MINNESOTA TECHNIC

IT'S NOT OPEN SEASON ON THEM, TODAY

IN THIS ISSUE

MOLDED PLANES
STUDENT SURVEY
YOUR DEFERMENT
ME AND ROLLO
SPINNING MOLDS

OCTOBER • 1942

15c

STATE OF TECHNOLOGY UNIVERSITY OF MINNESOTA

While Victory is being won prepare for the work of peace. Learn to know your bearings.

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BUY UNITED STATES WAR SAVINGS BONDS & STAMPS

American planes, tanks, trucks, guns and warships are doing an outstanding job in the fight for freedom because, in addition to being good all-around engineers, their designers *know their bearings.*

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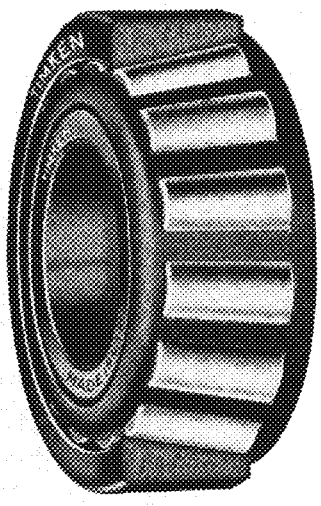
In achieving these objectives, Timken Tapered Roller Bearings will be used to an even greater extent than in the past because of their ability to meet—and beat—any and every bearing condition that might develop.

Now is the time to learn to know your *Timken Bearings.* Our engineers will be glad to help you.



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TAPERED ROLLER BEARINGS

Gilbert D. McCann, Ph.D., M.S.
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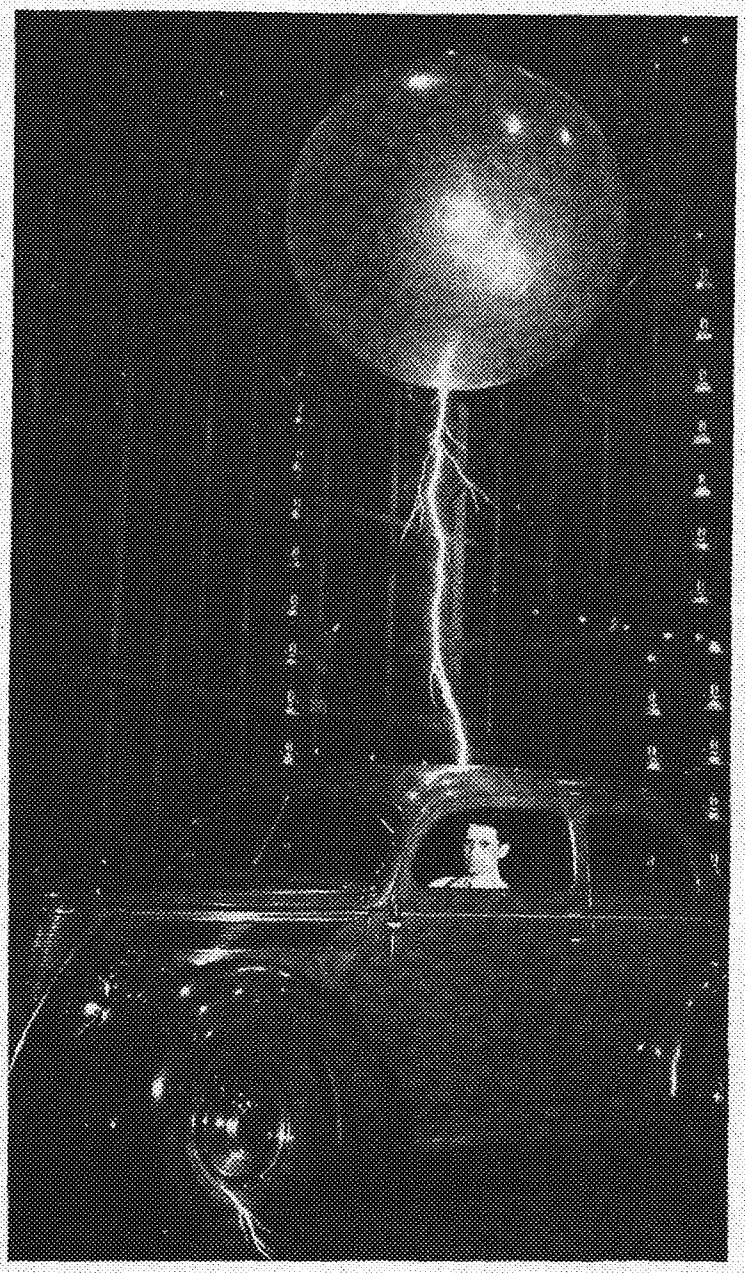

MODERN FARADAY CAGE. Three million volts of man-made lightning hit a car in Westinghouse High Voltage Laboratories, while Dr. Gilbert D. McCann sits safely at the wheel. Dr. McCann . . . co-inventor of the "fulchronograph" for timing and measuring the intensity of thunderbolts . . . joined Westinghouse in 1939, after receiving degrees of M.S. and Ph.D. at the California Institute of Technology.

EVERY TIME you take a breath, 175 thunderbolts crash to earth somewhere.

These lightning strokes, streaking down at 600 million miles an hour, are charged with torrents of electrical power . . . as much as 200,000 amperes, at pressures as high as 25,000,000 volts.

No wonder protection against lightning has been a major problem to utility companies . . . such a problem that, up to a few years ago, lightning frequently shut down power service to industry.

Today, a properly designed power line is not likely to be put out of service by lightning *more than once in 5 or 10 years!*

Dr. Gilbert D. McCann and Charles F. Wagner, Westinghouse engineers, have done much to make this possible through their studies of natural thunderbolts and laboratory lightning.

One of their contributions is the "fulchronograph" which automatically times natural lightning strokes and measures their intensity. Oscillographs and movie cameras also are used to photograph the celestial fireworks.

These mechanical "eyes" . . . perched high on the top of scores of tall buildings, smoke stacks, and transmission-line towers . . . are constantly collecting facts about lightning phenomena that were never known before. Facts about "cold" lightning, of terrific blasting power. Facts about "hot" lightning, the incendiary bomb of the sky.

Still further knowledge is gained from the study of *artificial lightning* . . . made in the Westinghouse High Voltage Laboratories. This man-made lightning is used to bombard insulators, lightning arresters, and other protective devices to test their efficiency.

These studies are constantly adding to the store of "know how" in the field of power transmission. As a result, Westinghouse engineers have been able to design and build lightning arresters and ground-wire systems that tame the wildest thunderbolt.

The work done by Dr. McCann is contributing mightily to America's war effort by helping to keep electric power flowing night and day to our vast war industries . . . as well as by protecting ordnance plants from destruction by lightning.

America needs scientists and engineers as never before . . . to help solve the technical problems of modern warfare and to rebuild the world when the last shot is fired.

Nearly 300 young engineering graduates joined Westinghouse last Spring to carry on this work. In the Class of '43 there will be many graduates who will have an equal chance to help win the war . . . and the peace to come . . . with Westinghouse.

Westinghouse

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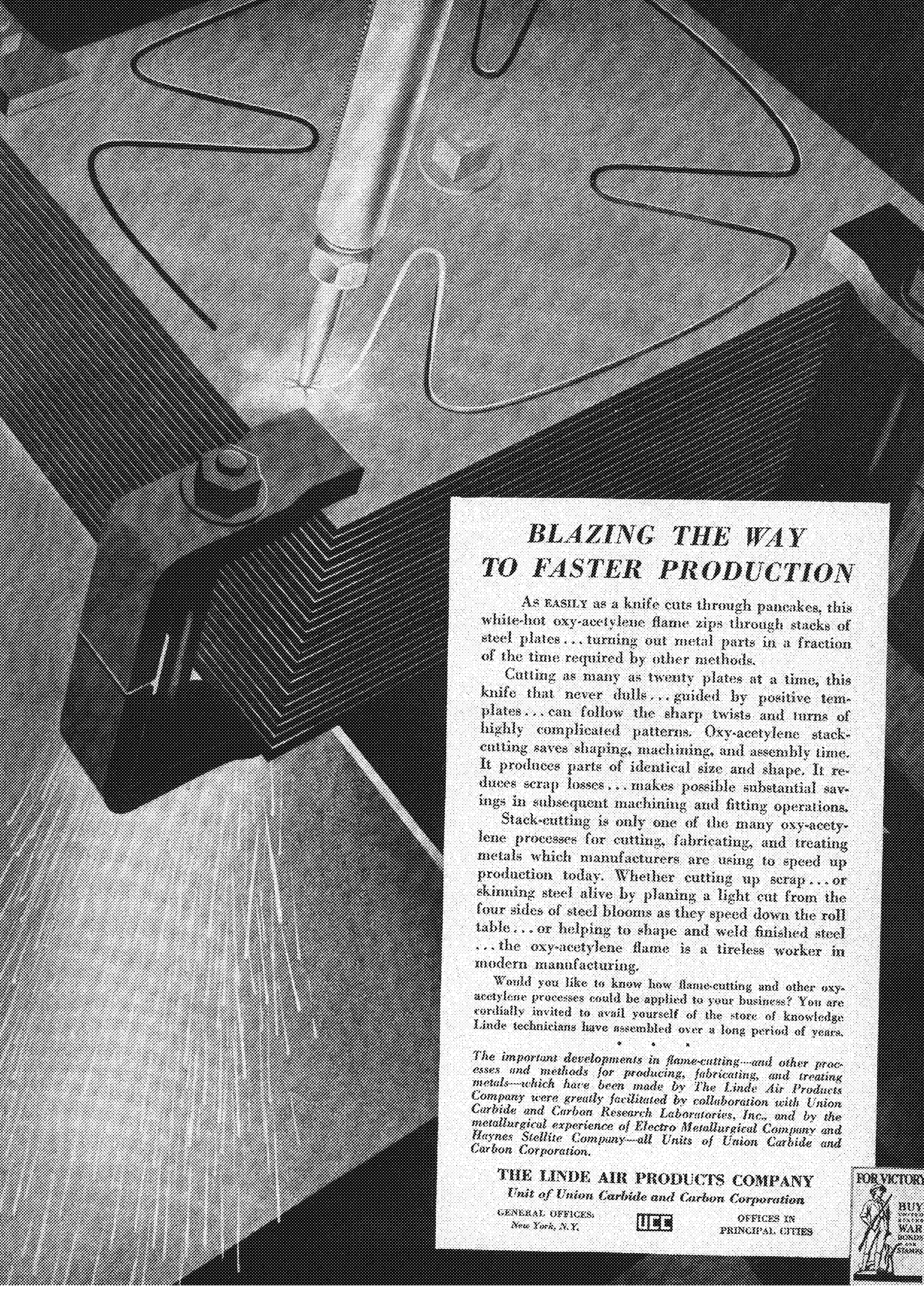

BLAZING THE WAY TO FASTER PRODUCTION

As EASILY as a knife cuts through pancakes, this white-hot oxy-acetylene flame zips through stacks of steel plates . . . turning out metal parts in a fraction of the time required by other methods.

Cutting as many as twenty plates at a time, this knife that never dulls . . . guided by positive templates . . . can follow the sharp twists and turns of highly complicated patterns. Oxy-acetylene stack-cutting saves shaping, machining, and assembly time. It produces parts of identical size and shape. It reduces scrap losses . . . makes possible substantial savings in subsequent machining and fitting operations.

Stack-cutting is only one of the many oxy-acetylene processes for cutting, fabricating, and treating metals which manufacturers are using to speed up production today. Whether cutting up scrap . . . or skinning steel alive by planing a light cut from the four sides of steel blooms as they speed down the roll table . . . or helping to shape and weld finished steel . . . the oxy-acetylene flame is a tireless worker in modern manufacturing.

Would you like to know how flame-cutting and other oxy-acetylene processes could be applied to your business? You are cordially invited to avail yourself of the store of knowledge Linde technicians have assembled over a long period of years.

* * *

The important developments in flame-cutting—and other processes and methods for producing, fabricating, and treating metals—which have been made by The Linde Air Products Company were greatly facilitated by collaboration with Union Carbide and Carbon Research Laboratories, Inc., and by the metallurgical experience of Electro Metallurgical Company and Haynes Stellite Company—all Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY

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OFFICES IN
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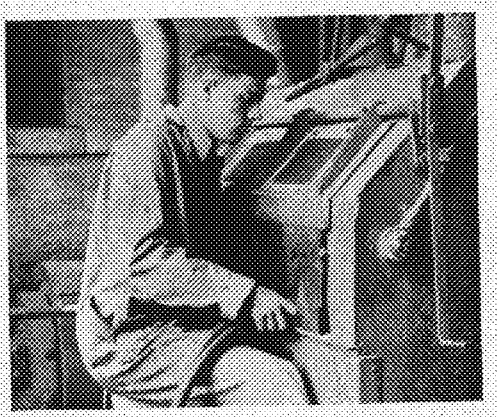
Authors OF THE MONTH

BY STAN GENDLER, M.E., '44

Miles B. Olson, M.E., '44, writes his first article for the TECHNOLOG this month. He became familiar with the subject of centrifugal casting when he decided to make a machine for that purpose this fall.



The summer following his graduation from St. Paul Central high school, he hitchhiked 7500 miles through Washington, California, Mexico, and back home through Texas and Oklahoma. Later that summer he took a bus to New York, so he saw both World's Fairs that year. In the fall of 1940 he entered the university. The following summer he hitchhiked with a friend to Detroit. Here they worked two weeks in the Ford plant and three weeks in a machine shop.

Miles is secretary-treasurer of the local student chapter of the American Foundrymen's Association. This is the only student chapter of the national organization. He is also a member of the American Society of Mechanical Engineers.

Miles used to like experimenting with chemicals until one day a mixture he was making to power a rocket blew up and burned his face. Following this, he turned to less explosive channels and now work in the foundry control laboratory has become his chief interest.

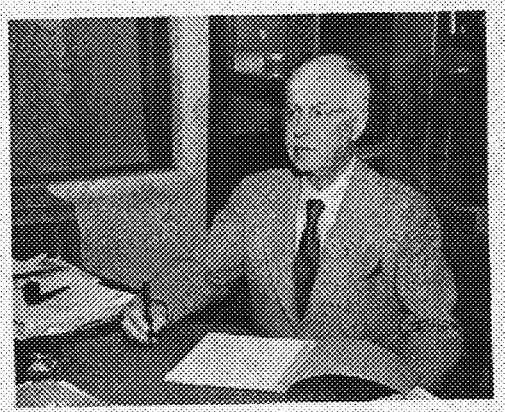
• • •

Jerry Busch, Aero, '45, is a new feature writer on the TECHNOLOG staff. This month he writes on the findings of a survey conducted during the summer quarter on the accelerated program. The interest that the survey aroused is witnessed by the fact that eight typed, single spaced, pages of suggestions were received for the improvement of the program. The suggestions were transmitted to Dean Lind and some of them were brought to the attention of the department heads.

Jerry jokingly lists his hobbies as wine, women, and song. He likes to swim and play tennis, but his favorite sport is golf although he is still in the divot digging stage.

Jerry took a two-week vacation between the accelerated summer session and this year's regular fall term by hitchhiking to New York. Jerry was disappointed with the bright lights of Broadway which, because of the war, have been dimmed out.

The author of "Unionism," **Professor Frederick Bass,** has had a long and successful career serving the state and the University of Minnesota. After graduating in civil engineering from the Massachusetts Institute of Technology in 1901, Mr. Bass went to work for the Boston Municipal Waterworks. After working there for a few months, he read an advertisement in an engineering journal calling for an instructor at the University of Minnesota. Mr. Bass subsequently came to Minnesota and has been here for forty-one years. He is now head of the Department of Civil Engineering.



Mr. Bass was Director of the Engineering Division of the State Board of Health. Later, he was appointed to the State Board of Health on which he served for ten years. He was president of this board for three years. Besides these duties he has been, for a number of years, Consulting Engineer for some forty Minnesota towns and the American Society of Metals. He also belongs to the American Society of Civil Engineers and was president of its local chapter eight years ago. This is Professor Bass' last year here at the University of Minnesota, for he expects to be called into the service of the Engineering Corps at the end of the spring quarter.

• • •

The story of molded airplanes is brought to TECHNOLOG readers by a new member of the TECHNOLOG staff, **Gordon H. Anderson.** He transferred to the University of Minnesota last summer from Superior State Teachers' College. At teachers' college, he was sports editor of their college paper, *Peptomist.*

Gordon is now a sophomore in aeronautical engineering. Among his hobbies, Gordon lists fly fishing, and building model planes with gas engines. Gordon recently pledged Triangle Fraternity.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

TECHNOLOG

OCTOBER, 1942

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The airplane in the cover photograph is a Douglas B-19, the world's largest airplane. It is an official U. S. Army Air-Forces photograph. The picture of the hunter and his dog is a Bruce Stillard photo.

The frontispiece shows the forms for pouring the millions of yards of concrete in a giant dam. The cut is through the courtesy of the **Allis Chalmers Electrical Review.**

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MOLDED AIRPLANES

BY GORDON H. ANDERSON, AERO E., '43

PHOTO COURTESY FAIRCHILD AIRCRAFT

The plane shown above is the Fairchild AT-13, a two-engined crew trainer, built entirely of non-strategic Duramold except for certain members supporting the bombing, machine gun, camera and other equipment. It is the first all-Duramold airplane to go into the military service.

IT is a generally accepted theory that air power will have considerable influence on the outcome of the present world war. Large numbers of cargo planes are undoubtedly the answer to the United Nations' prayers for conveying the tremendous quantities of equipment and food to the many world wide fronts.

It has been estimated by Curtiss engineers that only thirty-five Curtiss Commando transports (known to the army as the C-46) could have easily replaced the 7,700 trucks necessary to transport 30,000 tons per month over the Burma Road.

It was with these circumstances as a background that Henry Kaiser, well-known construction man and shipbuilder, recently broke into the front pages of all the newspapers by announcing that he would turn shipyards into aircraft plants. The present aircraft companies have been caused endless grief by shortages of many essential metals. How then does Henry Kaiser propose to build huge fleets of cargo planes into aircraft plants that do not as yet exist?

The so-called plastic airplane appears to be the best and most logical answer. Plastic-bonded plywood has literally saved the day for the Office of Production Management and the other agencies interested in the necessary materials for aircraft production.

As an example of the possibilities of plastic construction, the Fairchild AT-13, an advanced trainer for bomber crews, has recently been completed. It is constructed of Duramold plastic-bonded plywood throughout except for engine mounts, cowlings, bomb racks, machine gun, and camera fittings. The aft section of the fuselage is of monocoque construction and has no longerons or lateral stiffeners. The wings are of a more conventional construction having two spars and the usual ribs, but due to the thickness and rigidity of the plastic-bonded plywood skin the wing maintains its airfoil shape at high speeds with less than the usual amount of interior stiffening members. This remarkable new trainer is said to be in the 200 m.p.h. class.

Research and History

Before going further into the modern applications of plastics to airplanes we should look into the history of wood and glue as a structural material for aircraft. No aircraft factory at the time of World War I would have been complete without its glue pots and spruce strips for longerons, spars, ribs, struts, and even engine mounts. Plywood was also used extensively in those primitive aircraft, but the lack of glues of sufficient quality to withstand moisture, heat, cold and vibration without disintegrating caused the temporary decline of plywood as a structural material.

Research has been carried on for many years to find a substance that could be molded to any shape that was desired and that would have the necessary strength to withstand high stresses. Synthetic resins lack sufficient strength, toughness, and resilience to be used in their pure state. Vegetable fibers and various fabrics, laminated and impregnated with resin were tried, but failed to produce the necessary stiffness. However, this type of material has been used for some parts such as small control surfaces or tabs. It has had no structural use. As early as 1924, propellers were molded from resin impregnated fabric, but they were unsuccessful due to their low modulus of elasticity.

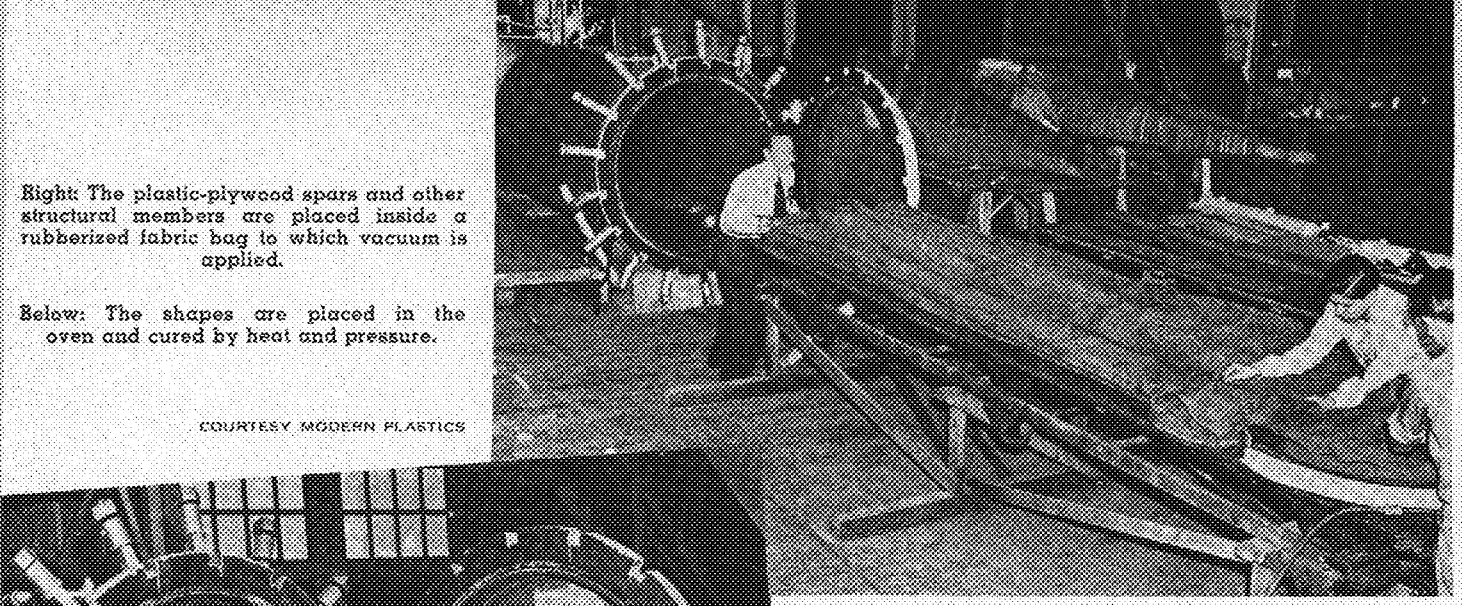
Wood and resin may be combined in either of two ways: by laminating thin veneers with a resin adhesive of the liquid or film type under heat and pressure; or by first impregnating the veneers with resin by soaking, vacuum or pressure methods and then applying the necessary heat and pressure to complete the polymerization cycle of the resin.

