. They will make their home at Niagara Falls, N. Y.

Civils

Death took two civil engineering grads during the summer. **KENNETH C. MacLEISH,** c'26 and water-power engineer with the Wisconsin Public Service Commission, died on August 6 at a Madison hospital of meningitis. **GLEN A. THOMPSON,** c'39, committed suicide in a fit of despondency on May 28 at Ambridge, Pa., where he had been employed by the American Bridge Co.



John L. Savage

JOHN L. SAVAGE, c'03, Sci.D.'34, chief design engineer of the U. S. Bureau of Reclamation, sailed in September for Australia, where he will advise on the construction of the Upper Yarra Dam to be built by the city of Melbourne. He has also been retained as adviser to the Government of Punjab, India.

WARREN WEAVER, CE'17, PhD'21, Director of Natural Sciences, Rockefeller Foundation, as chairman of a section of the national defense committee, made a two-month trip to England last spring. He arrived in London on March 20, just in time for one of the worst air raids of the war.

Several recent graduates have shifted into the field of teaching. **JAMES R. VILLEMONTE,** c'35 MS'41, is instructor and research assistant at Penn State College. **MILTON C. SCHMIDT,** c'38 MS'41, is instructor in civil engineering at Carnegie Institute of Technology, at Pittsburgh. **ROY L. KLEMA,** c'39, is instructor in civil engineering at the University of Idaho at Moscow, Idaho. **PAUL G. FLUCK,** c'41, is instructor in mechanics, and **JESSE C. DIETZ,** c'40 MS'41, is instructor in sanitary engineering at the University of Wisconsin.

During October a number of Wisconsin civil engineering graduates were honored by election to office in various state organizations. **HENRY TRAXLER,** c'13 and city manager of Janesville, was elected president of the League of Wisconsin Municipalities at the 43rd annual convention in Eau Claire. **JEROME C. ZUFELT,** c'26 and filtration engineer for Sheboygan, was elected president of the Wisconsin Section of the American Water Works Association at the state convention in Racine. **O. J. MUEGGE,** c'23 and assistant state sanitary engineer, was made vice president, and **WALTER PEIRCE,** a former student at Wisconsin and superintendent of the Racine water department, was awarded the George W. Fuller prize for distinguished service in his field. The Central States Sewage Works Association in convention at Ft. Wayne, Indiana, elected **GEORGE W. MARTIN,** c'26 and superintendent of sewerage works at Green Bay, as president for the coming year.

Fort Leonard Wood, a 40,000-man cantonment near Rolla, Mo., is largely the product of two Wisconsin civil engineering grads. **WILLIAM A. KLINGER,** c'10, president of the contracting firm of W. A. Klinger, Inc., of Sioux City, Ia., is chairman of the executive committee of K-N-W-L Company, a syndicate of four contracting firms that built the cantonment. The project manager was **LEE H. HUNTLEY,** c'08, who has superintended many big construction projects.

Three Wisconsin engineers are having a part in the construction of the big army base at Port of Spain, Trinidad, in the British West Indies. **EDWARD A. MENREZ,** MS'39, is design engineer for the firm of Walsh and Driscoll, a combination of two contracting firms that is building the base. **MELVIN J. NOTH,** c'40, MS'41, joined Menrez in August, and **NATHAN ITZKOWITZ,** c'40, sailed during October.

In the municipal field there have been several announcements concerning Wisconsin civil engineers. **ELMORE F. KLEMENT,** c'22, was appointed city manager of Ft. Atkinson, Wis., on Octo-

ber 7. He had been acting city manager for three months and was city engineer since 1924. **ORLANDO G. HOLWAY,** c'35, is the new director of public works at Superior, Wis. **ELMER KRIEGER,** c'25, has been appointed acting city planning engineer for Milwaukee. **HERMAN T. HAGESTAD,** c'32, who has a consulting engineering practice at River Falls, Wis., is serving his first term as mayor of that city. **ROBERT L. ENGDAHL,** c'38, is city engineer for River Falls. **EARL R. STIVERS,** CE'15, former instructor in railway engineering at the university and now the head of a research laboratory, is president of the Board of Education of Rockaway, N. J. He recently received considerable local publicity in connection with the dedication of a new high school athletic field in that city, at which he presided.