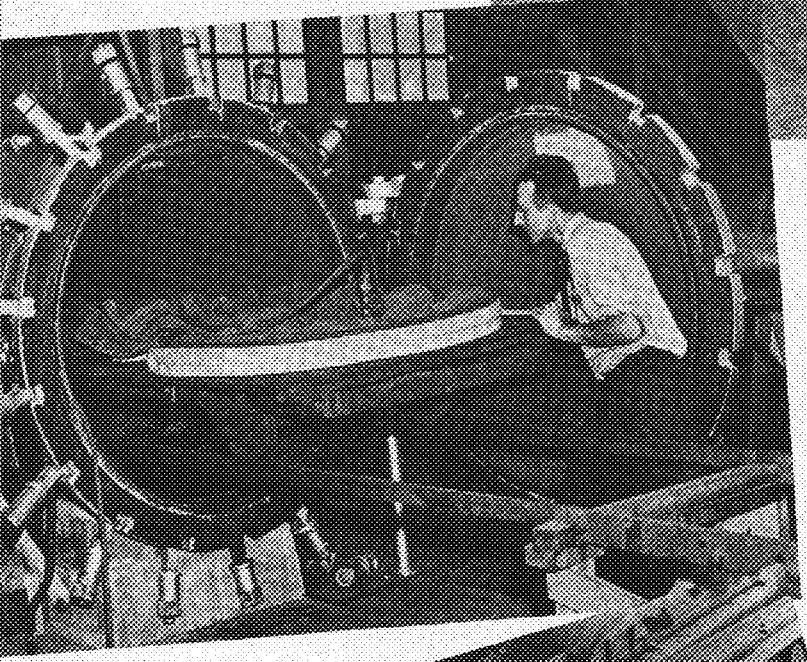
There are several general types of resins being used to produce plastic-bonded plywood at the present time. Included among these are a butecite resin, a phenolic resin, phenol formaldehyde, and urea formaldehyde. These resins may be roughly classified in two groups: thermoplastic and thermosetting resins. Butecite is a thermoplastic resin which means that it must be cooled before the pressure may be released and it has a tendency to soften and creep in temperatures such as might be encountered in the tropics. The others listed above are thermosetting resins which indicates that they are irreversible, heat hardened products. The phenol formaldehyde groups are considered more durable than urea formaldehyde and are used almost exclusively for flat aircraft plywood made by

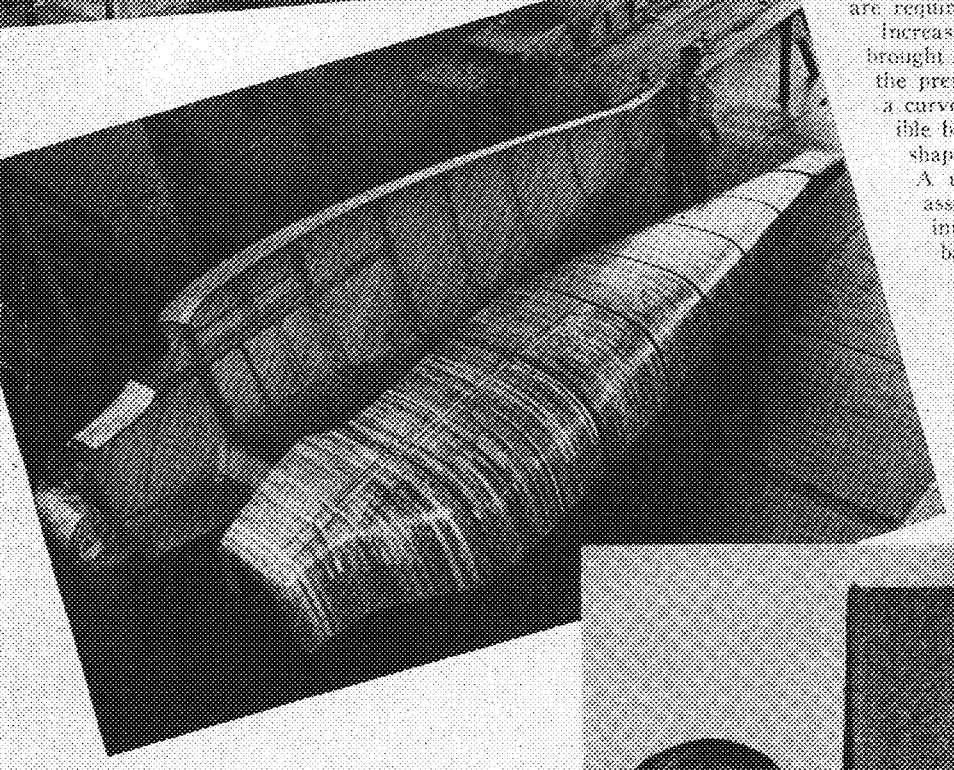
Right: The plastic-plywood spars and other structural members are placed inside a rubberized fabric bag to which vacuum is applied.

Below: The shapes are placed in the oven and cured by heat and pressure.

COURTESY MODERN PLASTICS







the hot press method. Phenol formaldehyde is even more durable than the wood itself.

Urea formaldehydes are not as lasting as the phenol group, but they may be cured at temperatures as low as 75° F. Urea formaldehyde, when heat cured, developes considerable resistance to heat, moisture and fungus.

The methods employed to produce plastic-bonded plywood are greatly diversified depending on the type of wood, type of resin, and the shape that is desired. Most details as to pressures, temperatures, catalysts and other information are closely guarded secrets of the plywood companies and the government.

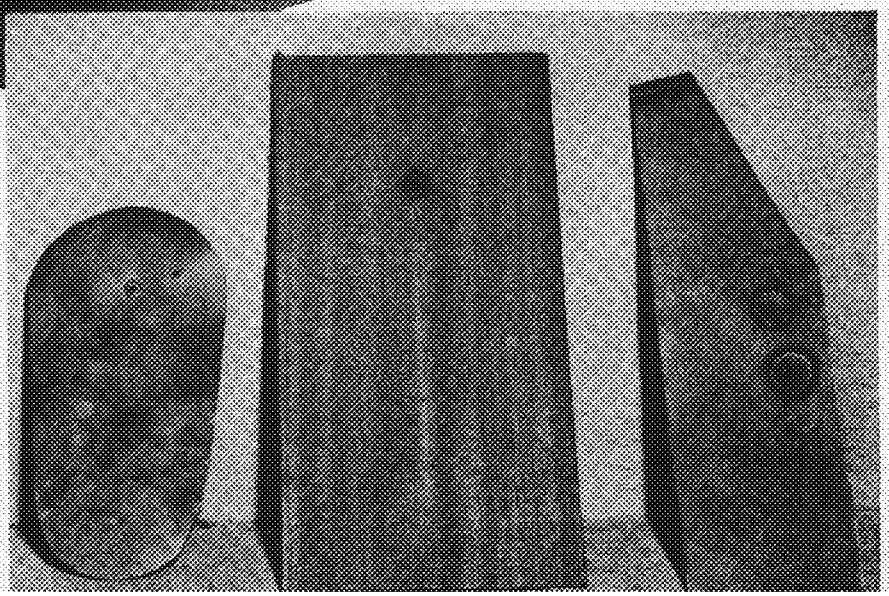
During World War I the hot press with multiple platens was designed to produce flat press plywood for aircraft use. The hot press equipment for laminated and sheet plastics has now been developed to a state such that a wide variety of slightly formed parts can be produced by this method. Flat sheets made by the hot press can also be formed cold into many moderately curved shapes which, however, have a limit when compound curves are required.

Increasing demand for compound curved plywood sections brought about development of the flexible bag method in which the pressure could be applied perpendicular to the tangent of a curved surface. Of the several methods employing the flexible bag, two will be described. In one of them, plywood is shaped over a form and covered by a flexible rubber bag. A metal restraining shell is then bolted over the entire assembly and steam, hot air, or hot water is admitted into the flexible bag at high pressure. The other flexible bag method utilizes a large metal container in which the plywood-covered form is placed while encased in a flexible bag. The bag is vented to the outside and the steam or other heat and pressure producing medium is admitted to the interior of the metal chamber, but is outside of the rubber bag. The bag, being vented to the outside, is forced against the plywood and molds it to the desired shape.

Another method of applying heat employs electrical resistance coils. A method particularly useful where the plywood section is thick is the

Above: Workmen removing the plastic-plywood fuselage from the wooden mold. No metal fastenings of any kind have been employed.

Right: An acetylene torch is applied to half-hard aluminum, three ply plastic-plywood and stainless of .0042 inch thickness. A hole was burned in the aluminum in three seconds, one second was needed to pierce the steel, while 22 seconds were required to burn the plastic-plywood.



use of high-frequency current with electrodes on each side of the sheet.

By suitable handling of the variable quantities a diversity of physical properties and densities may be had within the limits of the materials used. It is also possible to vary the density of the resin and wood veneers from one point to another, thereby producing a structural material that has a varying stress distribution. This becomes an important quality in the construction of wings where the stress varies considerably from root to tip. With such a material, the wing covering can be made to taper from root to tip and in the direction of the chord from the leading to the trailing edge. In some cases, however, the entire skin is made fairly thick, thus allowing the elimination of several ribs. At the present time there is a trend toward variable high density plywood for large propellers. Especially is this true in England and on the Continent. In propellor construction, the variable density plywood has an added advantage in that the density, and therefore the mass, may be reduced near the tip where the stress is not so great, but where the centrifugal forces may become tremendous.

Production Types

It is interesting to note that the largest quantity of literature and early experimental work in regard to plastic reinforcement of wood comes from Europe; especially England and Germany who find it necessary to import much of their wood requirements.

Although the wings of most high performance training planes today are molded plywood, there are very few truly "plastic" (plastic-bonded plywood) planes in production today. The new Fairchild AT-13 was briefly mentioned at the beginning of this article. Other notable examples are the small Langley bi-motored cabin plane which is well known for its beautiful natural grain exterior finish; the Morrow two-place open trainer which has a double plywood wall using the stressed skin principle; the Cessna bi-motored RCAF trainers which have single wall plywood fuselages; and the Bellanca Crusair cabin job.

It is believed that molded plywood wings are being used on some of the English and German fighting planes. There is no reason why plywood wings cannot be used with all metal fuselages. The United States has not, however, attempted this type of construction.

Whether or not it will prove desirable to construct large airplanes completely from molded plywood is yet to be shown. Perhaps it will be found that a happy medium may be struck in which the ideal plane will be constructed of combinations of metal, molded plywood, and fabric, with each of these materials being used in a manner that will best utilize its favorable characteristics: molded plywood for stiffness and smoothness; metal for tensile strength; and fabric for closures. This combination is being used to some extent now and the trend is toward a much greater use of molded parts not only for the cargo planes which Henry Kaiser proposes to build, but also for the fighting, training, and private craft now already in production. The list of parts most advantageously constructed of molded plywood is almost infinite in length. Particularly notable was the application of a molded and trussed plywood floor in a transport plane. This floor saved .3 of a pound per square foot over the original metal floor in a plane containing several hundred feet of floor space.

Items such as air ducts and pipes, pilots' seats, instrument boards, navigators' tables, cabinets, partitions, bomb bay doors, motor nacelles, gun enclosures, small control surfaces, and fairings are only a few of the parts that can be used on high speed fighting planes to save strategic materials. There are also many parts which can and are being molded from pure plastics such as Plexiglas noses, gun turrets, machine gun blisters, hollow radio antenna masts, and shielding for direction finder loops.

COURTESY CESSNA AIRCRA

Cessna AT-17 used by the U. S. Army Air Force in the training of bomber-pilots. The plane has a welded steel tubing fuselage and laminated spruce spars. The plywood forms the leading edge of the wing.

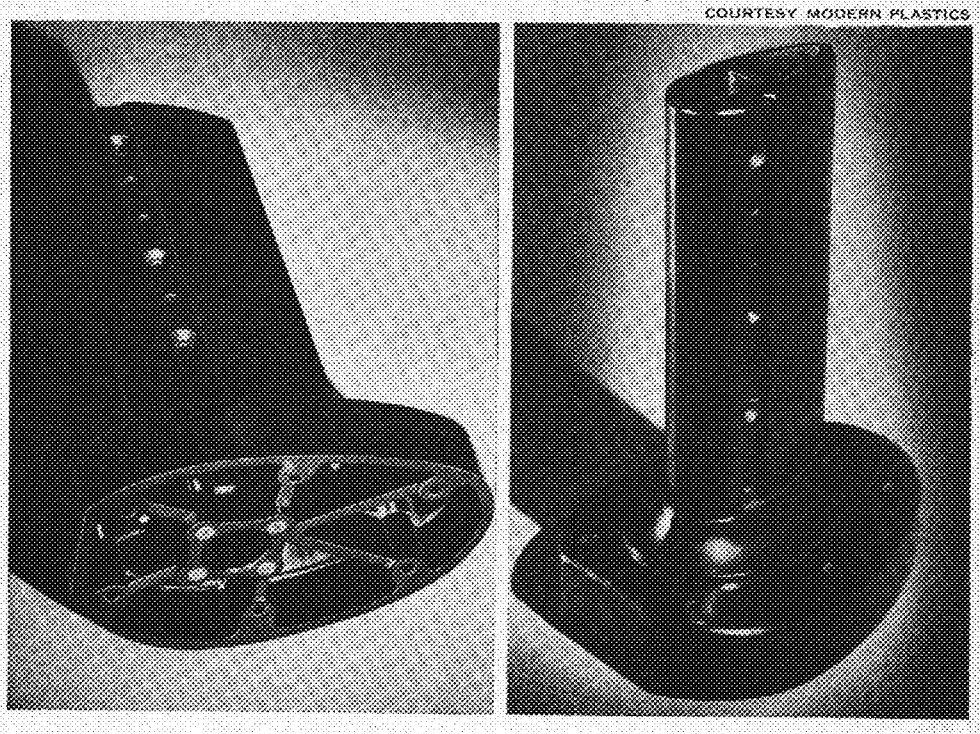
Aluminum Saved

It has not been the writer's intention in this short article to go into much technical detail in regard to the construction of plastic planes, but merely to show that the molded plywood plane has a definite place in our wartime production of fighting aircraft. Much of the overcrowding of congested aircraft factories could be relieved by subcontracting wood and plywood parts and sub-assemblies to woodworking factories. The success of this program to relieve the shortage in essential metals will depend on the skill and diligence devoted to the rapid conversion of woodworking plants into aircraft producers.

It is estimated that 10 million pounds of aluminum could be saved by substituting wood plastic parts on present government contracts. This is presupposing that there would be enough engineering talent and enough factory space and equipment available. The U. S. Government has estimated that there is twenty-nine and one-half billion board feet of spruce standing in our forests. Twenty-nine and one-half billion feet would pave a highway an inch thick from here to the moon.

The plastic aircraft radio mast stanchion as used on the Bell Airacobras is an extremely large injection molded polystyrene piece.

COURTESY MODERN PLASTICS



What Engineers Think About

ACCELERATION

A Student Opinion Survey

BY GERALD BUSCH, AERO. E., '43

ILLUSTRATED BY KENNETH COLES, M.E., '44

THE TECHNOLOG staff conducted a survey during the past summer sessions to obtain the student opinion on the accelerated program in the Institute of Technology. The results obtained and herewith presented represent just that: student opinion. S. C. Lind, Dean of the Institute of Technology, has volunteered to answer, in the November issue of the TECHNOLOG, some of the many questions raised by the students in regard to the program.

Each of the 876 engineers who accelerated their programs, as well as a representative sample of those who did not, received a questionnaire.

The results of the survey indicated that over three-fourths of the engineers who accelerated last June are still in favor of the program and agree with it in principle; but most of them feel that a number of changes are necessary if the engineer is to realize the full benefit of it.

About 35 per cent of the questionnaires distributed to the accelerating engineers, and about 50 per cent of those distributed to the nonaccelerating engineers were returned —the average TECHNOLOG survey return is less than 20 per cent—indicating that the accelerated program question is one of intense interest to the average engineers.

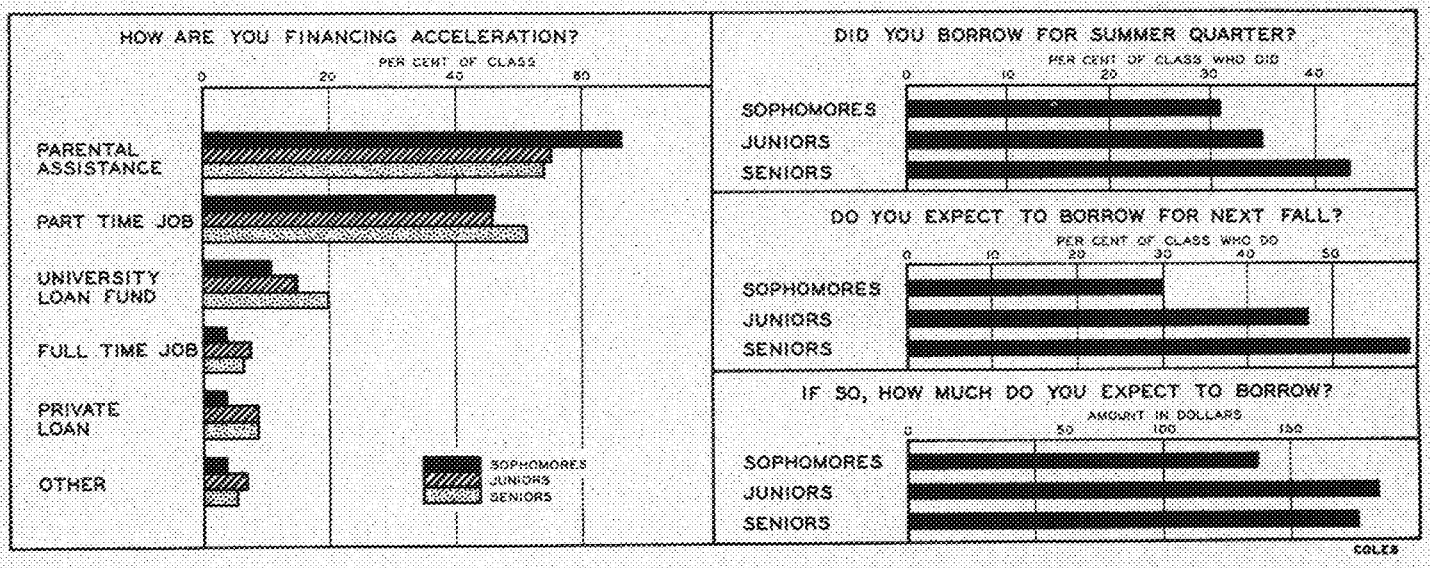
The majority of the engineers have financed their accelerated programs by part-time jobs, parental assistance, or a combination of both. About 30 per cent of the sophomores, 35 per cent of the juniors, and 45 per cent of the seniors found it necessary to borrow for the summer sessions. The number of upperclassmen, however, who expect to find it necessary to borrow this fall jumped to 47 per cent for the juniors and over 60 per cent for the seniors. The increase was due, for the most part, to the curtailment of summer earnings. The percentage of sophomores who expect to find it necessary to borrow remained about the same, indicating that the resources of the average sophomore have not as yet been completely drained.

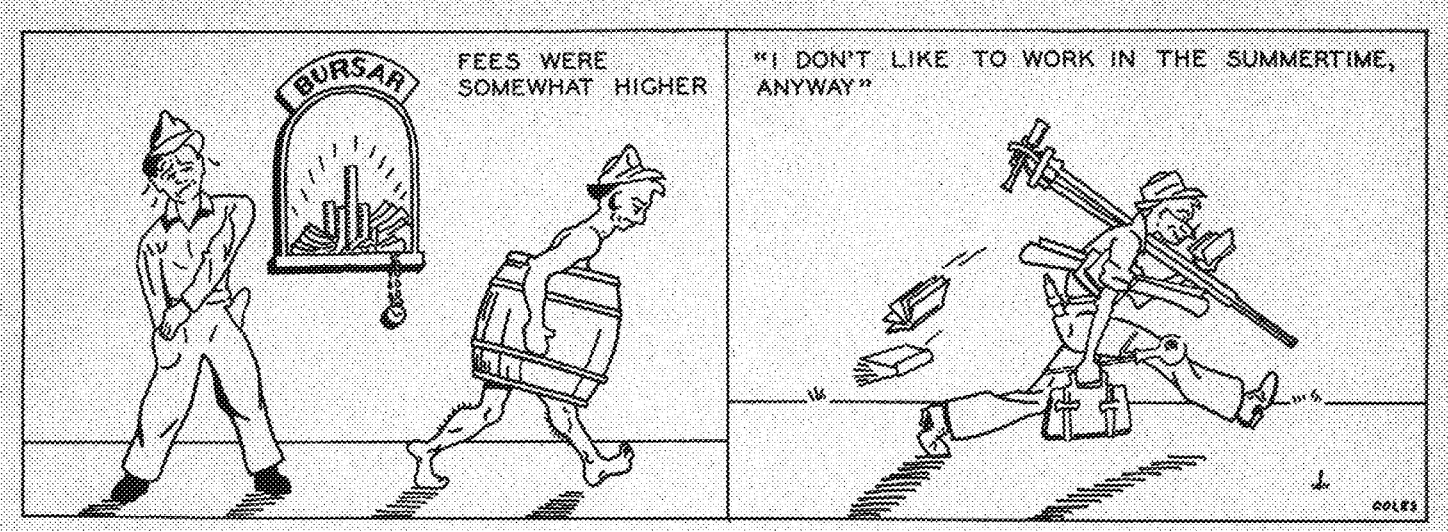
The results of the survey seem to substantiate the well-known fact that it costs an upperclassman more to go to school than an underclassman (more expensive books, higher fees, more social obligations) for the results reveal that the average senior needing a loan expects to borrow $177, the average junior expects to borrow $184, and the average sophomore expects to borrow $137 this fall. Aside from needing the largest loans, three times as many seniors and twice as many juniors as sophomores expect to borrow this fall.

Eighty-five per cent of the engineers who did not accelerate their programs indicated that a lack of funds was their primary motive for not doing so. Only 25 per cent of them regret not accelerating; the other 75 per cent feel that it was either necessary or worth their while to remain out of school for the summer months. One Ch.E. said, "I have earned the necessary money for school and I gained much practical experience in my field." However, it is interesting to note that over 65 per cent expressed a willingness or desire to accelerate their programs this fall if an accelerated program is made available to them. A typical comment came from a junior E.E. who said: "It was not possible for me to take advantage of the first accelerated program, but it would be possible for me to take advantage of one this fall, and I would like to graduate as soon as possible and aid in the war effort."

The survey brought out the fact that the majority of the engineers who need financial aid intend to borrow from private sources rather than from the University Loan Fund or the Government Loan Fund for professional students. Less than 25 per cent of the sophomores who need loans, 10 per cent of the juniors, and 30 per cent of the seniors expect to borrow from the University Loan Fund. A slightly larger percentage of the upperclassmen expect to borrow from the Government Loan Fund (government loans for professional students are not available to underclassmen). For the most part, this may be attributed to the fact that many engineers are unfamiliar with these loan funds—particularly the Government Loan Fund; however, the comments received from some engineers indicated that their primary reason for not borrowing through the University is the difficulty and red tape through which the student must go to do so. They feel that a broader viewpoint should be taken by the university with regard to the student needing financial aid.

As previously stated, over three-fourths of the engineers are in favor of the accelerated program and agree with it in principle, but feel that a number of changes are necessary. The engineers almost unanimously criticized the excessive fees charged for the summer sessions. They feel that they were made the victims of subterfuge, because at a meeting held last spring regarding the accelerated program, they were





led to believe that if enough of them (over 800) accelerated their programs, the fees would be reduced to the level of a regular quarter. After the summer sessions began the administration announced that a reduction in fees was not possible, and quickly squelched a petition to lower the fees started by the students. A comment came from a junior M.E. who said in part: "The monetary situation is preposterous. Who the hell are we to support the whole university for next fall?"

The engineers also feel that they were mis-led when it was suggested, and later rescinded in an article in *The Minnesota Daily*, that the university would not ask for deferments for engineers who did not accelerate their programs.

Another very popular criticism was directed at the summer session faculty. Many students from the M.E. department complained that some of the instructors in that department are devoting much of their time to defense work and that the labs and shops are overcrowded with civilian trainees. The engineers seem to feel that, since the prime objective of the university is to train its regularly enrolled students, since the well-trained engineer is vitally needed in the war effort, and since the state pays the faculty to instruct the students placed in their classes, the university should give the Institute of Technology back to the engineers for whom it was intended. However, in taking this viewpoint, we engineers seem to forget that there is a war going on and that mutual cooperation between all factions is necessary if we are to succeed in this all-out war effort. We must realize that there is an acute shortage of men capable of instructing students in technical fields, and of labs and shops which may be utilized for training defense plant personnel. Skilled labor is certainly as vital an entity in production as professional talent; we must, therefore, be willing to share our labs, shops and instructors in order that the war effort may realize the full benefit of these facilities.

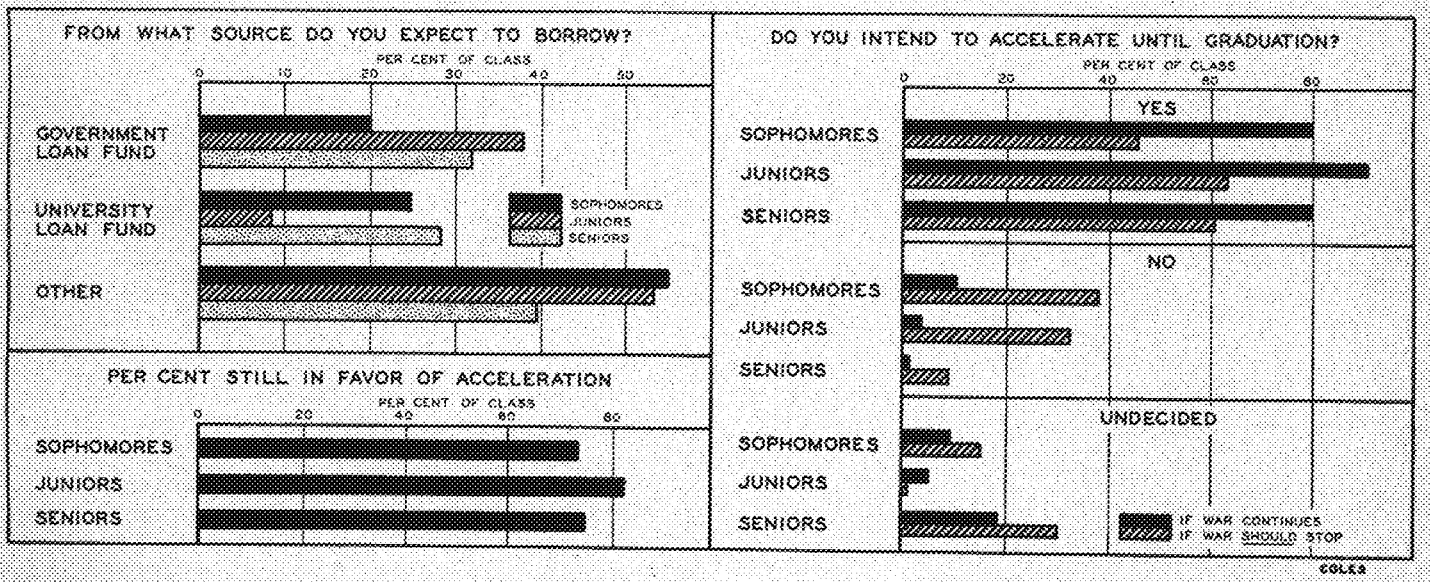
The shortage of capable technical instructors is particularly apparent in the Aeronautical Engineering department. Many Aero.E.s complained that the resignations in that department outnumbered the replacements. In general, we may say that in the case of instructors, as in the case of gasoline, tires, sugar, etc., we must make the best possible use of the materials at hand and find substitutes where feasible; in this instance we may even have to resort to that very unpleasant substitute for instruction: more outside study.

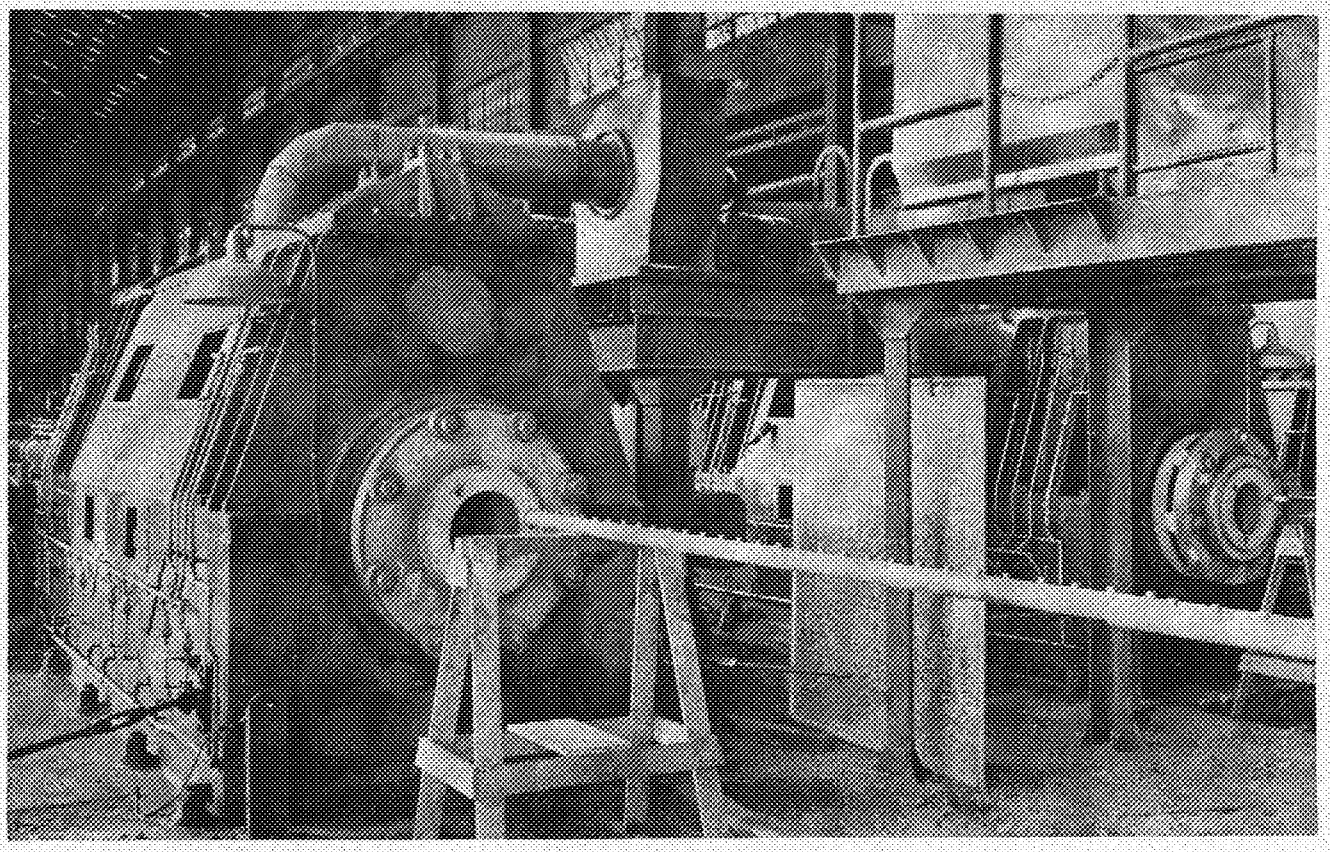
The majority of the engineers are convinced that the most expedient way to make the accelerated program a "paying proposition" is to put the Institute of Technology on a four-quarters-a-year basis for the duration. If this step is taken, the difficulties which arise when a student takes a five-credit course in five weeks will be eliminated, fees will be the same each quarter, and instructors can be hired on a twelve-month basis—thereby guaranteeing as efficient a teaching staff in the summer as in the other three quarters.

In spite of some of the rather cool comments received the engineers, for the most part, are behind the accelerated program, and are willing to cooperate to the fullest with any measure which may be taken for its improvement. Altogether, the majority of the engineers do not regret accelerating, but they do object to the methods employed by the administration in persuading them to follow the program and the uncertainty which still prevails.

The engineers are genuinely interested in the war effort. The comments indicated that the primary motive for acceleration was a desire on the part of the engineer to prepare himself as soon as possible for a position which would directly contribute to the war effort. A typical comment came from a junior Ch.E., who said: "It's the least we students can do as our part in this all-out war effort; also, it's only fair to those buddies of ours who are now overseas that we get into an active part of this fight."

The survey reveals that at least one student is completely satisfied with his lot in the accelerated program. His happy comment was: "I like it fine. I don't like to work in the summer anyhow."





COURTESY AMERICAN MACHINIST

Centrifugal casting machine used for casting gun barrels. The machine consists of a steel tube mounted horizontally on bearings and arranged for motor drive. Into the tube is placed a steel mold which is formed to the exact exterior dimension of the gun to be cast. This machine makes possible a 40% reduction in time and labor.

High Speed Casting with

SPINNING MOLDS

BY MILES B. OLSON, M.E., '44

CENTRIFUGAL castings, sometimes called spun castings, have given new life to the foundry industry. Today, such castings as gun barrels, airplane parts, and machine tools are being produced thereby adding versatility to the foundry. These, along with brake drums, gears, cylinder liners, pipes, rolls, bearings, bushings, expansion joints, valves, and wormwheels are essentially important to our ever-expanding war needs.

During the last three years the number of foundries capable of casting centrifugally has quadrupled. This has been due partly to the competitive situation within the foundry industry, but chiefly because of industrial demand for metals so cast. Better quality and more economical production are the factors creating such a demand.

The process of centrifugal casting is the founding of metal under the pressure of centrifugal force developed through the rotation of a specially prepared mold. Most engineers are not too familiar with the process of centrifugal casting, but that does not necessarily mean it is something new. In fact, it was conceived in 1850, but it was not until after 1900 that it was commercially applied. Then, for years it was employed in limited fields, and it was not until the last few years that it branched out on an unprecedented scale.

Vertical Machines Used

The process, as a method of producing castings, has too often been overlooked by the engineer. It has not been generally known that many different sizes and conformations could be cast centrifugally. Therefore the average engineer thinks of centrifugal castings in the form of cast-iron pipe, iron cylinder liners, or similar cylindrical castings. Also, he thinks of centrifugal castings as being made in horizontal centrifugal casting machines. It is true that the horizontal machine was used originally and has been used ever since with marked success, but centrifugal casting can be done either horizontally or vertically with vertical casting having the broader field of application.

The horizontal machine most commonly used for making cast iron pipe consists principally of a long horizontal tube rotated about its longitudinal axis by an electric driving unit. Into the tube is fitted either a sand or metal mold whose inside diameter corresponds to the outside diameter of the cylindrical casting to be made. While the mold is rotating at a predetermined speed the molten metal is poured in along its entire length. Pouring is accomplished by inserting a long narrow trough into the

mold, and the metal is made to flow at a uniform rate from the spout of the trough as it is drawn from one end of the mold to the other. Thus, the speed of retraction and the rate of metal flow from the spout determine the thickness of the casting. Horizontal casting is generally applied where the dimensions of length are greater than those of diameter, but the usual run of castings do not have the proper shape for this type of machine.

The vertical machine differs from the horizontal machine only in that the mold is rotated about its vertical axis and that the metal is poured into a cavity in the top of the mold. Theoretically, according to a well-known consulting engineer, almost any size or shape of casting can be poured vertically, but many castings have inconvenient configurations and are not economically cast centrifugally at the present time. Consequently, nearly all centrifugal castings are symmetrical about some axis, and only the production of symetrical castings is dealt with in this article.

Permanent Molds

The type of mold equipment used in centrifugal casting depends primarily upon the design and construction of the basic equipment. The most commonly used jacket for molds is an iron or steel shell, dynamically balanced, with sufficient fixtures for attachment to the driving unit. In some cases the jacket is used as a retainer only, and a liner with a sand mold rammed into it is slipped into the jacket. Otherwise, the molding sand is rammed directly into the jacket. Such molds are good for the production of one casting only due to the fact that the sand mold is broken during the removal of the piece. Therefore, high speed production calls for the use of permanent iron or steel molds whose insides are machined to the exact outside contour of the castings to be made, allowances being made for shrinkage and machining of the castings during cooling.

Due to the comparatively high speeds of rotation, it is imperative that the parts be dynamically balanced to insure uniformity of the casting and to save wear on the machinery. Small amounts of unbalance are sometimes hard to eliminate and are tolerable, while considerable amounts of unbalance may so overload the bearings and structural members as to preclude the use of the machinery.

Speed Casting

Rotative speeds range from 50 to 3,000 r.p.m., depending upon the size, weight, and kind of metal being cast. As far as casting the shape is concerned, the speed need be only enough to hold the metal to the mold wall. However, the factors of hot metal strength, cooling, shrinkage, and the liability of segregation of the metal ingredients must all be considered in determining the speed of rotation, and therefore will vary from one alloy to another. Consequently, the "cut and try" method of determining the speed is often resorted to with the influence of past experience as a guiding factor.

As the metal is introduced into the spinning mold, the heavier or more dense material is forced to the point farthest from the center of rotation. Accordingly most of the imperfections and impurities of lower densities, such as oxides and slag inclusions, are left imbedded in the inner surfaces of hollow castings and at the centers of a solid casting necessitating the removal of such impurities when they are objectionable by subsequent machining operations. The inside of cast iron pipe is left unmachined.

Heavy Ordnance

At the Watertown arsenal a few years ago the foundrymen found it possible and advantageous to cast gun barrels centrifugally, and today, several gun barrels are being cast by a single machine in the same time taken previously to forge one. As a result, machining operations have been reduced materially, and up to 40 per cent reduction in time, labor, and material used has resulted. A new process of cold-working the gun after casting so improves the metal structure that the old gun barrels made up of individually forged jackets and hoops shrunk onto each other have become obsolete. The single tube is called the monobloc type of gun. Due to the elimination of needless weight prevalent in forged barrels, many guns have gained increased mobility. A favorite gun metal at Watertown is their chromium-molybdenum-vanadium steel. Gun barrels cast centrifugally at Watertown include the 37, 40, 90, and 105-millimeter, and the new model 3-inch type.

The gun-barrel machines weigh from 5 to 10 tons. Enough metal is poured into them so that only a small hole remains to insure removal of the imperfections in the cast metal during the boring operation.

Aircraft Casting

In the aircraft industry centrifugally cast parts are used wherever possible. In the casting of lock nuts and bushings for propellers, pressures of about 66 pounds per square inch are used as compared to about 2 pounds pressure in similar parts statically cast. The density increases slightly, and the more rapid cooling produces a desirable homogeneous grain structure.

Electrically-controlled variable pitch airplane propellers are held onto the crankshaft by centrifugally cast and heat-treated aluminum-bronze lock nuts. Steel nuts were previously used, but in some instances they showed a tendency toward seizing the shaft. This delayed overhaul, and in some cases resulted in the loss of a crankshaft when the nut could not be removed. A severe strain through the application of a 1,000 foot-pound torque is set up by the propeller in locking the nut to the shaft and against the propeller housing. Another aluminum-bronze is used in the production of blade bushings for hydraulically controlled variable pitch propellers. Four years of service have seen no failures. The manufacturer has predicted a life expectancy of 2,000 hours for the part which has proved capable of even longer life in service. The bushings formerly lasted less than half as long, when made of beryllium-copper and cost three times as much. Some of the airplane parts centrifugally cast are hydromatic propeller cam rollers, propeller hub nuts, shock absorber piston bearings, and packing nuts.

Gear Castings

Since 1938 the Ford Motor Company, Dearborn, Michigan, has highly developed centrifugal casting techniques, enabling them to use steel castings for transmission and differential ring gears which had previously been made from steel forgings. The new gears are stronger and lighter, and production is much faster. According to R. H. Carroll, Ford metallurgist, the use of sand cores in molds permits undercuts to be made in castings which would be impossible in conventional forgings. In some forgings, lines of metal flow may be parallel to the lines of stress with resultant failures on some occasions. In centrifugal castings there are no flow lines, and the metal is equally strong in all directions.

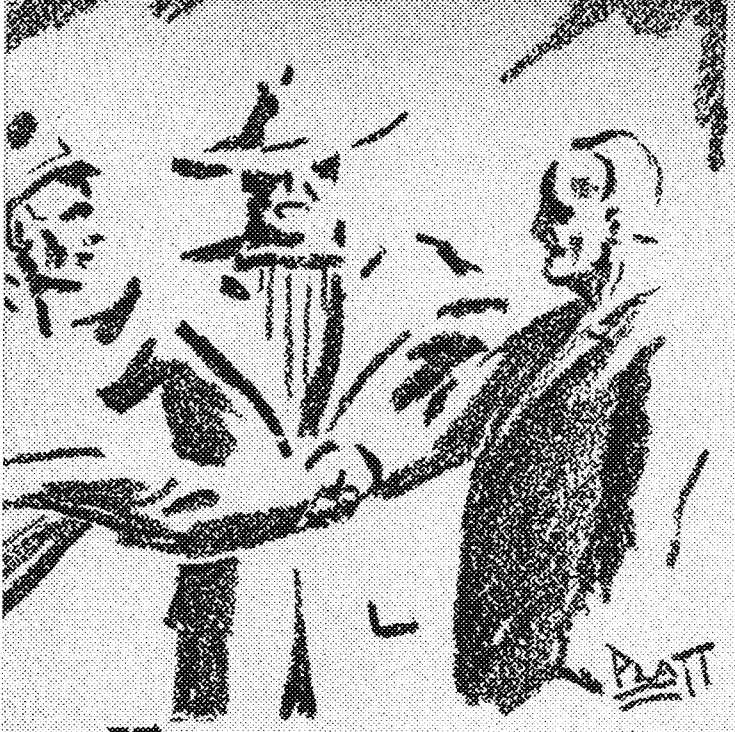
The complete process of casting steel gear blanks is carried out on a turntable which has eighteen vertical casting machines mounted on it. As each mold approaches a pouring station, a motor drive beneath the mold is automatically set into operation. Each mold is poured, and after spinning for about two minutes they reach an unloading station. Here the rotation of each mold is stopped to permit removal of the castings and insertion of new cores. As now set up, one man loads cores into the molds and places the top halves of the molds into position, another pours the steel, and a third removes the tops of the molds and resultant gear blanks. One revolution of the turntable takes approximately four minutes, making it possible to produce 270 gears an hour.

There is no hollow portion in the center of the gear blanks as is true with many centrifugal castings; nevertheless, there are inclusions in the center of the castings which are removed upon the drilling of the shaft holes. Teeth are machined into the blanks, and heat treating follows.

Steel molds enable dimensional limits to be kept well within a minimum, and tolerances from $\frac{1}{32}$ to $\frac{1}{16}$ inch are generally allowed for machining the blanks. Considerably more stock is usually required on forgings because of less dimensional accuracy and the fact that more draft is necessary on forging dies.

Latest Developments

New developments, such as the simultaneous rotation of molds about more than one axis which produces completely hollow castings without openings, and the bonding of two different metals by pouring them successively into molds, are ever increasing the field of application of centrifugal castings. Castings with increased density and enhanced metal structure rival forgings, and in these days of striving toward higher quality, reduced cost and increased production, centrifugal casting is gaining impetus.



An Issue In Engineering

PROFESSIONALISM VS. UNIONISM

BY PROFESSOR FREDERIC BASS
HEAD OF CIVIL ENGINEERING DEPARTMENT

THE origin, development and present status of the professions and the unions are quite different. Among the learned professions, theology, medicine and law have existed in some form for many centuries. Engineering is a comparatively recent addition; its practitioners' interests at first were in the actual execution of their work. Then, as science developed, there were formed national, state and local engineering societies, which devoted increasing attention to the scientific foundation upon which modern engineering depends. Engineering is now established as one of the learned professions and as such has formulated as its principal objective: the control and use of the forces and materials of nature for the benefit of mankind.

Labor unions in various forms have also existed for centuries. The modern labor union was created for the purpose of protection of the members against exploitation by their employers. Its objectives were higher wages, decreased working hours, better working conditions, security of employment, abolishment of child labor and similar aims tending toward higher living standards. Much has been achieved in these directions in the past half century and labor unions have demonstrated their value. Recent legislation, such as the National Labor Relations Act of 1935, has tended to better define the status of labor and labor unions and their relations to employers. In the beginning of the long struggle for protection by labor, want, disease and calamity were the worker's common lot. These enemies of society have been largely eliminated, but the powerful labor organizations are far from being satisfied; at the extreme they seek to control the sovereign power of government itself. Unionism is a necessity for the laboring man and consequently for society, but the abuse of its original purpose by selfish, unintelligent, or short-sighted leadership decreases its value and may lead to its destruction. When it relies upon violence instead of reason to further its ends, it emulates the tactics of a dictatorship, and becomes out of place in a democracy. Unionism can succeed only in a democracy and there only by the exercise of moderation and reasonableness; it must perish under a dictatorship. Its sole hope for survival is to abandon violence, find its logical place in democracy, and follow a nationally constructive leadership.

In the past few years, many younger engineers have felt the need of immediate economic protection by their societies and have questioned the advisability of joining a union. The C.I.O. has created the Federation of Architects, Engineers, Chemists and Technicians (F.A.E.C.T.), and the A.F.L. has created the International Federation of Technical Engineers, Architects and Draftsmen's Unions (I.F.T.E.A. and D.U.). There are other unions also available. At present both employers and employes are numbered among the engineers; also some engineers occupy supervisory positions. As employers and supervisors, engineers are ineligible as members of employes' bargaining unions. In the past, the average engineer, at first definitely an employe, rose to a supervisory position and often to the status of an employer. This progressive advancement is still his prospect and promise of success; the degree to which he may realize it depends upon his own ability and industry. The union does not and cannot help him to realize his ambition to excel in engineering, although it may help him to better wages, or shorter working time in his first few years of practice.

It is the business of the engineer to plan, to foresee difficulties, to look ahead. If he fulfills these requirements today he will see that the world needs him as a constructive leader and he can rest assured that in the long run the services of engineers to society will be rewarded in proportion to their quantity and quality. All societies and civilizations have sought to perpetuate themselves by means of tools, institutions and weapons superior to those of their enemies, which is to say, by economic means. The reason for the existence of engineers and engineering training is an economic one; to get the most from the least, not for themselves alone, not for their group alone, but for the common good. This is their responsibility, one which now is not that of labor unions. It is the distinction of a profession to be as a whole devoted to the common cause of human progress. No antagonism to unionism is thereby implied. Engineers in their daily tasks must deal with all forms of energy, including human energy, which must be recognized as the most valuable form because by it all other available forms of energy are controlled.

The conclusion is that engineers must reassess their ideas of economy; they must recognize that the ultimate economy is that of human life and energy. They must recognize unionism in its legitimate form as a conserver of human energy and support it, and they must fight its abuses where and when it creates unnecessary friction under leadership opposed to economic principles. Engineers too must support management in constructive enterprises of a legitimate nature and oppose the abuses of opportunism as they appear. They should maintain their independence in thought and position and prepare themselves for the role of leadership which is theirs as professional men in the years to come. If they will do this, it is even possible that their constructive way of thinking may eventually influence that of both employes and employers, with the result that professionalism and unionism will find cooperation, and not competition to be the superior economic means of rebuilding a world from the ashes left by war.

It is the younger engineers working as employes who are being solicited by the unions; their existing grievances being emphasized with offered prospects of immediate relief. No mention is made of the limitations imposed upon individual professional ambitions and objectives, no reference to the future is made, that future of professional engineering which holds so well founded a promise of progressive service to society and its accompanying rewards; such ideas are foreign to present labor-union policy. It remains for each young engineer to balance the present against the future. He has been trained in the technique of planning, so that the machine or structure which he designs will fulfill its purpose with certainty and efficiency; he should do no less with his own future.

Your DEFERMENT

BY DR. S. C. LIND
DEAN, INSTITUTE OF TECHNOLOGY

The TECHNOLOG of October, 1941 (page 9) contained a summary of deferment policies as they existed at that time for students and staff in the Institute of Technology. These policies are now reviewed and brought up to date. Changes are not great and procedure remains the same as last year.

IN ORDER to be recommended for deferment a student of Engineering (including Architecture), the School of Mines, or of Chemistry or Physics must be in good standing (i.e., permitted to continue in college) and making normal progress toward his degree. He must also have completed or practically completed his second or sophomore year. By "practically completed" is meant he must have reached the third quarter of the sophomore year or its equivalent.

The age for military service now being 20 (instead of 21 as a year ago) many of our sophomores in the fall and winter quarters will become subject to the draft. And since they are not eligible for deferment they should enroll for one of the reserve services exempting them from the draft so as to continue in college. Information in regard to these services can be obtained at the office of the Dean of Students, 213 Administration Building.

Graduate students in essential fields (See Selective Service Bulletin No. 10, June 18, 1942, Section IV, paragraph 5) are eligible for deferment only if they are also acting as graduate assistants or are engaged in scientific research related to the war effort and which is supervised by a recognized Federal agency (N.D.R.C. research, for example).

Staff members may be recommended for deferment if it is shown that they are "key" members of the staff and irreplaceable, and if they are engaged in the training of "necessary men" to enter defense work.

No member of the staff of the University is authorized to initiate a request for deferment without its going through the University Committee on Deferment and the President's Office for official approval.

The procedure to be followed by students and staff members seeking deferment is as follows: Immediately after registration under Selective Service come to the Dean's office (Room 145, Chemistry Building) and fill out one of the blanks giving information in regard to scholarship, draft status, etc. Nothing more is then required until the Selective Service questionnaire is received. Then return to the Dean's Office with your latest blueprint (or write if away from the campus), bring the information on scholarship up to date and request a letter recommending deferment in Class 2-A, as a student in a scarcity field.

Staff members seeking deferment should furnish a list of classes taught, number of students of each, and of other duties performed. A non-academic employe should furnish a list of duties performed and have a letter from his superior as to his essentialness, irreplaceability and relation of his work to the war effort. The letter of recommendation from the Dean after approval by the University Committee on Deferment is sent from the President's Office with a second letter and affidavit directly to the local board concerned.

The Selective Service questionnaire should be returned by the student within ten days to his local board with a request for classification in 2-A and a statement that an official recommendation may be expected from the University in the course of a few days.

Upon later receipt of his classification card, if given 2-A the student should report this to the Dean's Office and give the date of expiration. He will then be sent a copy of the Dean's original letter which he holds as credentials for second deferment after six months. About a month before expiration he should return with the letter and his latest blueprint, bring his scholastic record up to date and get a statement recommending second deferment for six months, and so on until graduation or some change in policy.

If given 1-A by the local board instead of 2-A as requested, notify the Board *in writing* of desire to appeal. This must be done within ten days of the postal date of the classification card. See the Dean at once for advice and a letter supporting appeal.

Any student enlisting or being inducted into the armed forces may receive a statement from the Information Window, Office of Admissions and Records, with instructions attached, in regard to his special training and education, and also a certificate if he has completed at least two years of college work.