Electricals

DREW. HOWARD S., '14, passed away in Chicago on the 18th of June. At the time of his death he was Illinois Works Progress Administrator.

KETCHUM, PAUL M., '38, and Dorothea Irene Harrington were married October 18, 1941, at Pittsfield, Mass. Paul is now with the General Electric Co., in Pittsfield.

LEITZKE, VICTOR A., '40, and Harriet Sorrenson of Madison were married in Schenectady, N. Y. Victor has successfully passed the entrance exam and is now in the "A" training course at General Electric.

WARNEK, ROBERT G., '40, formerly with the Wisconsin Telephone Co., has a second lieutenant's commission in the Signal Corps and is stationed at Fort Monmouth, N. J.

Miners and Metallurgists

ROSENTHAL, PHILIP, '35, former instructor in mining and metallurgy at Wisconsin, has accepted a position at The Battelle Memorial Institute. Before leaving the university the Rosenthals became the parents of a new engineer in the person of Stephen Andrew Rosenthal, born May 23, 1941.

SEVERSON, LOYD J., '36, is in the U.S.A. following the completion of his contract as chief engineer for Cia Huanchaca de Bolivia, Pulacayo, Bolivia, S.A. Mrs. Severson and their two children accompanied him home. The Seversons are contemplating returning to South America in the near future.

OCKERSHAUSER, TOM E., '36, exploration engineer for the Shell Oil Co., Inc., called in Madison while on his vacation. He has been transferred to the Great Bend Kansas division of the same company.

SMITH, ANDREW B., MS'41, has been promoted to the office of principal marine surveyor, Chicago office of the American Bureau of Shipping. Mr. Smith is a graduate of the off-campus Milwaukee course.

ETZKIN, JOE, '41, is employed by the U. S. Navy in cost determination work at Manitowoc, Wis.

SCHROEDER, ROBERT G., '41, is a trainee with the Shell Oil Co., Inc., at Freer, Texas.

WEBBERE, FRED J., '41, is research metallurgist with the General Motors Corp., at Detroit, Mich.

WORDEN, STEWART W., '41, is second lieutenant, ordnance division, U. S. Army, located at Shreveport, La.

WRIGHT, JACK S., '41, is with the Pickands-Mather Co., Biwabick, Minn.

Mechanicals

MAXFIELD, T. B., '22, is financial editor of the magazine "College and Campus," formerly called "Fraternity House Management." In the March issue he is the author of two articles, entitled "A Case Study in Budgeting" and "Receivables—What Are They Worth?"

FITZE, M. E. '24, senior test engineer of power plants, Wisconsin Electric Power Co., Milwaukee, has a paper on Mill Drying of Coal in the May 1941 Transactions of ASME.

LOWELL, FRED R. (formerly **LHOTAK, FRED R.**), '26, a salesman with the National Supply Co., Springfield, Ohio, was killed in an airplane crash on Tuesday, October 28, near Fargo, S. D.

HETTER, RICHARD W., is an industrial engineer engaged in plant layout and selection of equipment for military rifle production, with E. I. du Pont de Nemours & Co., Ilion, N. Y.

LOSSE, PAUL, '40 was married to A. Shultz, BA '40, at Milwaukee. They are making their home at 85 Mansfield St., New Haven, Conn.

QUALITIES . . .

(Continued from Page 11)

organizations of one sort or another, and the fact that they serve their apprenticeship in this same sort of organization and come to devote their entire efforts to its affairs, rather than to enter them after professional recognition elsewhere, as with medical or legal individuals.

And furthermore, every profession should have its secrets and mysteries; spread before the world that all may read, but truly grasped only by those who have lived the professional life; and these should be transmitted to the neophyte with due care, with reverence for their inherent worth, and in due time. Ritual and symbolism, secrecy and circumspection, were the ancient paraphernalias which insured a proper seriousness in youth in order that the impartation might be impressive. These have not wholly disappeared in the modern professions. Admission to the bar, the use of the title of doctor, and similar customs and usages have a profound effect in producing a professional consciousness. The engineering profession is wholly without these aids, and its task of inducting its neophytes into the true professional atmosphere is thus rendered doubly difficult.

But does it matter after all? Are the things that engineers do so vital that they must needs be approached in the professional spirit? Most certainly it matters. And most certainly the task is a professional one. The impact of science is making a new world, and the engineer is in the forefront of the remaking. He lights the way in a very literal sense. He brings people closer together for better or worse, by facile communication and rapid transportation. He temporarily disrupts the techniques of whole industries, and thus alters the life habits of many people, in maintaining a continually rising standard of living. He bores through the earth and under the sea, and flies above the clouds. He builds great cities, and builds also the means whereby they may be destroyed. Certainly there never was a profession that needed the professional spirit, if the welfare of man is to be preserved.

MATHEMATICS . . .

(Continued from Page 9)

on the sidewalk to the design of loudspeakers and non-Euclidean geometry, from the path of a tack in an auto tire to the design of a roller-coaster down which one can coast in the shortest possible time (why not a straight line?). If you are interested in looking into some of these things you might like to sample some of the following books:

Mathematical Snapshots by H. Steinhaus.

Mathematics and the Imagination by E. Kasner and J. Newman.

Biomathematics by W. M. Feldman.

Mathematical Methods in Engineering by T. von Karman and M. A. Biot.

Men of Mathematics by E. T. Bell.

Introduction to Mathematics by Cooley, Gans, Kline and Wahlert.

Number by T. Dantzig.

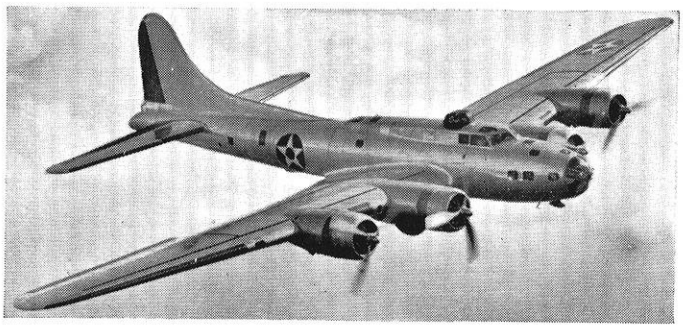
AIRCRAFT ANNALS

by Don Niles, m.e.'44

British Engine in Curtiss

THE first American built plane to be powered by those Rolls Royce "Merlin" engines which are being made by Packard, is the Curtiss Hawk P-40F. Quite a bit of furor was raised when the British engine was placed in our production schedules along with our own Allison, and this will probably start the question once more—is it to replace the Allison—or to supplement it?

The P-40F is externally the same as the P-40D (powered with the Allison) as both engines are 12 cylinder, V-type, liquid cooled. The plane itself is heavily armed with armor plating around the cockpit and motor, and has leakproof tanks.



—Courtesy Aero Digest

New Super Fortress

A new Boeing flying fortress is now being tested at Seattle. It is the latest of the series of B-17 models which started more than half a decade ago and is called the B-17E.

It is similar to the other fortresses in appearance except for the long tail fin which extends nearly half the length of the fuselage, and in general greater size. It is equipped with a blister type turret on top, and regular nose turret, and presumably has the same flush type turrets on the aft under sides. A stinger turret is included in the tail—a trick we learned from Britain.

Messerschmidt Menace

Not to be left in the lurch (or the channel) by Britain's new four cannon Hawker Hurricane, Germany has come out with a new version of their Me. 109 series, the 109F. This ship has a 20 mm. Mauser cannon with a reported rate of fire of 900 rounds per minute. The cannon is supplemented by two 7.92 mm. machine guns and a 550 lb. bomb can be slung under the belly.

The ceiling of the new ship has gone up to 40,000 feet, although it is doubtful if a pilot could operate at that altitude without a pressurized cockpit or suit as the air pressure is too low to permit one to exhale easily. The top speed at 21,000 feet is 380 m.p.h.

The tail fin has been cambered to help overcome propeller torque, and a new recessed radiator cuts down the resistance.

ZINC

Good Soldiers!

When the Country Calls, The Zinc Industry Responds

THE Zinc industry cheerfully and willingly accepts its share in fulfilling the present program for National Defense, just as it has always, year in and year out, given prompt, capable and efficient response when called upon to serve the needs of individuals and industry.

The present emergency brings with it an unprecedented demand for Zinc. Directly and indirectly, the requirements for National Defense involve the use of hundreds of thousands of tons of this indispensable metal. At the same time, the civilian industry demand is constantly increasing.