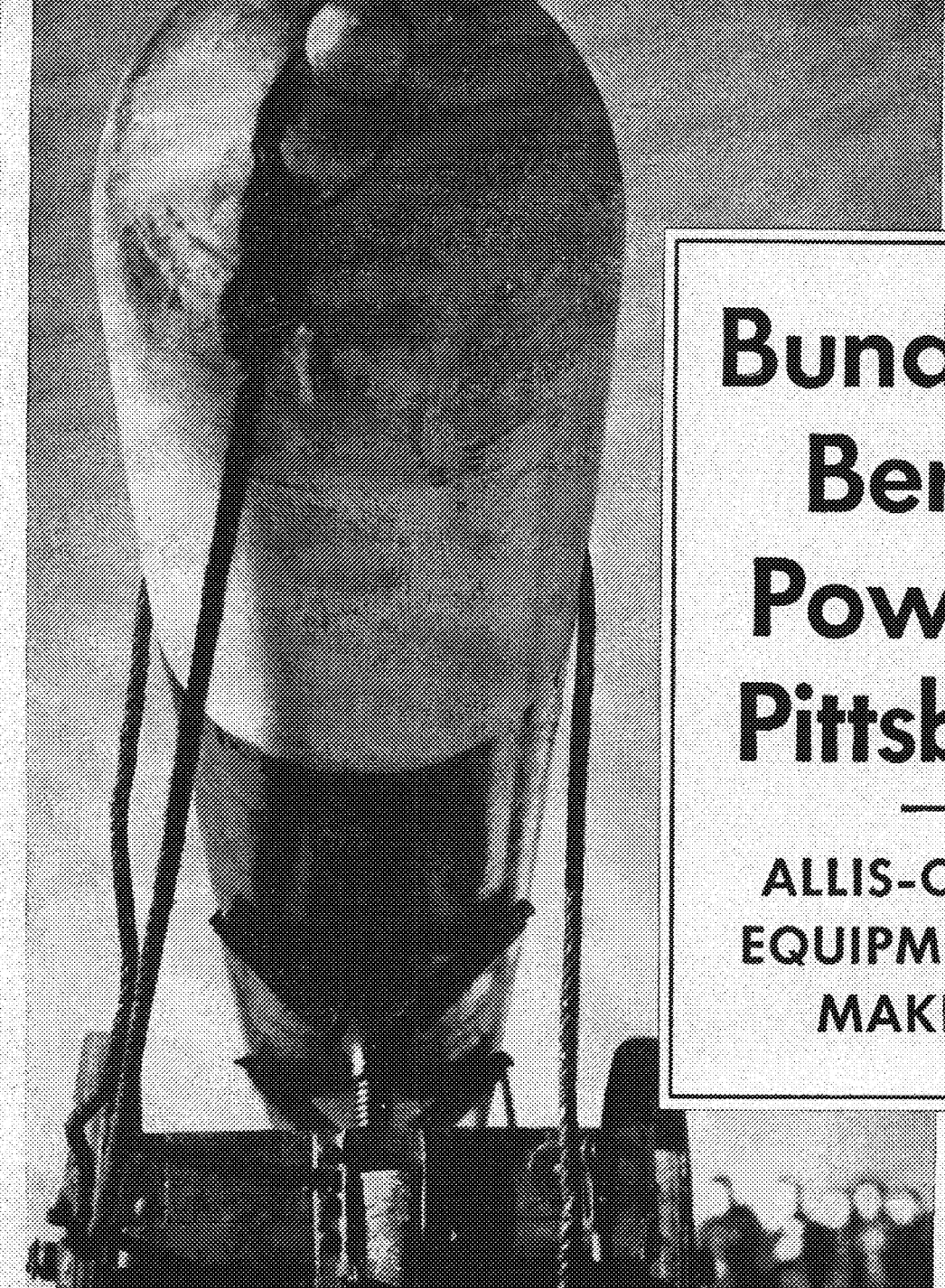
In the event that the University should not be able to make a recommendation, the student is notified by the Dean; the student may then apply to the Office of Admissions and Records for a statement of his credits and for a form letter addressed to local boards. The student should send these to his local board together with his own letter requesting deferment and stating fully the reasons therefor.

Those who are deferred to Class 3 on account of dependents or in Class 4 because of physical unfitness do not need any other deferment as long as that status holds. In the case of students or assistants who are reserve officers or who are members of the student ROTC the University will not make a request for delay of service. In the case of staff members who are reserve officers request will be made only if the given staff member is a "key" member who could not be replaced.

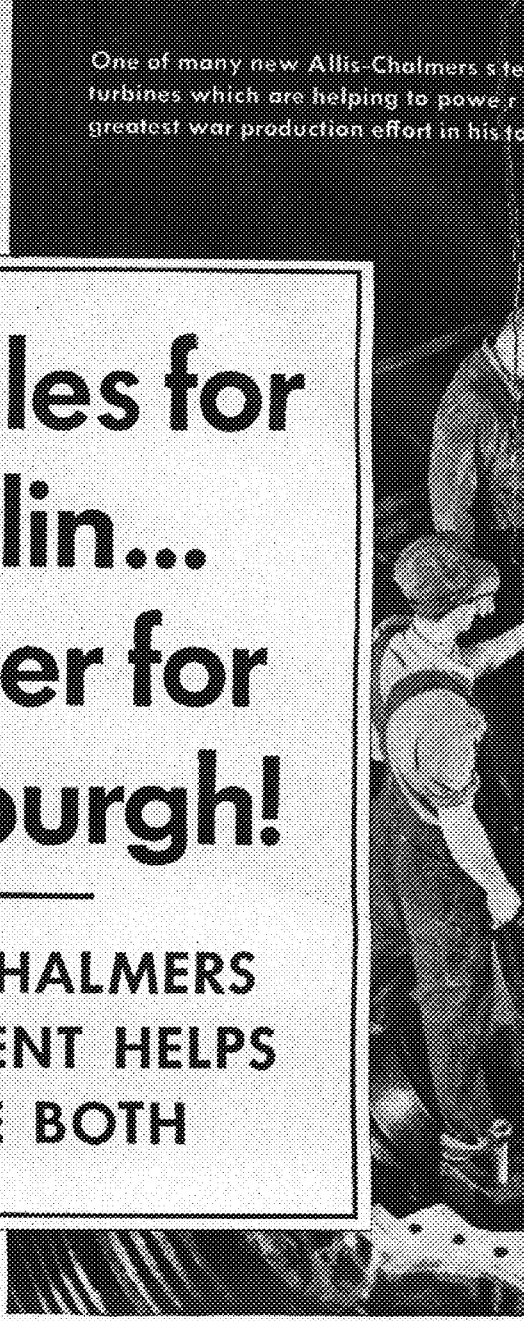
Many students of technology are perplexed in deciding whether to continue their studies or leave them to enter the armed forces. Even a strong feeling of patriotism gives no conclusive answer. Trained men are sorely needed in industry as well as in the armed forces. Both the Army and Navy have shown their desire to have competent students complete their special training in college and have provided classes for enrolled reservists, which enable them to do so before entering the service. No man who has completed the sophomore year successfully should fail to complete his course if possible to do so.

Trained men are needed in essential productive industry just as much as in the Army or Navy. The responsibility of filling these essential positions rests mainly on technically trained men. Everyone can't be in the Army. The men in industry backing up the men behind the guns are just as essential. The pride of a uniform must be sacrificed for more drab civilian duties. Students and teachers of science and engineering should not hesitate to request deferment. Local boards have almost universally recognized this and have not hesitated to grant requests of deferment when supported by the University.

In recommending deferment for students in essential fields of scarcity it is, of course, understood that the University cannot guarantee compliance. The Selective Service System is the final arbiter.



Ore for Giant Aerial Torpedoes and bombs is mined with Allis-Chalmers equipment.



Bundles for Berlin... Power for Pittsburgh!

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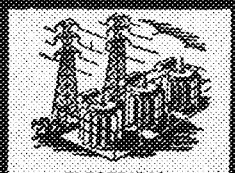
And that turbine above is another Allis-Chalmers product that will soon be turning out trouble for Hitler—supplying power to great war plants—helping to make America's soldiers the best equipped in the world.

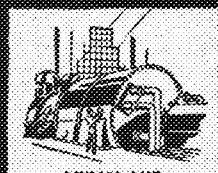
These are just two examples of how thou

ALLIS-CH

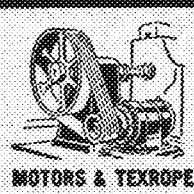
OFFERS EVERY MANUFACTURER EQUIPMENT AND ENGINEERING



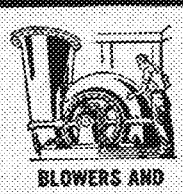
ELECTRICAL EQUIPMENT



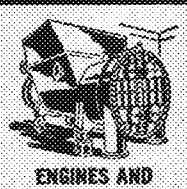
STEAM AND HYDRAULIC TURBINES



MOTORS & TEXROPE V-BELT DRIVES

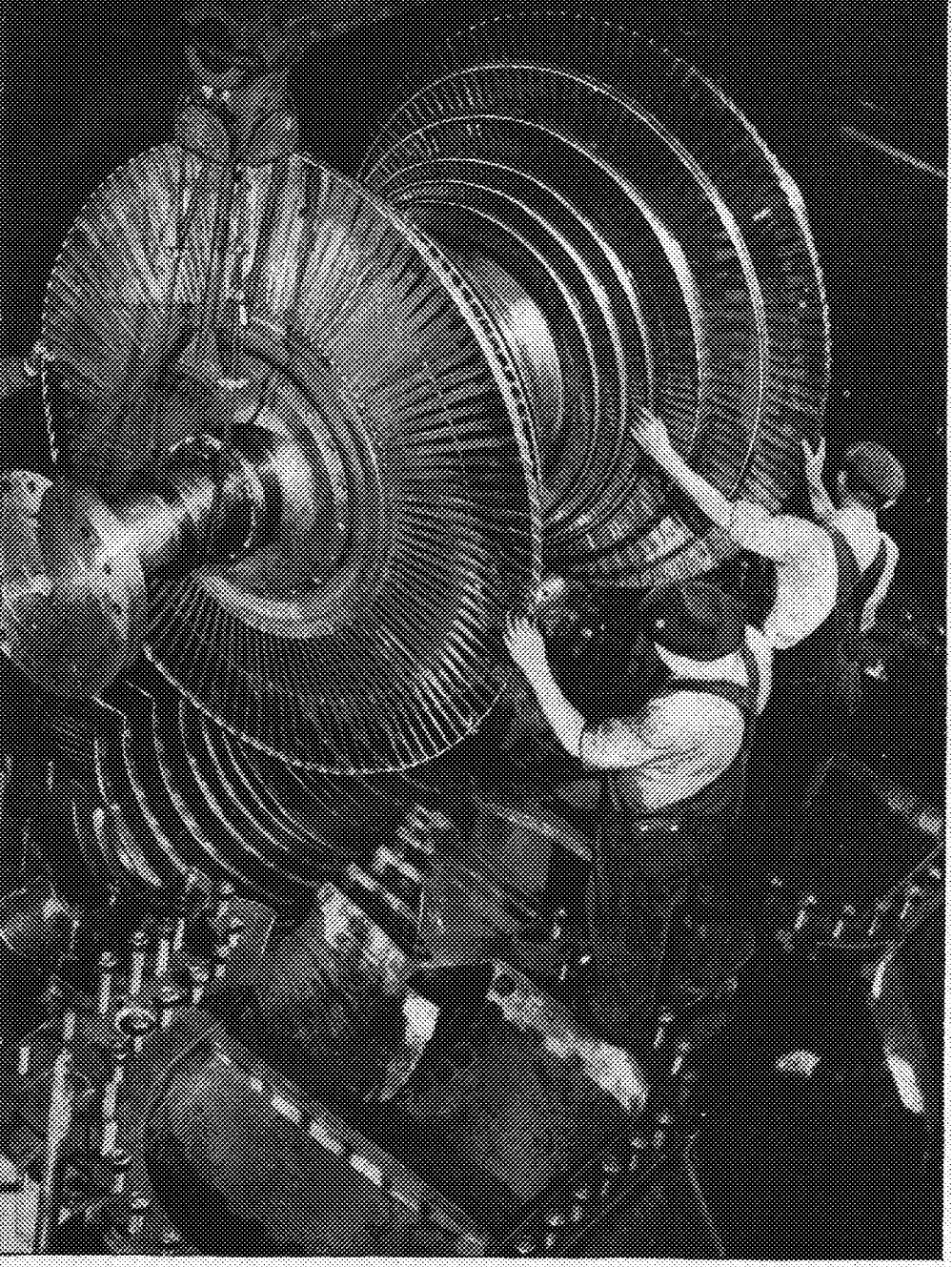


BLOWERS AND COMPRESSORS



ENGINES AND CONDENSERS

CENTRIFUGAL PUMPS



sands of Allis-Chalmers people are fighting the Axis—are *working for Victory!*

Over 1,600 Allis-Chalmers products are working in the Battle of Production. And our Cooperative Engineering service is helping makers *produce more*—not just with new machines, but with *machines now on hand!*

This production experience will be of added value when the war is over. We work for Victory—we plan for Peace!

ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

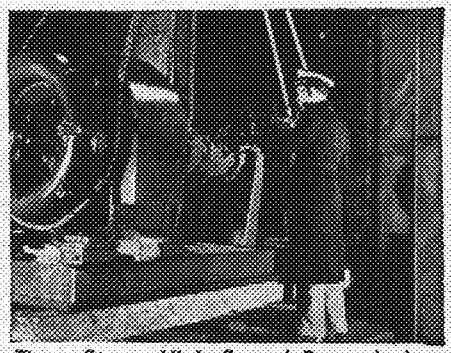
8 out of 10 loaves of bread in U.S. are made with the aid of A-C farm and flour mill equipment.

VICTORY NEWS

Washington, D. C.—Keels for more than 140 "Liberty" ships have been laid and more than 60 ships have been launched from ways which did not even exist before 1941. Original schedules have already been more than doubled.

To set the fastest shipbuilding record in history, mass production principles are used. More than 500 makers are feeding parts to Liberty ways.

From Allis-Chalmers, one of the most important of the contributing firms, comes products ranging from machine-gun cooling pumps to propulsion shafting.



Three-Stage High Speed Pump is inspected as it leaves A-C shops for a military destination. Equipment includes Allis-Chalmers motors and switchgear.

Milwaukee, Wis.—Mosquito boats no longer have to use their motors to recharge their batteries—small Allis-Chalmers rectifier units now do this job.

This unit is the newest means of obtaining nominal d.c. current from existing a.c. power lines. It eliminates need for keeping ships motors running for battery charging on shore. It also aids coast defense by helping to supply power for shore searchlights.

Industrial plants are also using the new unit to supply small amounts of d.c. for individual drives on planers and other machines, in laboratories for testing purposes, and in tool rooms.

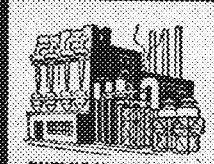
FOR VICTORY
Buy United States War Bonds

ALMERS

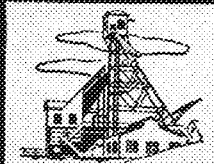
WE WORK FOR VICTORY — WE PLAN FOR PEACE

OPERATION TO HELP INCREASE PRODUCTION IN THESE FIELDS...

FLOUR AND SAW MILL EQUIPMENT



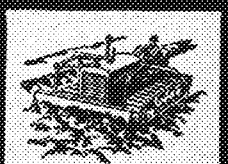
CHEMICAL PROCESS EQUIPMENT



CRUSHING, CEMENT & MINING MACHINERY

BOILER FEED WATER SERVICE

POWER FARMING MACHINERY



INDUSTRIAL TRACTORS & ROAD MACHINERY

COURTESY U. S. ARMY SIGNAL CORPS

Know Your Army

COAST ARTILLERY CORPS

BY CAPTAIN WILLIAM C. RINSLAND
ASSISTANT PROFESSOR OF MILITARY SCIENCE AND TACTICS

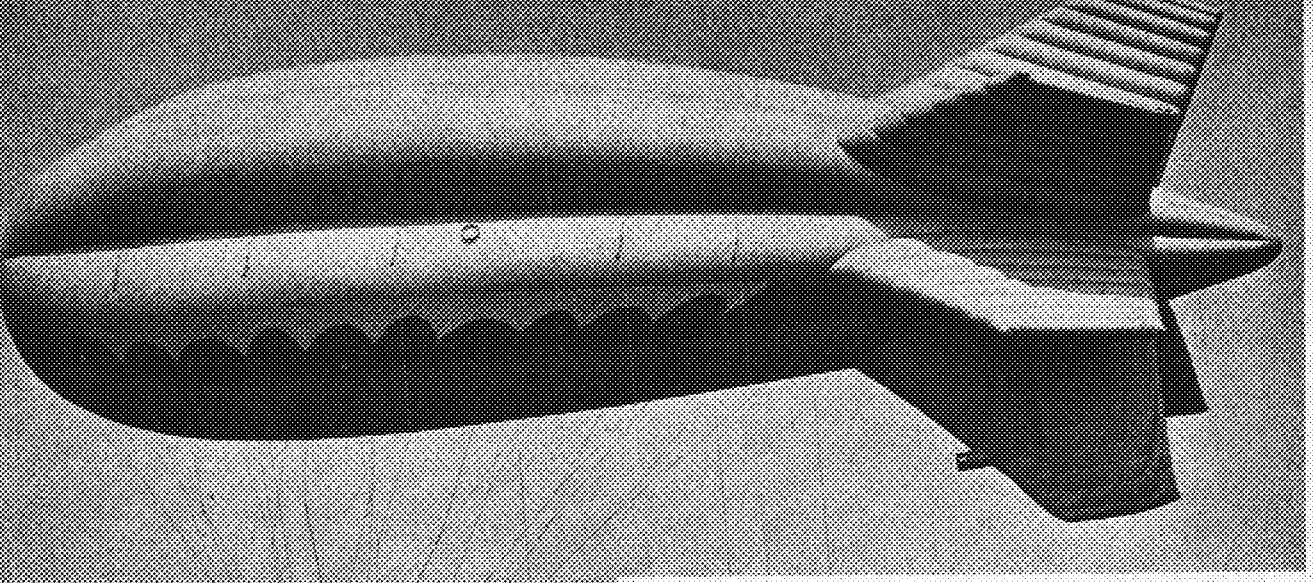
This is the first of a series of articles covering the work of the various branches of the R.O.T.C. and the N.R.O.T.C. at the University of Minnesota.

TO THE uninitiated, mention of the Coast Artillery Corps brings to mind only visions of giant guns that hurl huge projectiles far out to sea and belch forth great billows of smoke and flame. However, to the initiated, it means not only this, but also submarine mines, fast-moving antiaircraft artillery units, railway artillery, tractor-drawn artillery, barrage balloons, and all the intricate and complex mechanisms which are required to operate effectively this variety of armament and equipment.

The mission of the Coast Artillery Corps is unique among our combat forces in that it embraces offense and defense against the enemy under the water, on the surface of the land or sea, and in the air. This mission is primarily one of deterring the enemy from coming in close enough to accomplish his mission, and, secondly, of attacking and destroying him if he does get in close. It is doubtful whether greater versatility has ever been expected of any combat branch of our Army.

The need for coast defense was recognized as far back as 1700, when the colonial subjects of the British King William III began working on the problem of establishing defense along the Atlantic seaboard against aggression from the sea. The first seacoast defense was established at Old Point Comfort in 1711. This is now the site of Fortress Monroe, construction of which was begun in 1819 and completed in 1836, and which is an important part of the present Chesapeake Bay defenses.

An "Artillery School" was established at Fortress Monroe in 1824. The Coast Artillery Corps came into being as a separate and distinct combat force on February 2,



COURTESY COAST ARTILLERY JOURNAL.

Within the past year, the Coast Artillery has been assigned the responsibility for the balloon barrage.

1907, and the Artillery School at Monroe became the Coast Artillery School.

Prior to World War I, the Corps had as its primary function the establishment and maintenance of harbor defenses. A harbor defense is defined as, "a highly organized and permanently defended locality for the general purpose of protecting an important coastal area (seaport, naval base, or anchorage) and utilities, primarily against attack from the sea." During this first world fracas, the Coast Artillery was assigned the added responsibility of tractor-drawn and railway artillery, as well as antiaircraft artillery which has become one of the most important responsibilities of the Army. Within the past year, the Corps has been assigned still another responsibility, that of Barrage Balloon, to supplement antiaircraft defenses.

It is well to point out that although the Coast Artilleryman considers his assignment an important one whether it be seacoast or antiaircraft defense with all their many phases, he does not lose sight of the fact that his unit is part of a well-organized team made up of the Army, the Navy, and the Air force. Quite often the situation requires the coordinated action of the Navy and the Coast Artillery against hostile sea-borne forces, and the Air Force and the Coast Artillery against hostile air-borne forces. An adequate harbor defense with fixed armament ranging in caliber from 3-inch rapid-fire guns to 16-inch guns and howitzers with elaborate range-finding devices and powerful searchlights, as well as controlled submarine mines, supplemented, if need be, by mobile units of seacoast and antiaircraft artillery, will afford Naval units complete freedom of maneuver to seek out and destroy the enemy fleet.

As situations arise, mobile units of seacoast artillery, in conjunction with other combat forces, can be placed in action against enemy fleets, and/or landing forces at points not covered by fixed harbor defenses. These mobile units consist of 6- to 14-inch railway artillery and 155-mm tractor or truck-drawn guns. These units are also used in operations against land forces.

The Submarine Mine Service was established to augment the harbor defenses and became a member of the Coast Artillery family when the Corps was recognized as a separate combat force. To install and maintain the mines within the harbor defense areas, the Corps operates its own sea-going vessels, ranging in size up to approximately 1,000 tons. The mines are electrically controlled and can be fired from shore at will or by contact as desired. In addition, subaqueous sound-ranging devices are installed as part of the defenses to warn of the approach of vessels, especially at night and and in inclement weather.

The general mission of antiaircraft is to provide local protection for ground forces and important ground establishments against all forms of enemy aerial attacks and activities. Antiaircraft units for the most part are highly mobile and can move rapidly to take up new positions in protecting a moving army. There are a few fixed antiaircraft guns at vital points.

Antiaircraft artillery units are provided with 3-inch, 90-mm and 105-mm guns for use against all enemy aircraft within range, particularly high-flying airplanes. Contrary to popular belief it is not necessary to make a direct hit on a plane to cripple or destroy it. Projectiles for these guns are provided with a fuse which can be set to explode the projectile at any point along its trajectory. A battery of four 3-inch guns can fire at the rate of one hundred rounds per minute up to vertical ranges approximating the ceiling of a loaded bomber. Each battery of AA guns is equipped with a director or "mechanical brain" which is pointed continuously at the target and computes the pointing data for the guns. These data are transmitted electrically to dials at the guns, and it is necessary for the gun crew to match pointers on the dials in order to point the guns.

The gun batteries are supplemented by sound locators to detect the approach of aircraft during the night hours and to furnish directional data for the 800,000,000 candlepower searchlights which will illuminate a target at ranges from approximately 4,000 yards to 11,000 yards depending upon atmospheric conditions and target characteristics. All power for the operation of data transmission systems and searchlights is furnished by direct current generators driven by gasoline engines.

Additional protection against low-flying or "hedge hopping" attack planes is provided by automatic weapons which can deliver a large volume of automatic fire. The .50 caliber machine gun using tracer bullets and firing at a very high rate up to what are considered medium ranges, and the 37-mm antiaircraft gun firing a one-pound projectile equipped with a contact fuse are used.

The role of the balloon barrage is one of passive defense of extremely important areas, or clusters of areas of limited extent which require precision bombing for their efficient destruction. These balloons are intended to keep the hostile aircraft at vertical ranges best suited for gunfire, and also to prevent dive-bombing and attacks by low-flying aircraft on the defended area and upon the AA guns. Protection for the balloons is provided by the guns, thus it can be seen the two types of defense are mutually supporting. The balloon barrage has been used extensively in the defense of cities both in England and Germany. Defense of waterways has been attempted by anchoring the balloons to barges, and in some cases convoys have been afforded additional protection by towing the balloons from vessels.

The Coast Artillery Corps can now think of itself in terms of action that are all inclusive—defenders of the land, defenders of the sea, and defenders of the air.

Editorial Comment

AS WE SEE IT

In order to make the TECHNOLOG truly the "engineers' magazine" we welcome suggestions or contributions for this page. Send them to THE TECHNOLOG, 17 Murphy Hall.

Let's Face It

Whether we like to admit it or not, we are in a war, and as engineering students, we have a definite place in it. The very fact that the engineering student is being deferred from service until he graduates and can take his place in an essential industry or in a technical job in the armed forces is proof of this.

It is often difficult for us to see why we should try to apply ourselves to our fullest capacity while we are in school when the immediate future is so uncertain. Some students reason that the chance of their going into the armed forces upon graduation is so great that there is no reason for them to do more than "get by" until that time. Naturally, most engineering students don't consider the Army or Navy to be a job of which they want to make a career, and they fail to see why they should do their best to educate themselves for a job that they don't want. A little straight thinking will show the fallacy of this line of reasoning.

In the first place, let us admit it is inevitable that a number of us will enter the armed forces upon graduation. Let us also admit that the majority of us who enter the armed service do not intend to make it our career. It is logical to assume that the better able we are to do our own individual jobs, the sooner the big job at hand —that of winning the war—will be accomplished. It also follows that the sooner the war is won, the sooner we will be able to get back into civilian life and the job of which we really do want to make a career. In other words, the better engineers we make of ourselves while we are in school, the sooner we will be able to get into the job we want. This fact seems to hold true both in peacetime and during time of war.

For those engineering students who cannot see their place in the war, there is still another way of looking at the situation which leads to the same conclusion. As Professor Shoop put it to one of his senior classes, "I realize that most of you don't know where you're going, or what you're going to do when you graduate. But, you may as well realize that sooner or later you're going to have to support yourself and probably a family, so you may as well learn while you're here to be as good an engineer as possible."

Jack Rockwell, Editor

Dear Tech Commission,

I've been snooping in the files marked "Tech Commission" found in the Main Engineering office. Although sparse and antiquated (except for a financial statement of the last Engineers' Day prepared *for* you), I discovered some alleged reasons for your existence. Your Constitution asks that you coördinate departmental societies, promote the interests of the engineering students and the Institute, coöperate with the All-University Council, take charge of Engineers' Day, and conduct Institute elections.

The last Engineers' Day was successful, at least financially. Let's give the past T.C. credit for picking a good chairman (or was he the only candidate?). Institute elections were somewhat better than average, but still grossly sub-par; maybe you remember. Other accomplishments were nil.

Sure, we engineers (and chems and miners) are a bunch of slow-witted, dead-ended lunks that didn't coöperate with T.C. plans. We aren't doing much to help ourselves or the Institute. But what do you think we (all eight of us) elected you for? That's right—to put an incendiary under us.

Let's see you get rolling early. Maybe *you* will start some complete records and files in a permanent spot so that next year's gang will get a break.

Perhaps you ought to reorganize to the extent of having members-at-large elected for staggered two-year terms. Then you would have at least a few who would know the ropes and remember what happened the previous year. Or possibly all members should be elected for two-year terms, not limiting the majority of jobs to society presidents. There are advantages to both setups, depending upon the aims of the Commission. At any rate, consider your organization carefully and incorporate some continuity.

First of all, the state legislature convenes this coming January. With an intelligent and thorough campaign in coöperation with the administration (Dean Lind is hard at it), we could get appropriations ear-marked for the terrifically-needed aero-mechanical engineering building. Can you handle an assignment like that?

Then the technical societies could be improved by pooling ideas and planning joint meetings, and don't tell me the societies are perfect now.

Your elections might be helped if you had all society cabinet elections at the same time and place as board elections. Better publicity (Daily and P.O. boxes) could be secured with a little effort.

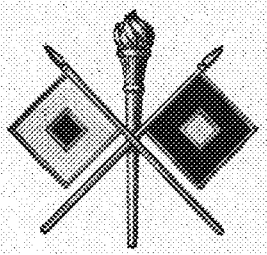
The accelerated program could be put on a firm foundation with your help and encouragement, and summer session fees reduced to a quarter basis.

Yes, and don't forget to work with the All-U Council. It coördinates all campus organizations, and its members and files can give you real help with your problems and projects.

How about it, fellows? Don't bite off too much, but please dig in and show us why we should have a Tech Commission.

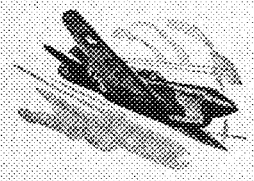
Stan Block, M. E. '43

COMMUNICATIONS
. . . directing arm of combat



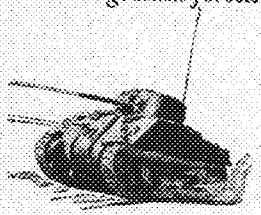
"Get the message through!" That's the tradition of the men who wear this insignia. Of the 18,000 Bell System people now in the armed forces, nearly 4,500 are with the Signal Corps. Young men can serve their country and obtain specialized training in communications in this great branch of the Army.

...and Western Electric equipment goes to every battle front



Army planes fly and fight with Western Electric radio command sets, which keep the planes of a squadron in contact with each other and with the ground forces.

Wherever American soldiers fight in tanks, they get their orders over Western Electric radio sets—vital in coordinating today's mechanized warfare.

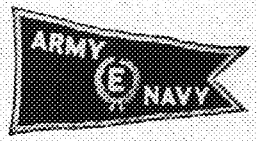


Observers report front-line action to Army commanders over Western Electric field telephones, field wire, field switchboards.

A major source for this specialized equipment is Western Electric—for 60 years manufacturer for the Bell System—one industry with over 70,000 skilled men and women dedicated to *"keep 'em in contact."*

Western Electric

ARSENAL OF COMMUNICATIONS



TECH NEWS

EDITED BY DON FRANKE, E. E., '43

Faculty Members Leave Institute

Institute of Technology faculty staffs have taken several losses over summer with members entering active war production or the armed service. Some, too, have gone to other schools.

Heading the list of faculty members leaving is Charles A. Koepke, professor of mechanical engineering and administrative assistant, who has taken a leave of absence to work on the war production board in Washington, D. C. Professor Koepke's duties as administrative assistant have been taken over by Edmund S. Loye, mathematics and mechanics instructor.

In the aeronautical engineering department, H. S. Sullwell, instructor, resigned to head the aero department at the University of Kansas. Albert Gail, assistant professor, is now at the University of Michigan.

The English department lost C. I. Haga, instructor, who is an instructor at the army air corps ground school in San Antonio, Texas.

Assistant professor Arthur Ford has taken a leave of absence to work for the naval ordance department in Philadelphia.

Lost to the School of Mines faculty are three assistant professors. They are A. W. Schlechten, F. W. Scott and J. N. Searles.

Taking the greatest loss of personnel considering the size of the staff is the physics department. H. H. Hill, John Bardine, L. R. Rumbaugh and W. W. Wetzel have all taken leaves of absence.

More than 700 Institute of Technology students attended the summer session.

Placement Bureau Gets Early Start

Seniors were recently urged to get in their senior data sheets before October 15, by Mr. E. S. Loye, head of the Placement Bureau.

Mr. Loye explained that inasmuch as the accelerated program has moved up the graduation of the senior class to March instead of June, representatives of prospective employers will come to the university early this fall, rather than during the winter quarter as is customary.

Mr. Loye further suggested that seniors visit their p.o. boxes every day so as not to miss appointments for interviews.

Drawing Furnace Purchased by M. E.

An experimental air-circulating drawing-furnace was recently purchased by the M. E. department from the Mahr Furnace Company of Minneapolis.

This furnace, employing the most modern methods of tempering, forces large volumes of air between and around the parts being tempered, and thus uniformity of tempering is assured.

Although the furnace is to be used primarily for class instruction and war-production work, it will also serve the Mahr Furnace Company in an experimental capacity.

I.T.'s Summer Social Activities Fizzle

According to the *Log's* staff of special investigators, the mechanicals were the only Techmen to take advantage of the balmy summer weather to enjoy some time together away from the spacious, air-conditioned M. E. classrooms.

August 9, the M. E.'s took their very best girls over to Stillwater for an afternoon of canoeing on the St. Croix. Survivors of the expedition reported the usual "good time," and the appearance of a peculiar foam-like substance on the beautiful blue (?) waters as the afternoon faded. Could it be that some kind of amber-colored fluid was in evidence?

Of interest to many, though, will be the news that the E. E.'s *almost* came out of their fox-holes for a houseparty, of all things, at Gull Lake, but the boys apparently couldn't find enough women to go around, or something. At any rate, the "double-ees" may still be found in the hidden recesses of their building.

M. E. Gets New Supermike

Mr. Crowder checks gage with new micrometer.

A supermicrometer—one of the two in Minneapolis—has just been acquired by the mechanical engineering department.

The 150-pound instrument will be used for checking and calibrating gages with a measuring range from zero to eight inches. Measurements can be made to the nearest ten-thousandth of an inch.

Bert A. Crowder, mechanical engineering instructor, is in charge of using the new instrument purchased from Pratt and Whitney.

The micrometer may be used by manufacturing plants in the Twin Cities for $3 an hour.

Muckenhirn Starts New War Course

A new course in "Fundamentals of Radio, Part I," an Engineering, Science and Management War Training Course, was begun September 28 under the direction of O. W. Muckenhirn, Instructor on the Electrical Staff. The 16 week course, which meets three nights a week, is the first part of a course designed to train Radio Technicians.

Part II of the course was also begun under the supervision of Dr. James S. Webb, Associate Professor of Radio Engineering.

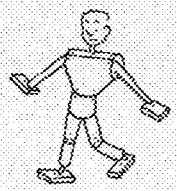
Good news for the Signal Corps is the latest addition to the required curriculum for electrical students majoring in communications. The new course, another "ESMWT" course, is called "Ultra-high Frequency Techniques," according to Dr. Webb.

Last Year's Seniors . . . Now

TECH ALUM NOTES

EDITED BY STAN GENDLER, M.E., '44

M.E.



M. E.

Bruce Torell, former editor of the TECHNOLOG, writes from Ottawa, Canada, that he is enjoying his job in the Mechanical Engineering Division of the National Research Council.

Bob Winter, who graduated with a degree in mechanical engineering and business administration, is now employed by the Minnesota Mining Company of St. Paul, Minnesota.

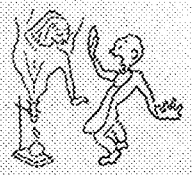
Art Brickman after working for General Electric in Schenectady, New York, this summer, is back at Minnesota as an instructor in mechanical engineering.

Richard Huettle, who is with the Remington Arms Company of Bridgeport, Connecticut, has just invented a thermostat which reduces the time for one operation by one-half.

John K. Moorhead is now with the Ordnance Department, Washington, D. C.

Rollin Alcott was commissioned recently as a naval ensign.

Ch.E.



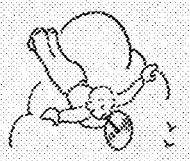
Ch.E. and Chem.

Earl Hoglund, Ch.E., has been commissioned as a second lieutenant in the Coast Artillery Corps and is now stationed at a base in Texas.

Kenneth Voge, Ch.E., is employed by the Hercules Powder Company, Wilmington, Delaware.

Robert Broholm, a graduate from the school of chemistry, is working for the Mallinckrodt Chemical Works, St. Louis, Missouri.

Ae.E.



Aero. E.

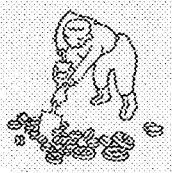
Jim Durenmburger and **Tom Mattson**, after receiving their commissions as ensigns, U.S.N.R., are now undergoing training at the Pratt and Whitney plant, New Haven, Connecticut.

Donald N. Duncanson is now an engineer at Wright Field, Dayton, Ohio.

James Nafstad has been commissioned as an ensign in the United States Naval Reserve.

Dale Drinkwater, after teaching a Civil Pilot Training course during the summer, is now an instructor for the aeronautical department at the University of Minnesota.

Met.



Met. E. and Mines

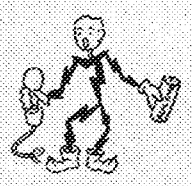
Gene Selemanoff, last year's news editor on the TECHNOLOG, is working for the Continental Machine Company, Savage, Minnesota.

Reuben Olson is a metallurgist for Inland Steel at Crosby, Minnesota.

Phillip H. Flynn is employed by General Motors, Detroit, Michigan.

Garth M. Crosby is a civil service metallurgist at Belmar, New Jersey.

E.E.



E.E.

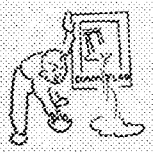
Russell Powers, who was president of the Triangle fraternity last year, is now employed by Allis Chalmers, Milwaukee, Wisconsin.

Eugene Ecklund and **Charles Faltin** are in the Aviation Volunteer Special Service branch of the U. S. Navy.

George Jenkins is now working for Minneapolis Honeywell.

Clarence Schultz is now with the Seabury Corporation in Chicago, Illinois.

C.E.



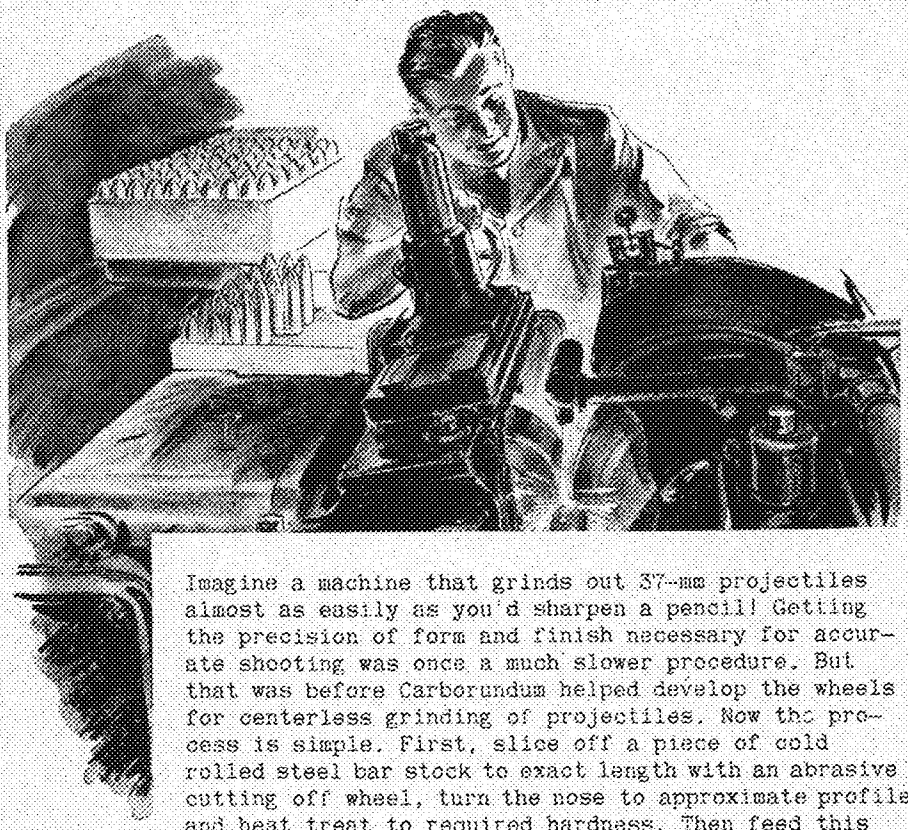
C.E.

Lloyd Vesely and **Leo George** are working for Boeing Aircraft, Seattle, Washington.

Burton Peterson has been commissioned as an ensign in the United States Naval Reserve.

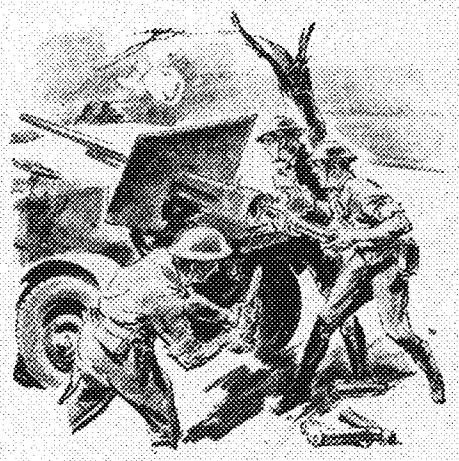
Kenneth Anderson is now with Standard Oil of Indiana.

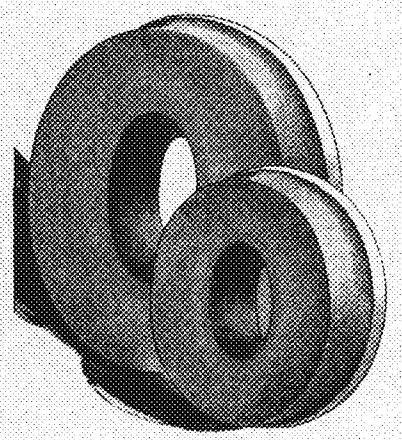
The giant "Pencil Sharpener" that grinds out projectiles!



Imagine a machine that grinds out 57-mm projectiles almost as easily as you'd sharpen a pencil! Getting the precision of form and finish necessary for accurate shooting was once a much slower procedure. But that was before Carborundum helped develop the wheels for centerless grinding of projectiles. Now the process is simple. First, slice off a piece of cold rolled steel bar stock to exact length with an abrasive cutting off wheel, turn the nose to approximate profile and heat treat to required hardness. Then feed this piece between the specially shaped wheels of a centerless grinder...and...out pops a projectile!

Centerless grinding is performing hundreds of operations in a fraction of the time previously required. And Carborundum has led in developing centerless grinding wheels, which are speeding the output of valves, pistons, shafts, and other products necessary to win the war.





At Carborundum, all our energies are centered on the single objective of helping industry do a better job through the better use of abrasives. When you need information on grinding, our facilities and experiences are at your disposal. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

ME & ROLLO
And Ju-Ju

BY GORDON DICKSON, A., '44

I REMEMBER I warned Rollo at the time. "Rollo," sez me, "you should not have called that Arts college student a darn swell kid. It was all right to take his woman away from him at the dance. It was even all right to kick the goggle-eyed little twerp in the teeth and break his glasses, even if it did happen in the middle of the dance floor. But not even Montgomery Prune is going to stand being called what you called him. Watch yourself, Rollo," sez me. But Rollo didn't pay me no attention; just leaned out the window in Main Engineering and whistled at a dog that was going by. Nonchalant, that was Rollo.

But the next day some fellows and me was in the Technolog office when Rollo staggers in and falls into a wastepaper basket, his teeth chattering so hard that flakes of dirt that had been on his face since the rain last week are falling off. "Rollo," sez me, "what is the matter, old pal? Speak to me, Rollo!" But all he does is roll his eyes so we give him a shot of Sterno and he braces up.

"My slipstick," sez Rollo, "Montgomery Prune grabbed my slipstick."

"Why did you let him get away with it?" sez me. Rollo shuddered.

"He ran into the library," gasps Rollo. We shudders like Rollo.

"Don't worry, Rollo," sez me. "Not even an Arts college student can live in the library for more than two hours. We will surround the library and catch Prune when he comes out."

"But my slipstick," sez Rollo. "Can I live for two hours without it?" Suddenly he screams and grabs his head.

"What is wrong, Rollo?" sez me.

"I just had a terrible shooting pain in my head," sez Rollo. Then he screams again so we take him to the hospital. He is delirious with the shooting pains in his head. Then we go out to hunt Montgomery Prune. Driven out into the open by the poisonous air of the library, we sees him streaking towards Folwell. We runs to cut him off before he can get there and catch him just in time. He squeals like a rat as we tromp on him with our size 10 boots. He is carrying Rollo's slide rule and a big thick book. We goes to find some one who can read and we find out that the book tells about stuff called ju-ju and how to torture people by sticking pins in wax models of them. We look at Rollo's slipstick. It's full of pins.

So we pulls out the pins and takes the slipstick to Rollo in the hospital. His head has stopped hurting and he grabs for the slipstick. Everyone leaves but me. "Well, Rollo," sez me, "you are cured." Just then a nurse comes in. Rollo and me take one look and whistle unanimous. She goes over to Rollo and lays her hand on his forehead.

"Are you feeling better now?" she asks, sweet-like. Rollo shuts his eyes and groans.

"That's too bad," she sez. "Just a moment and I will get you some more aspirin." She goes out. Rollo grabs his slipstick and shoves it into my hands. "Here, ol' pal," sez Rollo, "take Junior away and stick pins in him, will you? Lots and lots of pins, ol' pal." But I'm too busy trying to find someone to stick pins in my slipstick.

The Boy Mechanic, or

BREAK IT OR LEAVE IT

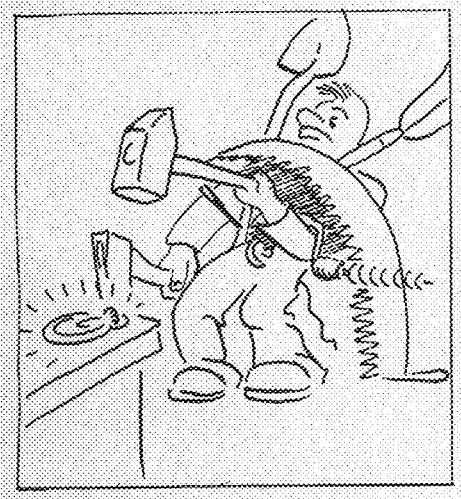
BY A. LITTLEHILL, JOUR., '49

ILLUSTRATED BY BOB PLATT, ARCH., '45

DURING the time of national emergency when materials and repairmen are hard to get (not that way, girls) the engineer should make himself handy around the house. There's always something going on the blink and needing fixing, so this article is being written to give helpful hints on how to make your toaster last (not first), how to make your watch tell time, what to do when the vacuum cleaner starts backwards, how to lengthen short circuits, and how to keep the electric refrigerator from having indigestion.

First thing that is needed is a good set of tools. A ten-pound sledge will do in place of a hammer, but is not recommended. The best carving knife or butcher knife will do for a screwdriver, and the scissors in the sewing basket can be used for a number of things such as cutting tin cans apart for the scrap drive. If a saw should be needed and none is at hand, a straight-edge razor can easily be converted by opening a few tin cans. Several rusty nails and bent hairpins will be invaluable.

The first lesson is one about heaters and toasters. If your heater coöperates with the power company she probably is unfaithful to you, but now we are off the subject. First of all look for a loose connection. If there is one, pour a zombie on it and that will make it tight. The only other thing that could go wrong would be too hard to fix so you can sell the worthless piece of junk to your next door neighbor as a decoration for the mantel.



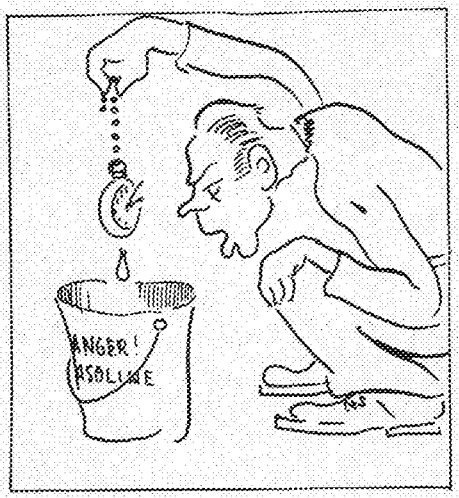
First thing that is needed is a good set of tools.

The second lesson is about fixing watches. According to the old adage: An ounce of gasoline is worth a ton of water, so give your watch a bath once a month in S.A.E. 50 viscosity lard oil. If this doesn't keep it from running, get out the sledge and tap it gently.

The third lesson is about vacuum cleaners. It should have a complete change of dirt every thousand miles so that the rugs will be kept well informed. If it has trouble picking up dirt, go out in the street and get a little tar to put on the brush. Then donate the rugs to the Tar and Feathering Club.

One of the most common ailments occurring in electrical fixtures is the short circuit. The best way to get a long circuit is to complain to the manager and tell him the side show is no good. Another sure fire method of making this repair is to lengthen the wire by fastening one end to the nearest lamp post and your pet mongrel to the other. After 24 hours the wire should be at least one inch longer.

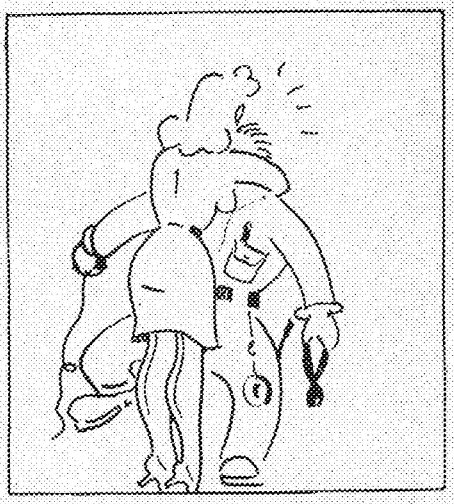
If the electric refrigerator should develop a bad case of indigestion, don't just sit there and let it suffer, do something! You may wonder how a refrigerator could have indigestion. If you stop and think a



An ounce of gasoline is worth a ton of water.

minute, you can see that you would have indigestion too if you had all the things in your stomach that the refrigerator had on its shelves. As I said before, don't just sit there, do something. The thing to do first is get the bicarb out of the cupboard and make a dilute 80 proof solution. This is not for the refrigerator, but for you when you are feeling faint after working on the old thing. Next, get out the tool box and the instruction book that goes with the refrigerator. The one that used to go out with the refrigerator got engaged to somebody else. The first thing that the instruction book says is to look for a loose belt. If the belt should happen to be loose, put a little beer in the refrigerator. This will fill it out in short order. Speaking of short orders, you might just as well fix yourself a snack when you are so close to food. The next thing that the book says can go wrong is too hard to fix anyway, so don't keep anything in the refrigerator and nothing will spoil in it because it doesn't work.