The real recognition and appreciation of the value of the service which Zinc renders comes at times like the present. Back of the metal itself, is the great industry that produces it—the miners, the smelters, the fabricators. All are bending every effort to meet not only the nation's needs for Zinc, but also to cover current production for civilian use. Production has been raised to record-breaking figures, and still the output increases. Consumers in every field are assured that the vigorous efforts being made by the industry to balance supply and demand will be sustained.

The American Zinc Institute continues to offer its cooperation to educational and extension agencies and welcomes opportunities to be of service.

AMERICAN ZINC INSTITUTE
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60 East 42nd Street, New York, N. Y.

ZINC IN INDUSTRY

The essential part that Zinc plays in a multitude of important products should be understood by every well-informed technician. The location of ore deposits and smelters; mining and smelting; important uses of Zinc, such as galvanizing, brass manufacture, die-casting, rolled zinc, paint pigments and many other applications—these are discussed in

"The Zinc Industry"

a "mine to market" outline in 32-page booklet form. Important data relative to the production and consumption of Zinc are given in

"Facts About Zinc"

Copies of both of these booklets will be sent upon request.

★

HIGH-POTENTIAL STATIC

(This is the second in a series of articles introducing prominent personalities in the College of Engineering)

Q. Who are they?

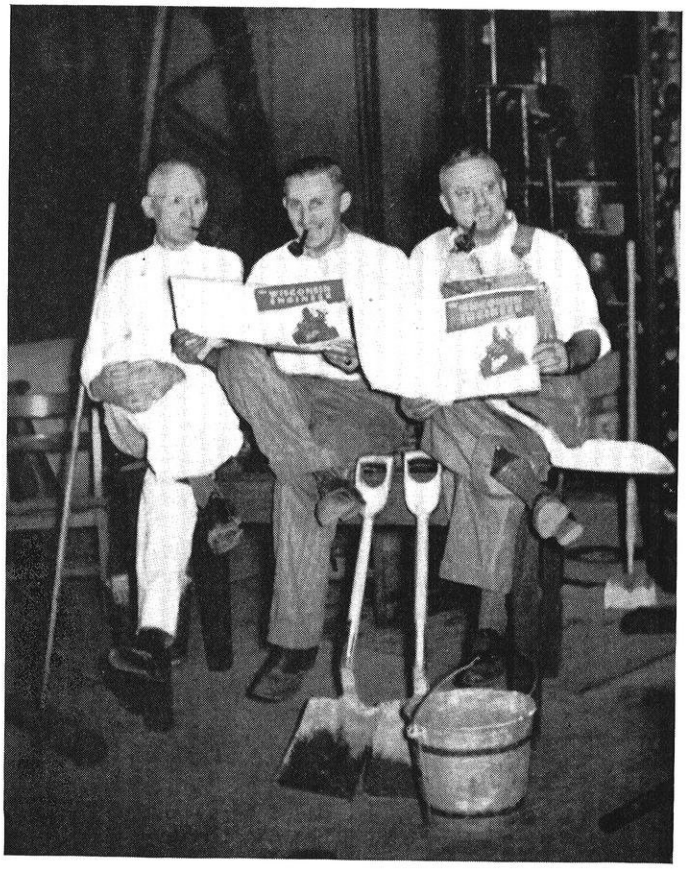
A. No wise cracks, mister. They are the men who clean up after the L. & S. and Engineering students in the Education and Engineering Building and the E.E. Labs.

Q. How do they like the job?

A. The Duke, who has served for 14 years, says, "Working with engineering students is a great pleasure. They are neat, clean, nice, and gentlemanly. I have no love for L. & S. students, because there are too many women who want too much waiting on. I'd rather clean up after engineering students anytime. More great, real worthwhile people graduate in engineering than ever graduate in L. & S. It is a great pleasure to see the grads come back. They are real gentlemen."

The quiet and soft-spoken Irving Windal gets in his two cents worth with, "They are a very pleasant bunch—both students and faculty."

And the Dean of Janitors, 72-year-old David Wilson, adds, "I helped haul the material for the Old Engineering Building about 40 years ago."