Lamps have a peculiar habit of refusing to digest the juice when they are most needed. In order to see if juice is getting to the bulb, wad the socket with tinfoil and turn on the switch. If nothing hap-



If your heater coöperates with the power company, she is probably unfaithful to you.

pens, throw the lamp away. If something does happen, the lamp will be no good anyway.

In order to test the wringer on the washing machine before entrusting it with the weekly wash, only one thing need be done. First, turn on the machine and engage the wringer. Then place the index and middle finger of your writing hand on the lower roller. If the wringer doesn't stall by the time that it gets to your elbow you know that the wringer is in good working order. You can figure out how to retrieve the mangled member.

If you have difficulty finding the keyhole to the front door lock, especially on Saturday nights, a simple remedy is described below. First examine the keyhole to see that no squirrels have been hiding nuts in it. If they have, get a left-handed wrench and remove them bodily. Also look for a coin slot in the immediate vicinity of the lock. Some slot machine operator might have installed a mechanism that would force you to pay to get in your own house. In this case, call the local police or invest in a good brand of slugs of the proper thickness and diameter.

If you have difficulty in finding out what the trouble is with whatever is out of order consult your local telephone directory or see the neighborhood garbage collector. When these sources of possible help have been exhausted, try the 1939 Fall and Winter issue of Montgomery Ward's extra special catalogue for size. Above all, don't forget to remember that if it can be fixed, you can fix it so that it can't.

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

To all incoming freshmen let the following apply: Don't take life too seriously—you'll never get out of it alive anyway. When you talk, you only repeat what you already know, but if you listen, you may learn something.

* * *

Burglar's advice: Always sleep with your windows open.

* * *

We are sure that this touching message will go down in the history of World War II:

Mr. Headquarters,
U. S. Armory,

Dere Mr. Headquarters:

My husband var induced into the surface long months ago and I ain't received no pay from him seuce he was gone. Please send me my elopment as I have a four-months-old baby and he is my only support and I kneed it every day to buy food and keep us enclosed. I am a poor woman and all that I have is at the front. Both sides of my parents are very old and I can't suspect anything from them as my mother has been in bed thirteen years with one doctor and she won't take another. Do I get more than I am going to get? Please send me a letter and tell me if my husband made application for a wife and child and please send me a wife form to fill out. I have already written Mr. Roosevelt and get no answer and if I don't hear from you I will write Uncle Sam about you and him.

Very trooly,

Mrs. Putandtake

P.S. My husband says he set in the Y.M.C.A. every nite with the piano playing in his uniform. I think you can find him there.

* * *

The editor of The Technolog must be a gentleman. The door I just saw him come out of says so.

* * *

The following advice on first aid is for the benefit of those freshmen away from home who might be inclined to run to Health Service.

Toothache: Wrap blanket around tooth and fasten with rubber cement to the roof of the mouth. Place your ear to the soles of the patient's feet and see if you can hear heart beats. A fly paper poultice on the back of the knees will help in many cases.

Freezing: Hang patient by heels of stockings. Then call an engineer. Rub frozen spot with tomato sauce. Pull out tongue a few inches letting it fly back. Continue this operation until the patient falls out.

Homesickness: If the patient is unconscious, wind his watch and return carefully to your pocket. Clamp mouth open with clothespin and look for indications of rust on back teeth.

Stagefright: If patient is unconscious, hang him face up over a convenient fence. See if he is breathing through the ears. If he is still unconscious, go through his pockets. This will bring him to.

* * *

Economics is a science that explains why business is lousy, but has no idea what to do about it.

* * *

In closing, let us leave you a word of advice about what to do in case of a blackout. Just jump into the nearest garbage can and keep calm and cool. When the garbage man comes around in the morning, you will be collected.

PURLOINED PROTOTYPES

BY JOHN UPGREN, M.E., '43

It was suggested that we perforate these pages so they might easily be removed before the magazine is taken home for parental approval.

The editor called the caption a rare combination of alliteration. He surely is an educated fellow. In view of this, he will gladly explain this first witticism for a set of 6.00 x 16 tires.

Statisticians claim the Chinese population will rise from 500 to 700 million after the war. The bombing is waking up the Chinese people.

* * *

Dean: "Know you? Why I knew you when your mother was kicked out of college."

* * *

"May I take you home? I like to take experienced girls home."
"I am not experienced."
"You're not home yet."

* * *

You all have seen placards stating that the Navy needs you. You can readily appreciate this if you read this next choice nautical vagary.

"Men," he cried, "there is an announcement I want to make. Last night my wife presented me with a son."

The men cheered for several moments before order was restored.

The admiral, pleased with the enthusiastic reception, indicated he wished to make another announcement.

"Men and officers," he said, "I thank you."

* * *

The only time a fellow can ever be seen with a girl on one arm and a blanket on the other is at a football game.

* * *

M. E. Prof.: "Are there any questions?"
Student: "How do you calculate the horsepower of a donkey engine?"

* * *

No good literary masterpiece is complete without some definition. Here's one for the month.

MODERN GIRL

Legs ..... by Steinway
Body ..... by Fisher
Necks ..... by the Hour

* * *

A college fellow told a sweater girl that it was impolite to point.

* * *

"Was he surprised when you said you wanted to marry his daughter?"
"Was he! The gun nearly fell out of his hands."

* * *

Sergeant: "Just between you and me, Lieutenant, you should remember to pull the blinds down in your quarters. When I passed last night, I saw you kissing your wife."

Lieutenant: "Haw, that's one on you! I wasn't home last night."

Scientific research shows that there are four things that resemble a freshman. A fly, a ham, a monkey, and a parrot:

A fly is always in somebody's business but its own — so is a freshman.

A ham is not a damn bit of good until it has been hung — neither is a freshman.

A monkey in some respects resembles a human being — so does a freshman.

A parrot talks, but has no brains — likewise a freshman.

* * *

Be it ever so homely, there's no face like an engineer's.

* * *

Don't let anyone ever tell you there is no such thing as transmutation. The other day a mechanical engineer named Stone and one named Wood met on the street. They stopped for a moment to exchange a few cheerful views, when a woman in a particularly noticeable gown passed. Simultaneously, mind you, Wood turned to Stone; Stone turned to Wood; then both turned to rubber.

* * *

The sergeant strode into the squad room. "All you blankety blank lazy apes, get outside!" he exclaimed.

The soldiers grabbed their hats and swarmed out. . . . all but one, who continued to lie on his bunk blowing smoke rings.

"Well," roared the sarge.

"Well," remarked the rookie. "There sure were a lot of them, weren't there?"

* * *

Patent Attorney: "I find no prior art in this country. We'll have to search abroad."

Client: "O. K., where will we find one?"

* * *

Jimmie: "Wot's de best way to teach a girl to swim?"

Johnny: "Well, yer want ter take her gently down to de water, put yer arm 'round her waist, and ....."

Jimmie: "Oh cut it out. It's me sister."

Johnny: "Oh, push her off de dock."

* * *

Cutie (in department store): "Do you have notions on this floor?"

Floorwalker (appraisingly): "Frequently, but we can't give way to them."

* * *

Shoulder strap:
The difference between an attraction and a sensation.

* * *

She: "Don't you love me any more?"
He: "Sure, I was just resting."

* * *

She: "All my life I've been saving myself for a man like you."
He: "Oh boy, bank night!"

* * *

Mose sat on his front porch munching cornbread when one of his hens went tearing past followed by the old rooster in high gear. Suddenly the rooster applied his brakes, pulled up short, trotted back, and started pecking at the cornbread at Mose's feet.

The old darky eyed him in astonishment, then exploded, "Lan' sakes, Mr. Rooster, I hopes ah never gets dat hungry!"

* * *

Now we feel much as Freezone, the Eskimo, who was sitting on a cake of ice telling a story. He finished and got up.

"My tale is told," said he.

In order to avoid any confusion, we would like to state the avowed purpose of this column here and now. It is to let you guys know what is going on with your magazine, the TECHNOLOG. This seems to be as good a place as any to let the uninformed know that last summer we kissed our favorite mice goodbye and moved out of the phone booth in the Electrical Building that we laughingly called an office, and into new and somewhat more spacious quarters in room 17, Murphy Hall. The change seems to be definitely for the better. It is getting so that even girls are no longer afraid to come into the office unaccompanied by a bodyguard.

• • •

We think that you'll be interested in knowing that this year's cover was designed by Bob Platt, an architect and artist par excellence. Last year Bob was the mainstay of the "Log's" art staff. This year we have two other artists whose work you will be seeing in the "Log." They are Faith Foster, a University College student, and Ken Coles, a junior I.T. man. Ken has had two years' experience as a statistical draftsman and has illustrated the survey article in this issue.

• • •

Although it was impossible to print all of the comments we got from the survey on the accelerated program—there were eight typed, single spaced pages of them—all of them were read and given careful consideration by Dean Lind and by the heads of the departments that they concerned. The return of questionnaires on this survey was the largest we have ever experienced, which seems to indicate that the engineers on the campus are really interested in acceleration and its accompanying problems.

• • •

In answer to a long-felt need, the TECHNOLOG has procured an experienced "sob sister" to advise those of you engineers with a problem. What's your problem? Do women avoid you? Hmmm? Are you a social failure? Hmmm? Send your problem to "What's Your Problem?" in care of the TECHNOLOG and you will get the advice you need from our experienced consultant. She has attended a girls' school for four years, and after you have done that for that long, you are bound to be experienced. Here's your chance, engineers. Why not take it?

• • •

We realize that you can't all be on the staff of the TECHNOLOG, but that is no reason why you shouldn't contribute your ideas to the magazine. Have you got an idea for a feature article? Do you know what one of our alums is doing now? Have you heard a good joke recently? Do you think that the magazine could be improved? Why not write a note about it and drop it into the Stray Scraps box on the bulletin board in Main Engineering? We are doing our best to give you the kind of a "Log" that you want. Why not help us out by letting us know what you want?

• • •

Scheduled for next month are articles on the x-ray inspection of metal parts, the low-down on this year's civil camp, an article on the Signal Corps, and many others.

• • •

A good example of persistence may be gleaned from the story of the two *Ski-U-Mah* cub coeds who, after a hard day of selling subscriptions to innocent freshmen, decided to go for a tramp in the woods. The tramp got away.

J. R.

I'VE GOT TO ACCELERATE!

The GOPHER senior picture deadline for Engineers is OCTOBER 24

The GOPHER is accelerating along with the Engineers

The 1943 edition of Minnesota's yearbook is coming out in March, so that those students graduating at the end of Winter quarter may have their books before they leave. This means that senior pictures will have to be taken earlier than ever before. The deadline for Engineers is October 24. Call and make an appointment now!

FOR A $3.75 SITTING FEE YOU RECEIVE:

- YOUR PICTURE IN THE 1943 GOPHER
- A 5x7 GLOSSIE SUITABLE FOR USE ON YOUR PERSONNEL SHEETS
- REDUCED RATES ON SENIOR PHOTOGRAPHS
- REDUCED RATE FOR YOUR COPY OF THE GOPHER

NEWBURG STUDIOS

1321 S. E. FOURTH ST.

GL 2255

Official GOPHER Photographer

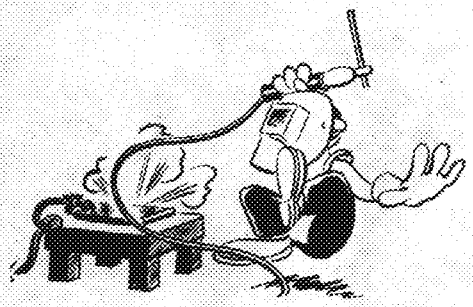
G-E Campus News

COLLECTOR

VINCENT J. SCHAEFER, of the G-E Research Laboratory, used to collect snowflakes, and because of his hobby metallurgists now have a simple method of observing details of metal structures far too fine to be seen with an ordinary microscope.

The young scientist's method of "casting" snowflakes in a film of Formvar has solved the problem of how to get a metal specimen thin enough to be examined in the electron microscope. (This device uses electrons instead of light to form the magnified images, and the electrons must pass through the specimen.)

A thin film of resin, stripped from the specimen and retaining all the details of the metal surface, can be placed in the microscope and be magnified as much as 100,000 diameters.



CALAMITY JOE

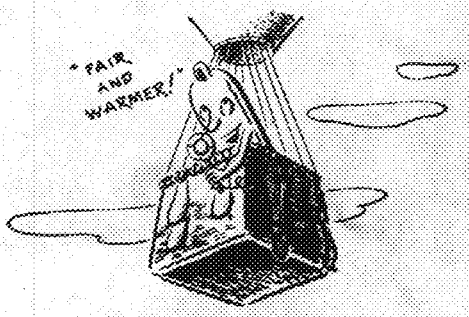
EVERYTHING happens to Joe.

And anything is likely to happen when he picks up the welder's electrode, because Joe MaGee, an animated cartoon character, doesn't know the first thing about welding. Throughout the new G-E instructional movie, "The Inside of Arc Welding," he seems to do the wrong thing.

But Joe does a good job of teaching you how *not* to strike the arc and how *not* to control the metal in the molten pool. His bungles, plus close-ups of the arcs in action, make this full-color film "one of the most helpful training aids ever offered to the welding industry."

The movie is in six parts. Each part (16 mm.) is complete in itself—a 10-minute sound production covering one particular phase of arc welding in full detail.

Organized groups may borrow the films with no charge other than transportation costs; schools and industry may buy single reels at cost—$52 each—for use in training welders. Write Campus News, General Electric, Co., Schenectady, N. Y.



SH-H-H-H-H-H!

THE one announcer in the country who can give weather forecasts over the air is a mechanical man who broadcasts from a point 12 miles up in the stratosphere, where next week's weather is in the making.

This mechanical investigator, whose heart is an electron tube, works for the U. S. Weather Bureau. He weighs only a couple of pounds and looks like a large box camera.

As a small balloon takes him up, the robot broadcasts the atmospheric conditions he finds. Tuned in with a ground receiver, the radio signals tell the temperature, wind velocity, etc. The balloon bursts at the low pressure limit (about 60,000 feet above ground), and a parachute brings the radio sonde, as it is called, down to earth.

The mechanical weatherman carries a calling card with his return address on it in case he gets lost on the way back.

GENERAL ELECTRIC

225-48-42X

MINNESOTA TECHNIC

IN THIS ISSUE

SIGNAL CORPS
X-RAY INSPECTION
SUBMARINE ESCAPE
UNCIVIL CIVILS
HEAT TREATMENT

NOVEMBER • 1942

15c

INSTITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA

Battle wagons have glass ears . . .

SOMEWHERE on the tough hide of U. S. warships are mounted what look like inverted glass mixing bowls.

These are the radio lead-in insulators, the "ears" through which the battle wagons get their orders. They are made of Pyrex brand electrical glass, as are the insulators in the ships' antenna, because the service requires the best and most dependable materials available.

Today, with metals scarce, the raw materials for glass are fairly plentiful. And glass is being put to work at many urgent tasks. Planes, tanks, ships, trains, for example—all use some contribution of Corning research in glass. The giant dairy industry, faced with a metal piping shortage, is now working with special glass piping recently developed at Corning. In chemical, food, and explosives plants, glass piping and glass pumps are handling everything from soup to HCL.

Years ago glass was regarded as a fragile, decorative, costly material with limited applications. Now Corning makes glassware that has kicked old barriers out the window. It's tough and strong, resistant to chemical attack and thermal shocks, widely varied in shape and size, reasonable in cost, and accurate to tolerances comparing favorably with metals. Today's engineers are discovering that they can put glass to practical uses which in the past were labeled, "impossible". For tomorrow's engineers, glass is the material of unlimited possibilities. Industrial Division, Corning Glass Works, Corning, New York.

CORNING
means
Research in Glass

HE SPECIALIZES IN "BIG STUFF."
L. A. Kilgore has been designing electric generators, rectifiers, and motors ever since he joined Westinghouse . . . but his 40,000 h.p. Wright Field wind-tunnel motor tops them all. Kilgore received his E. E. at the University of Nebraska and his M.S. at the University of Pittsburgh.

The hurricane that shapes an eagle's wings.

THE LIGHTNING SPEED of the modern warplane has brought a lot of headaches to aircraft designers.

Wind-tunnels, the "proving grounds" of aviation, were satisfactory for studying the performance of the lighter, slower planes of yesterday. But they were not adequate for today's fighter planes . . . with top speeds of *over 400 miles per hour*.

To investigate the terrific forces at work at these high speeds, the U. S. Army demanded a wind-tunnel that would produce a tornado many times greater than Nature's wildest gale.

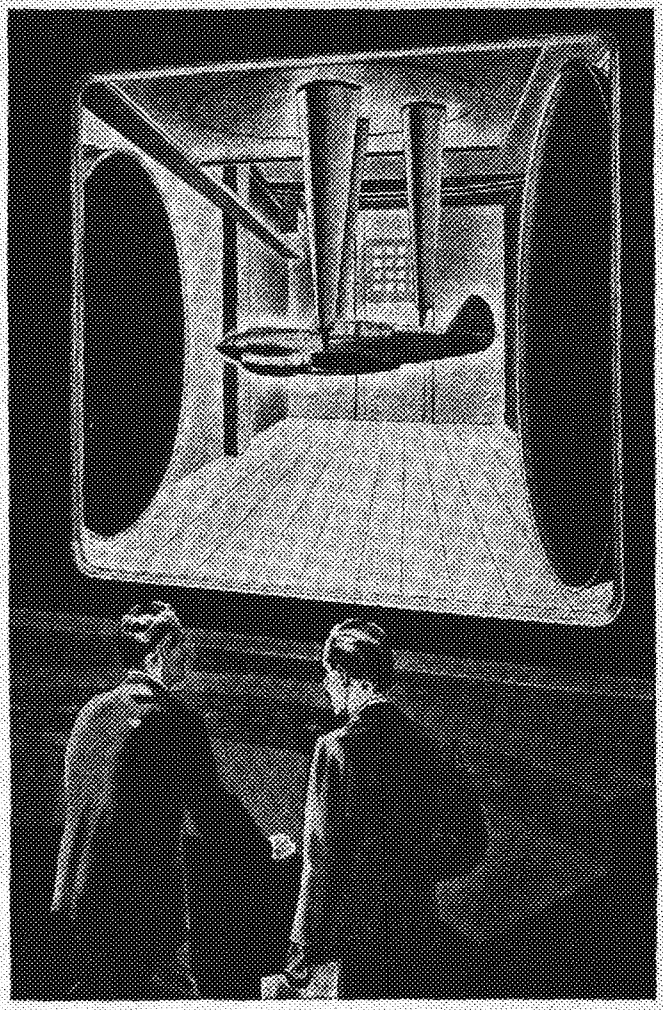
Army officials asked Westinghouse to take over the job of *building the electric motor* to drive the fans in this tunnel.

The two fans were to be truly colossal . . . 40 feet across, with a combined weight of nearly 150 tons. They were to be mounted on a 16-inch solid steel shaft, 120 feet long. Merely starting this great mass in motion, with minimum disturbance to the power system, was the toughest kind of engineering problem.

To complicate the problem further, a wide range of air speeds is required for wind-tunnel testing. And at each air speed the motor speed must be held constant, regardless of fluctuations in the electric power lines.

L. A. Kilgore . . . in collaboration with J. C. Fink . . . tackled the problem. In twelve months these Westinghouse engineers designed and supervised the construction and installation of a 40,000 hp wound-rotor induction motor . . . world's largest of its kind . . . an installation that met every Army requirement.

That 40,000 horse power motor . . . a direct result of Westinghouse "know how" . . . is now in service in the new $2,500,000 wind-tunnel at Wright Field. Large airplane models and actual-size motors, with whirling propellers, are tested and studied in its 400-mile-an-hour windstream.



• • •

Kilgore and Fink have given vital aid to winning the war . . . for they have helped to make it possible for Army experts to learn many new facts about plane performance and plane design, facts of utmost importance in gaining and maintaining air supremacy over the Axis.

Today the need for engineers is very great. Of the 300 young engineering graduates who joined Westinghouse last spring, many are already showing great promise in engineering.

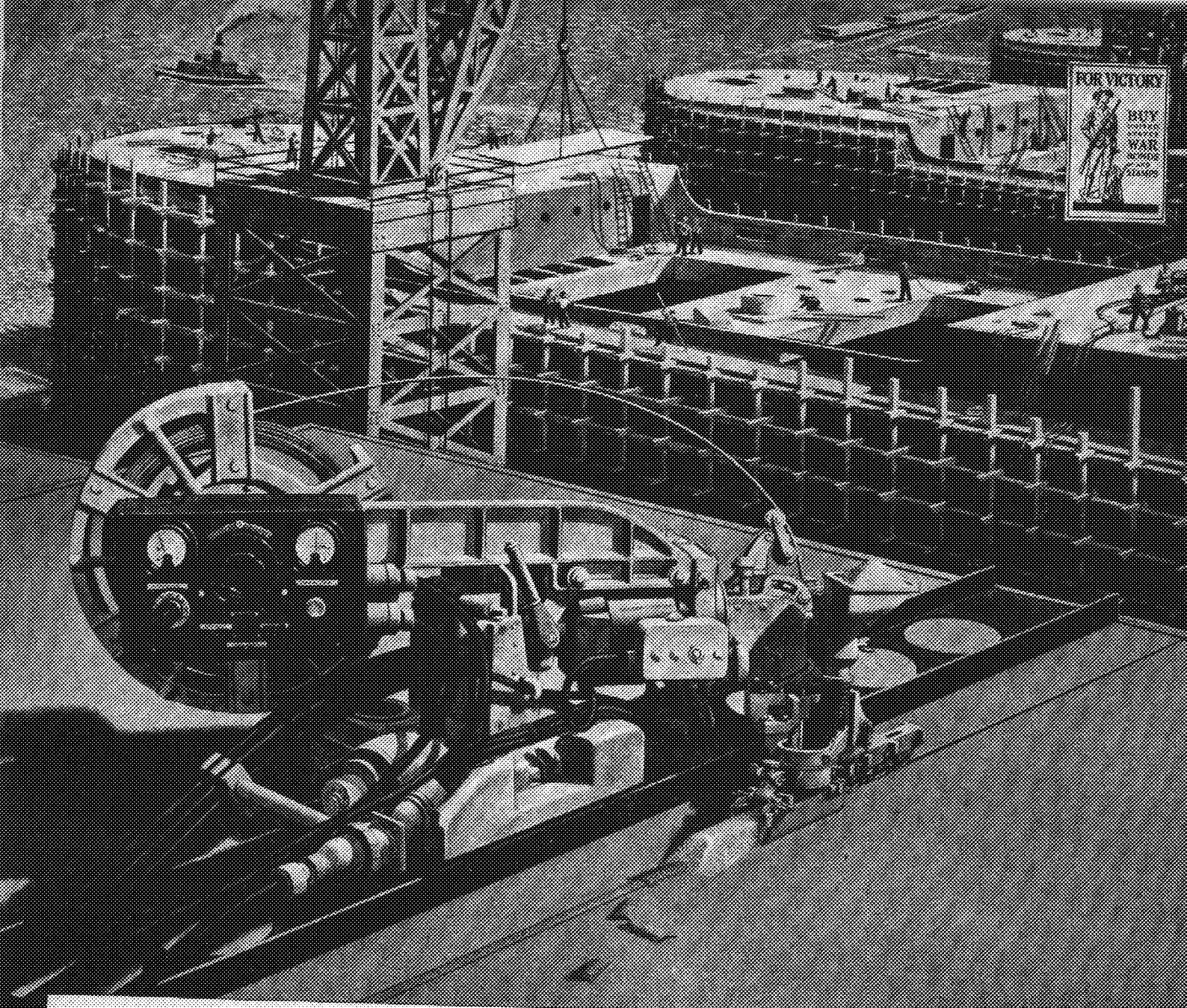
Westinghouse looks to the Class of '43 for its future scientists and engineers.

• • •

THE WESTINGHOUSE ENGINEER . . . a quarterly magazine brimful of interesting articles on electronic research and electrical engineering . . . keeps you posted on the latest scientific developments. Profusely illustrated. Subscription, only 50¢ a year. Address: Westinghouse Electric & Manufacturing Company, Department 6N-17, East Pittsburgh, Pennsylvania.

Westinghouse

. . . MAKING ELECTRICITY WORK FOR VICTORY



MAKING ONE-PIECE SUITS FOR *SHIPS!*

THERE'S NEWS on America's ship ways today . . . an amazing machine that unites steel plates without noise, fuss, sparks or visible arc! A process that is helping to construct those marvels of speed, strength, safety, and carrying capacity . . . "all-welded" ships!

This process . . . known as "Unionmelt" Welding . . . joins steel plates of any commercial thickness as much as *20 times faster* than any other similarly applicable method! And it produces uniformly high-quality welds!