Left to right (equipment excluded)—David Wilson, Irving Windal and the Duke of Richmond.

STATIC *(Discontinued)*

Q. Do they ever earn their day's pay?

A. There is one sure way to find out. Get a couple of your fellow suckers and try cleaning three acres of floor space some evening. If you do a good job, the janitors claim that you should fill ten barrels with paper and dirt. But before you try it, spend an evening or two climbing stairs. Carrying paper containers up and down the 97 steps in the Education and Engineering Building is no picnic stunt, they say. Maybe you'll beg for an elevator, too.

Q. How do **they** do it? What is the driving force which makes these men work so hard every night?

A. They are all married.

The following jokes are dedicated to these gentlemen, and not to their wives.

• • •

Conversation between two members of a ski troop readying for a furlough after six months of training in the barren northland.

"Gee, it'll sure be heaven getting back to civilization," said the first soldier. "What is the first thing you are going to do?"

The second soldier pondered a minute. "Well," he replied, "the second thing I'm going to do is take off these skis."

•

Engineer: "Every time I kiss you it makes me a better man."

Girl Friend: "Yeah, but why try to get to heaven in one night."

•

"Well, Mary, now that we've struck oil, I want you to have some decent clothes."

"Bill Jones, I've worn decent clothes all my life. Now I'm going to dress like other women."

•

They tell of the girl who learned her virtues on her mother's knee, and her vices in other joints.

•

A farmer was once phoning a veterinarian. "Say, Doc," he said, "I've got a sick cat. He just lays around licking his paws and doesn't have any appetite; what shall I do for him?"

"Give him a pint of castor oil," instructed the vet.

Somewhat dubious, the farmer forced the cat to take a pint of castor oil.

A couple of days later the vet met the farmer on the street.

"How's your sick calf?" inquired the vet.

"Sick calf! That was a sick **cat** I had."

"My God, did you give him a pint of castor oil?"

"Sure did."

"Well, what did he do?" asked the vet.

"Last I seen him," said the farmer, "he was going over the hill with five other cats. Two were digging; two were covering up; and one was scouting for new territory."

(Continued on Page 28)

STATIC AGAIN

A lady was eating dinner in a restaurant when a man came up to her said, "You look like Helen Brown."

The lady angrily replied, "You don't look so hot in that gray suit, yourself."

•

"We can't have any fun this evening. All I have in my pocket is some small change."

"Well, what do you think it takes to send my kid brother to the movies? A five-dollar bill?"

•

Two mosquitoes once lit on the features
Of two fair and peroxided creatures.
When asked by what right,
They replied, "We're not tight,
We're just seeing the game from the bleachers."

•

CO-ED'S LAMENT

Mother told me not to smoke—I don't
Nor listen to a naughty joke—I don't
She made it clear I must not wink at handsome boys
Nor even think about intoxicating drinks—I don't
Wild youths chase women, wine and song—I don't
I kiss no boys, not even one,
I don't know even how it's done
You'd think I wouldn't have much fun—
I don't

•

Senior: "This letter says my dachshund died."
Roomie: "Too bad! What happened?"
Senior: "He met his end going around a tree."

Town Gal: "You're awfully bashful, Einar, aren't you? Now look out, I'm going to scare you! (She kissed him.) Now you try to scare me."

Engineer: "Boo."

•

A clergyman visiting an army camp, asked a soldier: "Do you kneel down beside your bed every night and ask Divine Guidance in your new life?"

"I don't," snapped the recruit.

"And may I ask why not?" pursued the clergyman.

"Because I occupy the top bunk," he explained.

•

A young theologian named Fiddle
Refused to accept his degree,
For, said he, it's enough to be Fiddle
Without being Fiddle, D.D.

•

A colored preacher at the close of his sermon discovered that one of his deacons was asleep. He said: "We will now have a few minutes of prayer. Deacon Brown will lead."

"Lead!" said Deacon Brown, suddenly awakening, "I just dealt."

•

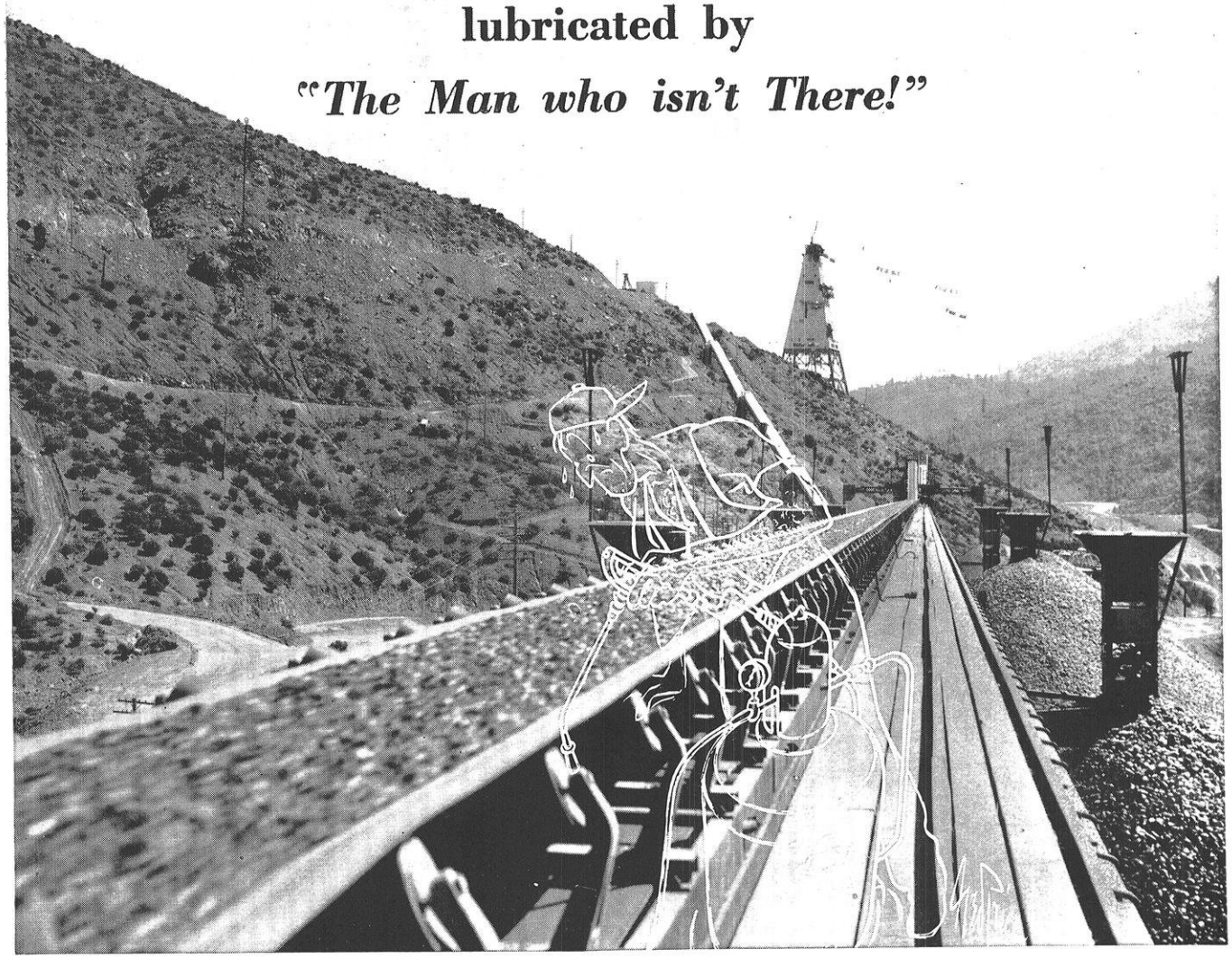
She was pensive when I met her,
Sadness was on her brow.
But my checkbook made her happy,
And she's ex-pensive now.

•

"You brute, where did you kick that dog?"

"Ah, madame, thereby hangs a tail."

Mile and a-half of Conveyor lubricated by *"The Man who isn't There!"*

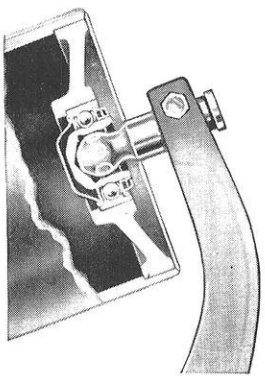


● Yes, 16,000 bearings at the Shasta Dam project, greased regularly by Yehoodi's old man—the phantom of the operation.