How does it work? A special welding composition . . . "Unionmelt" . . . flows from a hopper and blankets the edges to be joined. Within this granulated mixture, intense concentrated heat is generated by electric current. A bare metal electrode and the edges being welded are melted and fused. Some of the "Unionmelt" melts and remains as a temporary protective coating over the weld.

The process is completely automatic. Special apparatus *feeds* the "Unionmelt," the welding rod, and the electric current. Speed and current values are adjusted by an operator.

"Unionmelt" welding is also speeding up the construction of fighting tanks and chemical tanks . . . artillery mounts and aircraft parts . . . pressure vessels and locomotive boilers . . . pipe and pipe lines . . . and all kinds of heavy mechanical equipment.

Working with this unique process is an astoundingly fast Linde method of preparing steel plates for welding. White-hot oxy-acetylene flames . . . cutting simultaneously at different angles . . . bevel and square-up steel plates as fast as they are needed! Together, these two processes are speeding up the fabrication of key equipment at a remarkable rate.

Many years of research into welding, flame-cutting, flame-fabricating, and flame-conditioning of metals have given Linde engineers a vast store of useful knowledge about these methods. Have you a war production problem which might be solved by this "know how"?

The important advances in the cutting, conditioning and fabrication of metals made by The Linde Air Products Company have been facilitated by collaboration with Union Carbide and Carbon Research Laboratories, Inc., and by the metallurgical experience of Electro Metallurgical Company—which companies also are Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation

GENERAL OFFICES: New York, N. Y. Offices in Principal Cities

Authors OF THE MONTH

BY STAN GENDLER, M.E., '44

George W. Shaffer, M. E. '43, presents in this month's TECHNOLOG an article on submarine escape devices and training methods. George and his brother have been working on diving equipment for eight years. They have built four diving helmets of their own, and last year the two brothers completed plans for a super helmet, but because of priorities on aluminum they haven't built the experimental model yet. For the last few summers George and his brother have aided the police in recovering drowned persons by diving in local lakes such as Hiawatha and Cedar. Their biggest salvage job was to go after an airplane which had crashed into a lake near Minneapolis.

George has also experimented with the new diving lung made by the Heidbrink Equipment Co. of Minneapolis. The principal advantage of this lung over other diving equipment is that it eliminates the danger of bends by removing nitrogen from the blood.

Besides his diving hobby, George likes to hunt and fish. He is a member of the American Society of Mechanical Engineers and Mortar and Ball, military fraternity. Cadet First Lieutenant Shaffer expects to graduate next March. At that time he will be commissioned in the Coast Artillery Corps and be sent to Camp Davis, North Carolina, for a refresher officer's training course.

* * *

Major Carl A. Jacobson's article on the Signal Corps is the second in a series of articles on the Minnesota R.O.T.C. carried by the TECHNOLOG. Major Jacobson is assistant professor of military science and tactics and lectures on tactical signal communication and other Signal Corps subjects. He received his degree of Bachelor of Electrical Engineering and his reserve commission in the Signal Corps in 1929. He then spent twelve years doing maintenance engineering work for the local telephone company. During these twelve years, Major Jacobson continued to go to summer army training camp. In 1938, he became a captain and in 1939 he graduated from the war school at Fort Monmouth. Last April he was promoted to the rank of major.

Major Jacobson is married and has one daughter, aged ten. In peacetime the army was his main avocation. Major Jacobson is leaving the University of Minnesota, in the latter part of November, for he has been ordered to report for duty at the Signal Corps school at Fort Monmouth.

Gordon R. Dickson, a fugitive from S.L.A., expounds in this issue of the TECHNOLOG on manners for engineers. Gordon is a junior and is majoring in creative writing. He was born in Edmonton, Canada, in 1923. Gordon is a charter member of the local chapter of Alpha Phi Omega, national scout service fraternity. He has also joined the Minneapolis Fantasy Society. He likes to play golf and tennis in his spare time. Last summer he worked on a road crew for the State Highway Department in northern Minnesota.

* * *

Herbert Scobie, lecturer in foundry practice, is back in this month's TECHNOLOG with an article on the x-ray examination of metallic parts. Micro-porosity, which is invisible to the naked eye, in castings, can be found by the method described. The problem that Mr. Scobie is interested in is how critical are these defects which can only be seen by radiography and what allowances must be made for the strength and density differences due to these defects. The University of The Minnesota foundry department is conducting research work on this problem. Much of the equipment in the x-ray laboratory has been built by Mr. Scobie and other men of the department. A densitometer, for measuring film density, has just been completed. This device enables the operator to accurately interpret pictures made by the x-ray machine. Parts are now being accumulated for an x-ray diffraction apparatus. Local foundrys bring in castings which they have had trouble with and Mr. Scobie makes x-ray analysis for them.

Mr. Scobie has been one of the instructors teaching a war training course in x-ray inspection of castings and welds. Three fifteen-week courses have been given in the last year and one-half. In addition to teaching and doing research work, Mr. Scobie is a consultant for a large manufacturing company which is making essential war machinery and developing valuable mineral deposits.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

TECHNOLOG

NOVEMBER, 1942

Contents

THE COVER PHOTOGRAPH shows a private using one of the army's new portable radios, the "walkie-talkie" in a jeep. This is an official United States Signal Corps photograph.

THE FRONTISPIECE shows the boiler room of the new laboratories of the Bell Telephone Company at Summit, New Jersey. The cut is through the courtesy of Fenell Points.

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COURTESY OF WESTINGHOUSE

Industrial X-RAYS

BY HERBERT F. SCOBIE
INSTRUCTOR IN MECHANICAL ENGINEERING

In the examination, inspection, and testing of industrial material x-rays are as important as in the medical field, although not as universally used. The value of this nondestructive method of testing both finished and in-process materials is being recognized more and more, and in a few years there should be as many industrial installations as there are medical. In either case the principles are the same.

In general, x-rays are much like visible light but of shorter wave length. The range of the x-ray spectrum is from 0.06 to 120 angstrom units, the wave lengths averaging about one-thousandth those of visible light. In addition to behaving according to many of the laws followed by visible light, x-rays are able to penetrate opaque objects by virtue of their short wave lengths. When x-rays impinge on matter, more or less pass through depending on the thickness and density of the matter, and the wave length of the radiation.

The transmitted radiation is usually recorded on a film much like that used in regular photography but more sensitive to the shorter wave lengths, and with an emulsion on both sides of the film base. Subsequent film-processing produces a permanent record or shadowgraph of the object under investigation.

X-ray Penetration

When an object is radiographed it is the differential absorption of the x-rays by its various components that reveals its internal structure or condition. Thus a discontinuity in a casting, such as a blowhole, permits more radiation to pass through to the film, resulting in an image which is darker than the image of the adjacent sound metal.

Most defects in ferrous materials appear on the film as dark images. Blowholes, pipe, shrinkage cavities, cold shut, and cracks in castings; and gas holes, slag, oxides, lack of penetration, and cracks in welds appear darker than the surrounding metal. This is also true of most defects in nonferrous metals with the exception of an occasional case, such as a particle of iron accidentally incorporated in an aluminum casting in which instance the shadow of the iron particle would be lighter than that of the rest of the casting.

Assuming that there is a sufficient difference in x-ray absorbing power between a defect and the adjacent material, two factors determine whether or not a defect can be detected—the skill of the radiographer and the relative size of the defect. Usual industrial standards require a sensitivity of 2%; that is, technique must be such that a defect as small as 2% of the thickness of the object being radiographed will be recorded. This is determined by superimposing a penetrameter on the object under examination. The penetrameter is of the same material as the object, machined to 2% of the thickness of the object and having several holes in it. If the images of the holes can be seen on the film, the proper sensitivity has been attained.

Sensitivity better than 2% is possible. A casting was recently examined in the Foundry Control Laboratory of the University of Minnesota which showed shrinkage only if a sensitivity of 0.66% were attained. On sectioning the casting no defect was visible until hot acid etching showed a high degree of microporosity. Each individual cavity was invisible to the unaided eye but the total discontinuity permitted enough radiation to pass through to produce an image on the film. In some instances where maximum sensitivity is not required, sensitized paper is used instead of film because it is cheaper.

Installation

A complete installation for industrial radiography includes an operating room where the exposure is made, a control room from which operations are controlled, a dark room for film processing, and a viewing room where finished films are studied and filed.

The operating room houses the tube which produces the x-rays and is usually lined with sheet lead an eighth of an inch or more in thickness, depending on the penetrating power of the radiation produced. Instead of being covered with lead the walls may be brick or concrete several feet thick. Protection for technicians, workmen in nearby departments, and film supply is essential. Uncontrolled radiation produces physiological effects varying from mild skin burns to dangerous blood changes, sterility, and x-ray dermatitis with possibly fatal results. Operating rooms are usually equipped with door switches which will not permit the

COURTESY OF WESTINGHOUSE

THE 220,000 VOLT INDUSTRIAL X-RAY MACHINE is being widely used by industry to test national defense equipment as required by rigid Army and Navy specifications.

machine to operate unless the door is closed.

All radiography is not done by means of permanent installations through which the work is routed. In some cases portable machines are used which are moved directly to the work.

Step-up transformers and rectifying equipment to produce high voltage unidirectional current may be housed where convenient. The installation must be shock-proof. Voltages for operating industrial x-ray machines vary from 40,000 volts for magnesium and aluminum to 400,000 volts for denser metals. The 1,000,000 volt machines developed in the past few years are decidedly in the minority.

The control room houses switches, timers, voltage selectors and the like. The operating room can be watched during exposure by means of lead glass windows or a suitable arrangement of mirrors.

The dark room must be light-proof, well ventilated, and usually provided with means for passing film holders to and from the operating room. The viewing room, or film-reading room, is usually located near the dark room, perhaps with a drying room between. With the exception of special viewing lights, illumination in the viewing room is dim.

It is in the viewing room where the soundness of an object is judged. The film reader must be familiar with the appearance of defects and also the application of the part under examination. Preferably he is provided with service data of similar parts indicating the seriousness of the type, shape, size, and location of various defects.

Ultimate Saving

Radiographic tests are invaluable because they are nondestructive and also afford 100% examination. They are of special value in cases where the structure is to be subject to high tensile stress, high temperature or both. Examples of this may be found in oil-cracking units, vessels for chemical manufacture, boilers, high pressure steam fittings, or the atom-smasher shell in back of the Physics Building.

In themselves many structures are insignificant and a minor part of a whole assembly but, should they fail, expensive equipment and valuable personnel may be lost. All aircraft parts are radiographed before being put into service.

Frequently much machining expense is incurred before an internal defect is uncovered. A part worth 70 cents a pound may suddenly become scrap worth only 17 cents a pound because of a hidden fault.

Ordnance plants and many manufacturers have x-ray departments which operate constantly. They easily may use as much as 500 square feet of film every 24 hours, the work falling in the class of mass radiographic inspection. The Lockheed plant at Burbank, California, has four automatic machines radiographing 20,000 aluminum castings every 24 hours.

Radiography is not confined to inspection of finished products. It is often used in development of manufacturing procedures or training of mechanics. In the instruction of welders welds may be made on test specimens using variations in technique such as low and high currents and too long an arc. Radiographs of the welds show the nature of the weld under the varying conditions. Here a psychological factor also plays an important part in the quality of welding, because the welder knows that faulty work will be discovered.

Pilot Castings

In the Bendix plant at South Bend new patterns are molded, the aluminum poured, and the resulting casting radiographed. This is repeated until a satisfactory foundry technique is established.

A classic example of the use of pilot castings in the development of foundry technique is the work of the American Manganese Steel Company. A 6900 pound seven-foot cone-crusher liner was failing regularly in six places due to microporosity. Failure occurred long before the remainder of the cone was too thin to be of service. Because experimenting with castings weighing three and one-half tons is costly, a model of the casting was made to a scale of 1:6. In order to duplicate solidification phenomena, the scale for thickness was 1:3. Twenty pilot castings were molded, poured, and radiographed. The best foundry practice employing the principles of controlled directional solidification resulted in a sound casting in which gates and risers were reduced to give a yield of 77.7% of metal poured in the casting. Previous technique had resulted in a yield of only 38.5%; twice as much metal going into gates and risers as into the casting itself. When the new technique was tried on a full-scale casting the same satisfactory castings resulted.

Steel castings or welds which are defective often can be repaired by welding after the defective material is chipped out. Subsequently, repaired portions are radiographed for soundness. It is often desirable to know whether a defect can be more readily chipped out from one side or the other of a metal section. In this

case a double exposure with the radiation coming from two different positions plus a little geometry enables one to calculate the exact location of a defect with regard to the surfaces bounding it; or stereoradiographs may be taken and viewed simultaneously to get proper depth perception.

Although x-rays cannot be focussed as can visible light, a geometric enlargement of an object occurs because the radiation emanates from a very small focal spot and travels in straight lines. Enlargement is greater the farther the object is from the film relative to the distance between the film and focal spot of the tube. Advantage is taken of this in measuring the thickness of a corroded ship hull. For this a lead diaphragm is placed on the tube side of the hull; the film is placed on the other. By using similar triangles the thickness of the hull is calculated, knowing the distance of the focal spot of the tube from the hull, the size of the diaphragm opening, and size of the enlarged image of the diaphragm.

Fluoroscopy

Besides the photochemical reaction on the silver halides which are used in making film and paper emulsions, x-rays also ionize gases and cause certain materials to fluoresce. The fluorescence, which consists of visible radiation in the blue-green range and also ultra-violet, is used in two ways. Cards coated on one side with a layer of calcium tungstate are placed on either side of a film, coated side toward the film. During exposure the film is subject to the action of both x-radiation and the fluorescence of the intensifying screens, markedly decreasing the exposure time.

Fluoroscopy makes use of the fluorescent screen for visual examination of objects by means of x-rays. A fluoroscopic examination requires that much stronger x-radiation pass through the object under examination because the eye cannot integrate the radiation over a period of time a film can. Other disadvantages are that no permanent record is obtained and special precautions must be taken to protect the observer. However, fluoroscopy is advantageous because it permits a rapid examination of thin metal sections for gross defects or of miscellaneous assemblies where there is a great difference in absorption between the components of the assembly. Examples of the latter case are common in the food industries where packaged foods are fluoroscoped, those containing foreign matter being manually or automatically removed from the conveyor belt. Stones are separated from coffee beans, pits are discovered in bon-bons, and bits of metal or glass are located in breakfast cereals. Shoes are fitted by fluoroscopy and tires are examined for glass, nails and broken walls.

The installation in an eastern silverware plant for the continuous automatic inspection of the soldered joint between the hollow handle and the blade of table knives is an excellent example of the use of the ionizing power of x-radiation.

If the joint is defective, x-rays pass into the chamber and the gas is ionized, thereby permitting a current to pass between charged plates. The current is amplified, and the knife is ejected by a solenoid operated lever as it passes from the inspection hood. In this way 1400 knives are examined per hour.

X-rays aid the FBI and others engaged in investigational work. Bombs are radiographed to reveal their construction. They then can be safely opened—perhaps. In the museums and art galleries old masters often are discovered beneath other paintings. Eight of twelve paintings of Shakespeare in the New York Metropolitan Museum of Art show the great bard as a nobleman although he supposedly was a commoner. X-rays reveal that a signet ring which had been painted over originally bore the insignia of the earls of Oxford. Was Shakespeare really the brilliant 17th Earl of Oxford? Mummies are examined by x-ray. Oysters are x-rayed to see if they contain pearls; cultured pearls can be separated from natural pearls. A Midwest creamery received complaints that their butter contained crushed glass. A frantic examination revealed nothing until someone thought of radiographing the salt supply. There the glass, a broken light bulb, was discovered. By means of high intensity x-rays and 1/1,000,000 second exposures films can be made of a bullet passing through a rifle barrel or through opaque objects. The flow of dirt in a vacuum cleaner or the distortion of the core of a golf ball at the moment of impact with the club is readily recorded.

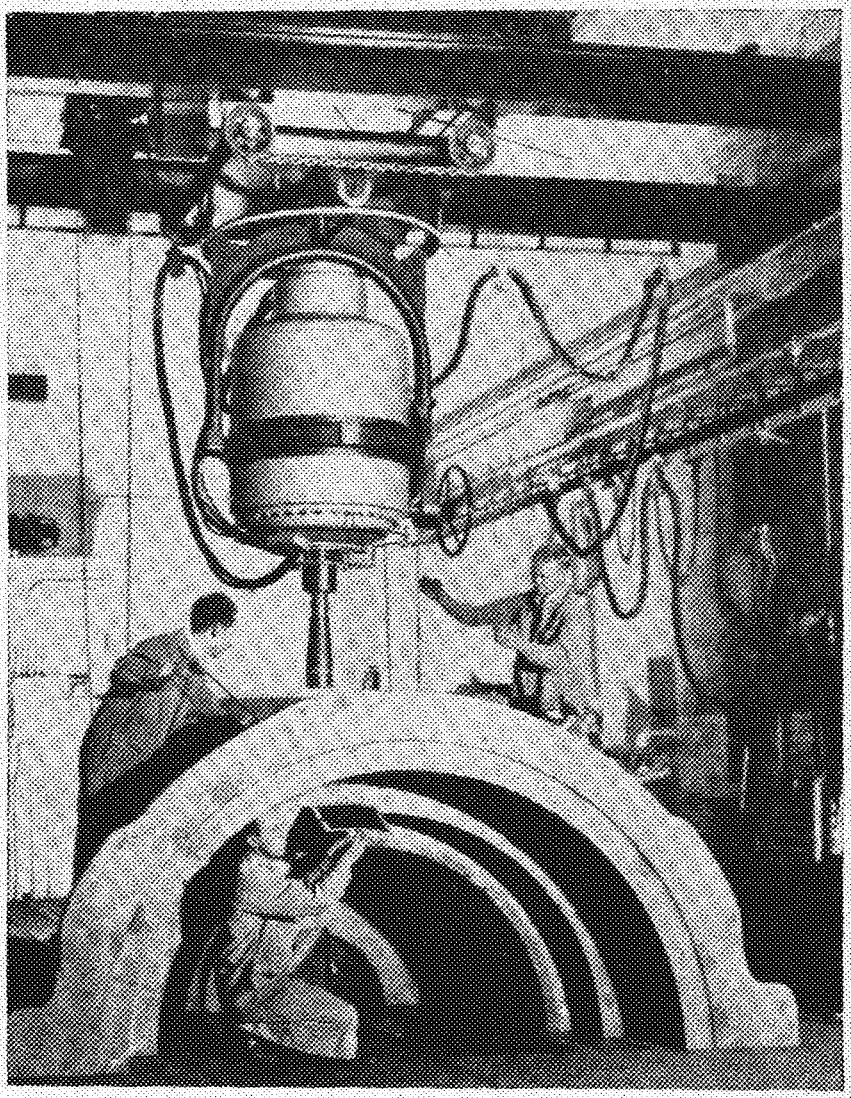
Additional Uses

A list of all the miscellaneous uses of radiography would be tremendous. It would include examination of plastic objects to see if metallic inserts were properly located, determining the location of reinforcing rods in concrete, separating frozen from unfrozen oranges, locating golf balls with misplaced centers, even studying the internal condition of trees. Due to the work of a Minnesota professor agriculturalists now are able to predict the proportion of hollow heart in a potato crop by radiographing growing potatoes in the field. In the Foundry Control Laboratory electric stove elements were recently examined to discover where a short circuit was located. About a year ago a local radio station brought in several transmitter tubes; the portion enclosed in

(Continued on Page 56)

THE NEW MILLION VOLT PORTABLE X-RAY UNIT makes possible easy inspection of large castings and clearly defines defects of less than one per cent of wall thickness. The man inside is putting a photo plate in place.

COURTESY OF GENERAL ELECTRIC



CIVILS SURVEY LIFE

At Summer Camp

BY DALE PILLSTROM, C. E., 42

Mosquitos, rain, wind, cold and snow—those five words describe very effectively the conditions under which thirty-three Civils attended the thirtieth Civil Engineers' Summer Surveying Camp at Norway Beach on Cass Lake.

The camp was under the direction and supervision of Professors A. S. Cutler, who returned after a year's absence; O. S. Zelner; L. F. Boon, and Assistant Wiley "Meatballs" Souba.

Now then, as for those mosquitos—you needn't take our word for it but you may believe Mr. Boon, and he swears faithfully that the first week of camp one of the Cass Lake mosquitos got caught in a strong tail wind, landed at the Bemidji airport, and the attendants there put in 87 gallons of gas before they discovered that it wasn't the Northwest Airlines' Fargo flight.

It was necessary on many of the days before the cold weather set in to equip oneself with mosquito netting and various patented insect repellent lotions. And for the benefit of future Civils—by all means take literally the instructions to take along lots of warm clothes, because no matter how much you have it still won't be enough.

The outboard motors and pick-up truck were well taken care of by Ernie Bootz, M.E. '43, who proved to be a dare-devil driver as well as an energetic competitor at the dances. Said Ernie as he rounded a corner with a truck load of boys destined for work in the wilds, "We lose more darned Civils that way."

The cook, Albert Erickson, although he had to work with a curtailed allotment of sugar, proved once again that good food in large quantities gives the Civils the necessary vitamins and energy for a good day's work in the woods. And thirty-three hungry fellows didn't have to struggle very hard to stow away the grub and show their appreciation of Albert's culinary efforts. The pathetic pantomime that took place each evening after dinner as each man waddled slowly from the mess hall patting his bulging front bore good witness to the kind of appetites the fellows had.

After dinner there were office computations to occupy the time. This meant computing and plotting the data obtained in the field during the day. Incidentally, the camp bulletin listed the time for office computations from 7:00 to 9:00 p.m., but it was usually closer to 11:00 before the work was completed. However, you can't keep a bunch of Civils down and so time was usually found after computations were completed to seek methods and moments of relaxation and amusement.

Camp Tradition

Civil Surveying Camp has two traditions. The first is that the Red Rooster shall be the headquarters from which all Civils in search of relaxation shall start, and the second that the water tank in Cass Lake shall have the class year of the Civils at camp painted on it in five-foot numerals.

The first tradition is not too difficult to carry on because said Red Rooster has a virtual monopoly on the amusement of Cass Lake.

The water tank tradition has always been one that caused great excitement both among the citizens of Cass Lake and the boys in camp. In this time of emergency the Federal Government has great interest in the power supply stations throughout the nation and had issued orders that such tom-foolery would have to end. Despite definite warnings from the government authorities and follow-up threats of the local constabulary (alias Les, the cop) that arrests would be made should anyone be caught meddling with the bane wagon (short for water tank), after a great deal of oratory on the part of a few of the gang, the water tank got its new trimming and now reads "U. of M., C.E. '43".

Delaying Policy

The same night that the dastardly deed was performed there seemed to be an excess of energy in the boys. It was discovered that the doors to the office and quarters of Messrs. Boon, Souba and Boo and also those of the mess hall in which the cooks' quarters were located, all opened inward. Engineering minds quickly realized that a plank placed diagonally across the door frame and lashed securely to the doorknob with a half-inch rope would provide an effective barrier to the passage of those who were on the inside. Messrs. Cutler and Zelner have cottages at the lake and do not stay in the camp. They,

course, would be able to come down to camp in the morning and release the entrapped victims of deviltry. A policy of complete isolationism could not be carried out but a plan of delay was definitely required and so, at a point about a half mile from camp, several large logs were placed inconveniently across the road, thereby barring the passage of cars and forcing Mr. Cutler and Mr. Zelner to abandon their modes of transportation and walk into camp. The delaying policy worked all right, but not as effectively as hoped. It must have taken about two hours to complete the shenanigans, and if I remember correctly the first gong was only about a half hour late the next morning. Some people just "ain't so very bright" I guess.

For the first three weeks of camp Mike Lofstrom when in a jovial mood would bring forth bursts of laughter with his favorite expression of "Mein Gott! Mein house iss on fire!" Cold weather required the building of fires in the tent stoves. About three o'clock one Sunday morning the boys in Tent 8 awoke to find that their stove had gotten too hot and their tent was in flames. Four boys dashed madly and sleepily through a wall of flame. But in the excitement of it all Mike missed his cue and forgot to say his line. In fact in his dash from the tent he didn't wake up until he was standing ten feet out in the lake with a pail in his hands. Damage to clothes and books was evident but no one was seriously burned.

Camp Schedule

Late each afternoon a schedule of work for the following day was posted on the bulletin board. This schedule listed the specific project each party was to work on, the duties of each man in the party, the name of the instructor to see for instructions and data, the number of basket lunches to check out from the kitchen (indicated by a number in a circle), and any special equipment that might be required.

On the cold, bleak, memorable morning of September 24 when we were given unexpected orders to break camp, it was found that someone had substituted a new work schedule for the one previously on the board. Some one got it before I could lay my hands on it, but the reproduction on this page (with foot note explanations) is as near as I can remember the masterpiece.