Seriously, the secret is New Departure anti-friction bearings, self-sealed against dirt and lubricated-for-life!

Just another "new departure" by New Departure—another "famous first" by an alert company whose products are *ideas* as well as ball bearings.

If you are to become a mechanical engineer, you just cannot escape New Departure—because these finer anti-friction bearings are used wherever shafts turn—and nothing rolls like a ball in the Forged Steel bearing.



Conveyor Bearing self-sealed and lubricated-for-life

The whole absorbing story of anti-friction bearings is told in a beautifully illustrated 112-page book we'd like to send you. Ask for "Why Anti-Friction Bearings."

New Departure, a Division of General Motors, Bristol and Meriden, Connecticut.

New Departure

THE FORGED STEEL BEARING

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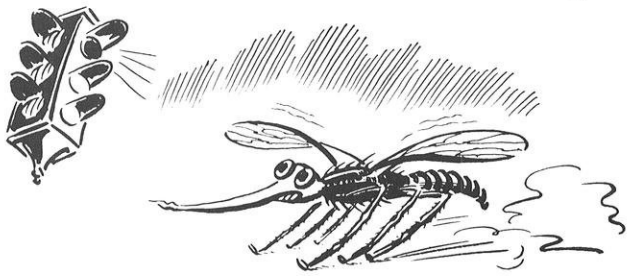
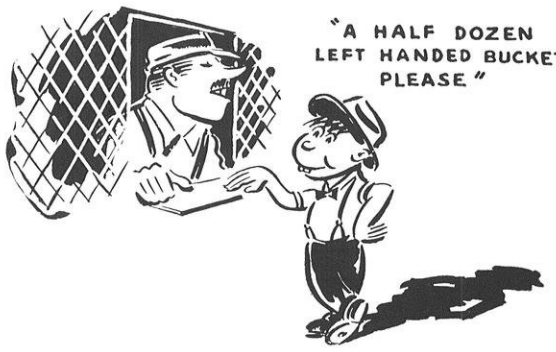
G-E Campus News



MOSQUITOES DON'T LIKE RED LIGHTS

OUT in Cleveland, Ohio, a group of engineers and entomologists has been spending a lot of warm summer evenings sitting around under a string of colored lights. But any passerby who got the impression that they had joined the rocking-chair brigade would be very much mistaken. They were conducting a scientific experiment to determine what color lights attract, and what repel, night-flying insects.

Results: mosquitoes and most other night-flying insects don't like red lights, prefer blue. But since red is not a very satisfactory color to work under, the scientists suggest that if you must work under a lamp outdoors, yellow light provides the maximum advantages to human beings with the minimum attraction to insects.



LEFT-HANDED BUCKETS

UNLIKE the famous fellow who wanted a left-hand monkey wrench, the young man at the window is perfectly in the right if the buckets he wants are the buckets for a steam turbine. For a double-flow turbine for ship propulsion has both right- and left-hand buckets.

There's an important reason for using this construction. Though it sounds more complicated, a double-flow turbine operates at higher speed, weighs less, and occupies less space than a single-flow one. All these are distinct advantages when the equipment has to be installed in a ship, where space is at a premium. And in times like these, when turbines must be turned out in a hurry, the smaller metal parts required represent an advantage in manufacture, too.

General Electric, which has probably built as many naval and marine turbines as any other single manufacturer, is right now making more of them than at any time in its history. And by taking advantage of every engineering and manufacturing advance, it is turning them out on what approaches a mass-production basis.

WANT A BOOKLET?

NOT required reading in any course we ever heard of. But if lightning should strike you some day, you'd be glad to know what hit you. This booklet explains the whys and wherefores of lightning. Tells you how to recognize lightning when you see it, how to catch it if you should want to take some home to play with, etc. In fact about the only thing missing is a "lightning" index to enable you to thumb to your favorite passage in less time than it takes to say "blitz."

And if you have just been on a textbook-buying binge, you may be interested in the fact that this 24-page pamphlet is free.

If you *are* interested, write to the General Electric Company, Dept. 124E, Schenectady, N. Y., and ask for "The Story of Lightning," based on the work of Dr. Karl B. McEachron author of the book, "Playing with Lightning."

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