Explanation of Schedule

(1) No explanation needed—darned dirty job.

(2) Civils take observations on Polaris (North Star to the darned smooth kids from General) to establish the true direction of a line for use in survey control. Familiarization through the years has coined the expression "shooting Polar's Ass".

(3) The lunch baskets have seen many classes of Civils and on the covers are inscribed the witty thoughts of each class. Such quips as "Hot-damn peanut-butter sandwiches for a change" etc., etc.

(4) The two old stand-by sandwich fillers at camp are peanut butter and minced ham. Vern is the assistant cook.

(5) Your guess is as good as mine.

(6) No explanation—happens every day in the best of families.

(7) Center line stakes referred to are commonly known as "swizzle sticks" of which a goodly number were saved up during the month of camp. A statistician has been busy the past week computing the monetary value represented by the pile of sticks brought back to civilization. Result:—the statistician has had a hangover and blood shot eyes for six days.

(8) Sufficient to say that B. M. Gong is on shore and E. Cedar is a point on Cedar Island. You try to chain across half a lake—it can't be did I betcha.

(9) Wouldn't dare try to explain this one—you draw your own conclusions again.

CAMP SCHEDULE

INST.	PARTY	ASSIGNMENTS	LUNCH
1	Benert Pehrson Koko	Excavate Garbage Pit & Compute Cross Section. See Cutler	0
2	Gilles Knieff Doepke	Compute Eclipse of Polars Ass & Check time with Mr Boon	0
3	Nelson Fosness Pitts Hinneber	Copy Lunch basket notes into office copy. See Boon	0
4	Opland Ciulstrom Niemi	Help cook prepare decayed clam & peanut butter sandwiches. See Vern	8
5	Schnarr Rood Lofstrom	Go to Mr. Zelner's cottage for tea at 2:30. Be prompt—bring your own sugar. See Zelner	3
6	Demarais Ried	Solve love triangle with Prof. Priester's daughter (2 axes)	0
7	Pihlstrom Ymtelli Hosfield Sall Kallstrom	Run line from city bar to Red Rooster. Get center line stakes at Rooster. See Cutler	3 qts
8	Sailor Lindsay Herman Exner Don Johnson	Run Precise Chainage from B. M. Gong to Δ E Cedar. See Zelner	5
9	Westin A. Johnson Anderson	Prepare rating curve to determine camp Grades. See Zelner for strowe	0

Flashbacks

The strains of "Five-Foot-Two", "The Jersey Bounce," etc., issuing forth from Tent 3 as Ell Rood gave out on his accordion in spare moments. He can really manipulate that squeeze-box too.

Burly Ted Zontelli, afraid of no man, and one of the best "cat skinners" in the state, tying himself to a 20-foot tower when reading triangulation. And incidentally, that boy is really a businessman. It seems he financed the purchase of the paint used on the tower, a sum of sixty cents. On the last day as everyone was busy breaking camp he went from tent to tent collecting five cents from each man to pay for the paint. You figure it out; he should be voted most likely to succeed or something.

Dick Schnarr and Mike Lofstrom, detailed to set up triangulation towers, falling from the tower on Cedar Island and into the cool waters of Cass Lake, clothes and all.

Dick Gilles, one of the few fellows who brought along any hair tonic, which of course soon became camp property and was known as "Gus' Goose Grease", guaranteed to bring results if applied generously before leaving camp on Saturday nights.

Kate, singer and piano player at the Rooster, all 350 pounds good natured enough to take a kidding. And maybe you think she didn't get a ribbing from the gang.

After much persuasion from Kate, Mike's frequent vocal renditions of "Chattanooga Choo Choo" and "When My Baby Smiles At Me" with the accompaniment by the fine three-piece orchestra at said spot of entertainment.

The 30-inch saw, used for routing the boys out in the morning, disappearing and showing up under Sid Sailor's bed. Mr. Boon and Wiley Souba still won't admit they were the culprits, though Sid swears they are guilty.

Virgil Demarais trying to lure a family of skunks down to one of the tents. Almost succeeded, too.

Ye scribe standing in the lake for about two hours, clad only in a pair of hip boots while reading triangulation with the waves plenty cold and about a foot over the tops of the boots (picture censored).

Mosquitos, rain, wind, cold and snow—we had 'em all, but there isn't a guy in the bunch who didn't get a kick out of it.

MOSQUITOS APLENTY. interesting life

Submarine Escape From

THIRTY FATHOMS DEEP

BY GEORGE SHAFFER, M.E., '43

During these times of manpower shortage, it is interesting to find out new ways in which manpower is conserved. This article deals with a few devices that the United States Navy uses in order to save lives.

Whenever a submarine has one or more of its major compartments flooded because of explosion, collision, gun fire, or other cause and is unable to rise to the surface under its own power, the submarine is considered sunk and must be abandoned by the crew in the shortest possible time. Delay in abandoning the stricken craft under such conditions must always mean reduction in the oxygen content and gain in the carbon dioxide content of the craft's atmosphere. As a result of this changing atmosphere, men lose efficiency and vitality as time progresses.

The United States Navy has developed two methods by which the crew of a submarine may be rescued. These methods are individual escape and collective escape. In the individual system, each crew member leaves the submarine through an escape hatch and makes his way to the surface. Breathing and buoyancy necessary to carry the crew member to the surface are provided by a Momsen lung. The escapee is guided to the surface of the water and regulates the speed of his ascent by a guide line from the escape hatch to the surface. This method can be used anywhere providing the necessary equipment on the submarine is undamaged by sinking. Collective escapes are made in conjunction with friendly surface craft which are supplied with the special equipment needed. The main part of the special equipment is a rescue chamber, which is really a large diving bell used as an underwater elevator. In operation, the rescue chamber descends along a guide line to a hatch in the submarine. It is then clamped securely over the hatch and rubber gaskets are employed to make a watertight seal. The hatch is then opened and several men from the submarine are taken into the chamber. The chamber is then unclamped and raised to the surface to unload its passengers before making another trip. Obviously, this method is limited because of the bulky apparatus required; for example, the rescue chamber must be towed into action in order to prevent damage to some of its delicate parts. A diver is used in conjunction with the chamber to secure the guide line and remove obstructions that would hinder the operation of the chamber. In all cases of use of the chamber the sunken submarine must be located from the surface. In time of war, the rescue vessel may fall prey to enemy torpedoes because an anchored ship makes a perfect target. This rescue chamber is probably best suited for operation in training areas where submarines follow known courses in a small area which is usually free from enemy action.

It may be remembered that this was the case of the American and British Submarines Squalus and Thus.

Each man of a submarine crew must undergo training in the use of the Momsen lung before he is allowed to train for his regular duties on board a submarine. On the other hand, only a small number of men are trained in the use of the rescue chamber; consequently, the emphasis of this article will be on training in the use of the Momsen lung, which is often called the "lung" for convenience. The name "lung" is applied to this apparatus because it has the function of a third lung.

Training in the use of the lung is done under conditions closely approximating those actually encountered in service. An escape training tank filled with water and provided with escape hatches at various levels provides the equipment for training by degrees.

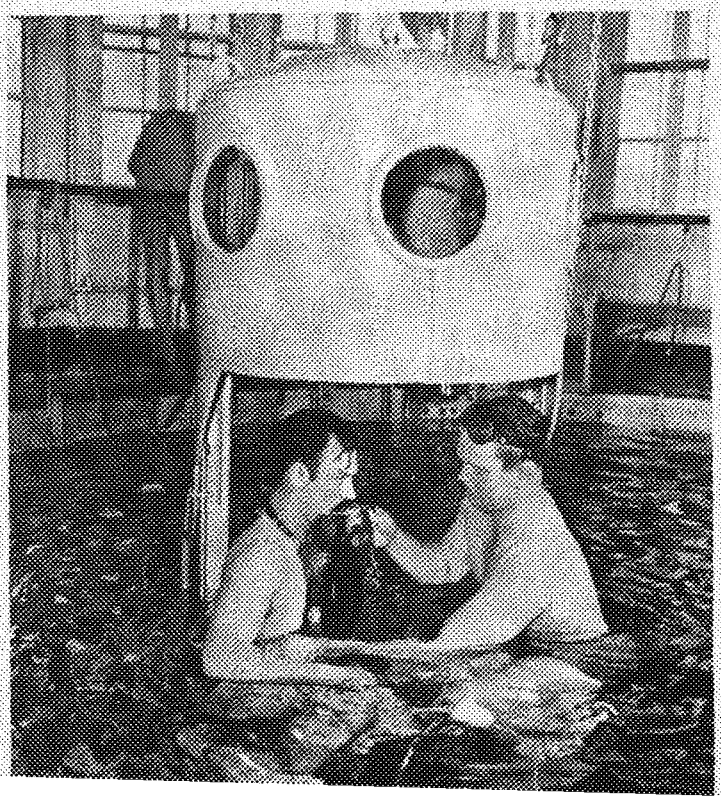
A candidate for training must pass the regular Navy physical examination plus a pressure test of 50 pounds per square inch or a pressure equal to 112 feet of ocean water. This pressure test is required in spite of the fact that under normal conditions a submarine's air is only under atmospheric pressure. During escapes, however, pressure inside the escape compartment is increased until it equals the pressure of the water surrounding the submarine. The pressure is increased by allowing sea water to enter the compartment and keeping the air content trapped in the upper part. When the air is compressed so that its pressure is equal to the water pressure no more water will enter the compartment and the men can then make their escape. The pressure test is conducted in a compression chamber where all men being tested can be closely observed at all times.

The actual tank training begins with a simple breathing exercise by the student while his head is out of the water and then a simple breathing exercise with the student just barely submerged. This first exercise proves that the lung works and also teaches the student how to breathe into the mouth piece properly.

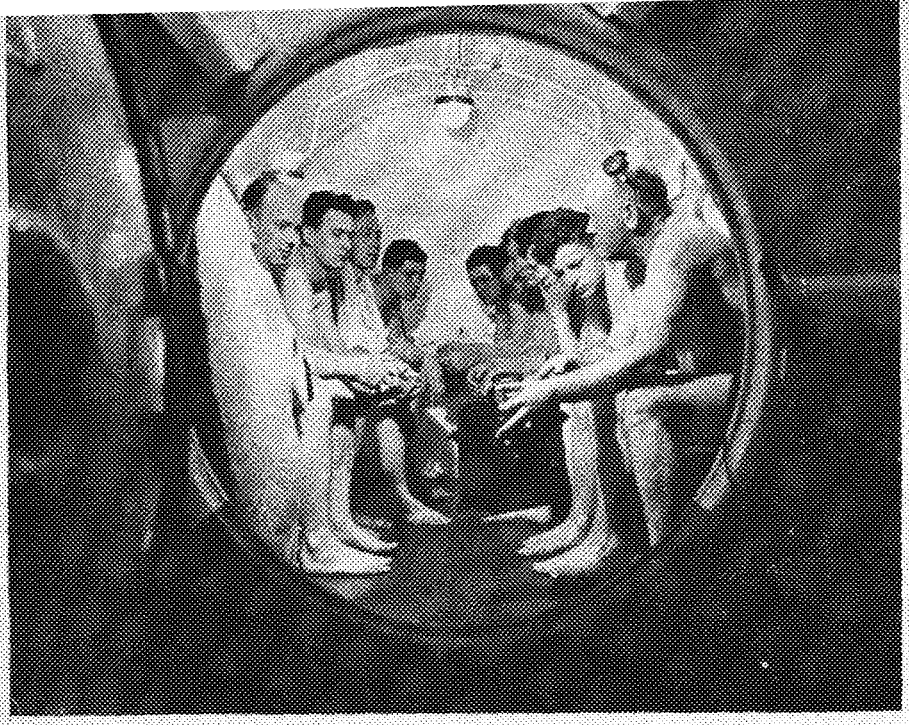
The second step in the tank training is an actual ascent from a depth of about 12 feet, with at least one stop, for a period of 30 breaths. During the ascent the student is carefully watched by the instructor to see that he breathes properly, ascends at the proper speed, and that he does not hold his breath. The student should have learned how to breathe properly in the first step of the tank training, but the instructor must see that he does not forget how in the excitement of ascending.

The student must regulate his ascent by holding on to the guide line, because the buoyancy of the lung would otherwise cause him to rise too fast. The maximum speed of ascent is 50 feet per minute, and

U. S. NAVY PHOTOGRAPHS



THE MOMSEN LUNG is carefully checked by the instructor before the student begins his preliminary training which consists of simple breathing exercises with his head out of water.



IN THE ESCAPE CHAMBER at the submarine training school near New London, Connecticut, the men are exposed gradually to an increasing pressure equal to the pressure for the depth of water in the tank before leaving on their adventurous ascent.

after a student has practiced a few ascents he can keep fairly close to that figure. At speeds above 50 feet per minute the student is apt to get the diver's disease called the "bends". A student can easily be killed if he holds his breath during the ascent, because the air compressed within his lungs will expand with the decreasing pressure and do serious damage if it is not released by normal breathing.

The third step in the training is a few ascents from the 18-foot level escape hatch in the tower. No further escapes are required of the men, but most of the men that have come this far volunteer for trial escapes from the escape hatch at the bottom of the tank 100 feet below the surface.

The thrill and pride of ascending from the 100-foot level is usually enough to cause men to make the escape from this depth. At one training tank, waggish Navy men have painted mermaids around the walls of the tank at the 100-foot level in case the men get lonely down there. In Navy parlance a man has joined the mermaids when he has escaped from the 100-foot level.

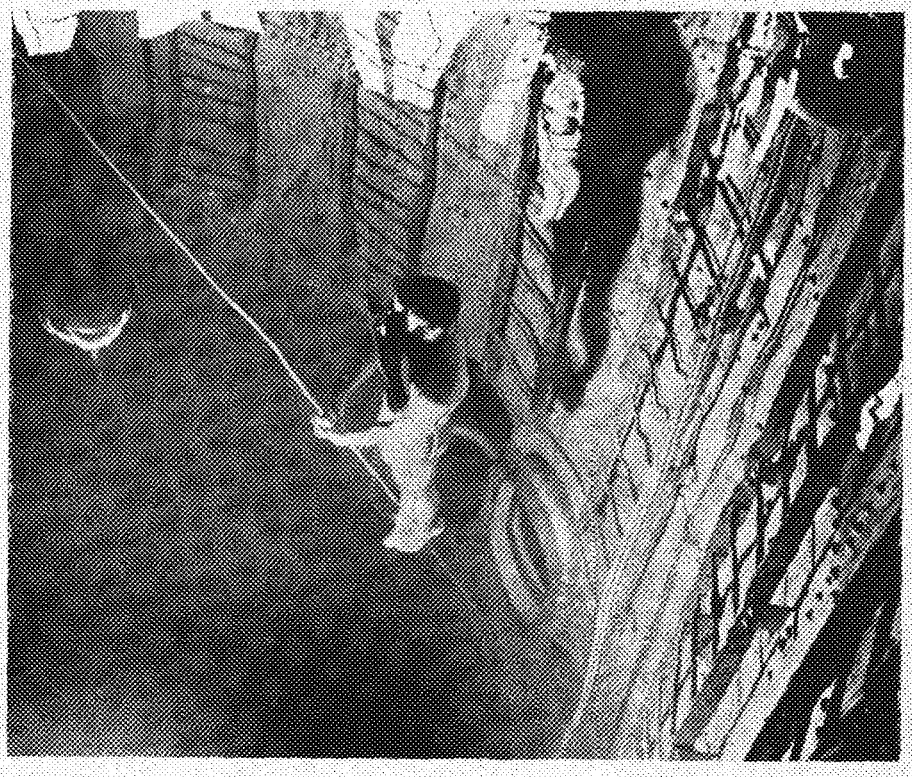
The primary purpose of a lung is to provide enough good air for a human to breathe while he is *ascending* in the water. An initial charge of oxygen is supplied in the bag which is supplemented by the charge of air compressed in the wearer's lungs. For example, suppose a person was in a sunken submarine 165 feet below the surface of the water. The pressure in the escape compartment would be about 73.5 pounds per square inch or about 5 times atmospheric pressure. This means that a person's lungs contain about 5 times the weight of air at that pressure that they would at atmospheric pressure.

When the person is ascending with a lung the volume of air contained in the person's lungs and the Momsen lung increases as the pressure decreases. Some of this expanding air is released through a relief valve while some of the oxygen is used by the body of the wearer. The canister of the lung filters out carbon dioxide and soon will be made to filter out carbon monoxide and chlorine gas so that it can be used as a gas mask if fitted with goggles to protect the eyes. This will make things more compact on submarines because now respirators (gas masks) are carried in addition to the lungs and consequently twice as much room is being used as should be. Carbon dioxide is given off as a waste product when a person breathes. Chlorine gas is formed when salt water gets into the batteries of a submarine, and carbon monoxide is sometimes given off from the submarines' internal combustion engines; hence, the need for gas masks. The lung also serves as a life preserver, providing the escapee closes the air relief valve when he gets to the surface. The lung can be refilled if the operator blows through the mouthpiece.

Other types of lungs have been tried. One type of special interest is really a midget, self-contained diving gear. This type of lung has a high pressure oxygen bottle strapped on the back of the wearer and continuously feeds oxygen to the air mixture in the rubber bags that act as the air reservoir. This device has one advantage over the Momsen lung and that is its ability to go up or down at will and still be serviceable. In using the Momsen lung if the ascent is not continuous or descent is attempted, the rubber bag will collapse and render the apparatus useless to the wearer, because it uses the principle that the volume of a gas expands with a decrease in pressure. The principle mentioned above also works in reverse thereby limiting the Momsen lung to steady ascents with only a few short stops for decompression. All in all, however, the Momsen lung is the best in its field for providing a compact, safe and easily used device for escaping from sunken submarines.

In conclusion it might be said that these escape devices make the United States Navy Submarine Forces more efficient, because the men are in better frame of mind to do their duty if they know that come what may they always have a fighting chance to survive.

THE THRILL of ascending from the 100-foot level is the ambition of all the men. The student must regulate the speed of his ascent to fifty feet per minute by holding on to the guide line for if he rises too fast he will probably get the "bends."



Accurate Control With

INDUCTION HARDENING

BY EARL ANDERSON, M.E., '45

ONE of the more recent and certainly one of the more remarkable discoveries involving electricity is heat treatment by induction, which is also called electromagnetic heating. Begun during World War I, this field of applied science has grown to such an extent that it is almost indispensable in our present battle of wartime production.

Several years ago there was a popular demonstration showing one of the novelties of electricity. An iron frying pan containing an egg was placed in a rapidly changing magnetic field and the heat produced by the induced current passing through the high resistance of the pan fried the egg, with no obvious source of heat. Today the use to which induction heating is applied is vastly different. Wartime production demands have been a prime factor in the development of high frequency induction heat treatment. Its most important function is in the production of war materials and parts, although it has been used a great deal in other fields.

The method employed for surface hardening, which is the primary application of induction heating, is comparatively simple. The portion of a charge which is to be hardened is first heated by placing it within a magnetic field created by passing a current of frequency from 2,000 to 100,000 cycles per second through induction coils. The molecules of the charge, each acting as a separate magnet, tend to align themselves in the direction of the magnetic field. When the field changes very rapidly, the molecules change position accordingly, and a great amount of energy in the form of heat is produced. This action which produces heat is known as hysteresis, and occurs only in magnetic materials.

After the charge reaches a certain temperature it loses its magnetism and heating then depends entirely upon eddy currents induced by the change of flux. But at temperatures even below that at which the material loses its magnetism, a large part of the heating is due to these eddy currents, and hysteresis plays only a minor role.

After the charge reaches the desired temperature for hardening it is quickly quenched. Quenching is done through orifices in the induction furnace.

Since heating depends on hysteresis to only a small extent, several nonmagnetic materials such as copper, aluminum, and carbon can be heated by induction with eddy currents.

The depth of penetration depends upon the frequency used. If surface heating is all that is required, high frequency and high power are needed. If, however, a charge is to be heated throughout at an even temperature (as for forging) a frequency must be selected which is low enough to allow the interior to be heated by conduction nearly as fast as the surface is by induction.

Although the number of steels on which induction heating can be used is quite large, there are several on which it can not. Generally speaking any material that can be hardened by heating and cooling can be hardened by induction methods. Induction heating allows a greater degree of hardness to be produced than does any other method because it permits a faster recombination of free carbon with iron to produce hardenable steel.

The induction method of hardening has a distinct advantage over other methods in that any desired depth of surface can be hardened to any particular degree without changing the structure of the interior. For example the surface of a cam or crankshaft can be treated to give it an extremely hard wearing surface without impairing the strength and machineability of the interior.

Speed is another advantage held by induction heating. The old method of heating a metal at extremely high temperatures for several minutes is definitely being replaced by the induction method in which matter of seconds is all that is required to raise the metal to the desired temperature. Recent information has shown that .02 to .03 of a second is sufficient to bring about complete hardening of some metals.

Other advantages of induction heating are: hardening of only the portions which are to be hardened, thereby maintaining the original ductility and strength; hardening of articles of irregular shapes which cannot be done feasibly by any other method; and elimination of expensive pretreatment for case hardening such as copper plating and carburizing and subsequent costly cleansing and straightening operations. The variety of parts that can be heat treated is tremendous. It ranges all the way from very small bearings to huge Diesel camshafts.

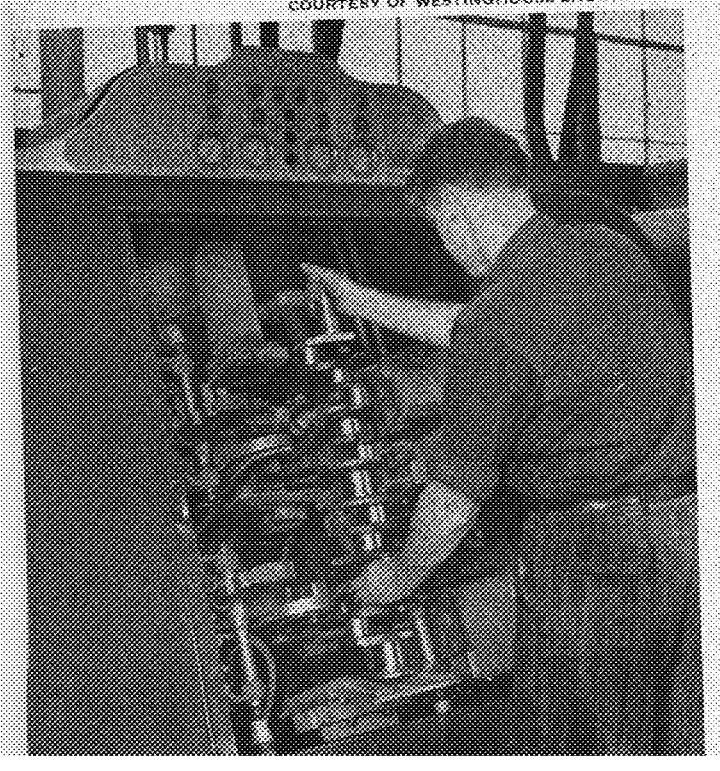
Mass-Production Efficiency

As an example of the speed and efficiency obtained by this method of hardening, a large automotive plant in Pittsburgh hardens 70,000 tappets in a ten-hour day. This is more than 100 per minute from a single automatic induction heating machine. Out of 28,000,000 tappets hardened by this method there have been no rejections due to improper hardening.

The essential equipment for surface hardening is the inductor itself. This may consist of a single copper wire or several turns of copper tubing. The space required for the induction coil is generally quite small, and is insignificant when compared to the space taken up by the charge-handling equipment. The coil usually consists of a single layer for high frequency usage or several layers for use on low frequency. The shape and size of the coil depend upon the charge to be heated. For instance, if the charge is flat, the inductor may be only a single piece of copper wire zigzagged across it, and if the charge is round, the inductor will be of copper tub-

A VERTICAL CRANKSHAFT for a Diesel engine is shown being loaded into a controlled heat-treating machine. An operator can handle four induction units.

COURTESY OF WESTINGHOUSE ENGINEER



ing coiled around it. Tubular-shaped objects may be heated by placing the inductor inside of them for internal surface hardening.

In addition to the inductor the equipment comprises suitable arrangements for applying the quenching medium through orifices; a transformer and capacitor; a high-frequency generator; and automatic timing controls.

As stated before induction heating is used in a great many fields. It is particularly adaptable to forging welding, upsetting, and similar operations. For forging, the temperature throughout the portion of the charge to be worked can be made uniform, thereby assuring very few rejections. The amount of heat given off externally by induction heating equipment is very small, which makes it much less difficult to work near than the gas or oil-fired furnaces. The only heat the operator is exposed to is that given off by the charge as it is removed for forging.

Controlled temperatures of 3600 degrees Centigrade have been obtained for induction heating in sizeable furnaces. Since heat can be produced in a charge as long as it is conducting, the temperature can be increased to a point where heat insulation of the furnace fails or where the charge itself vaporizes.

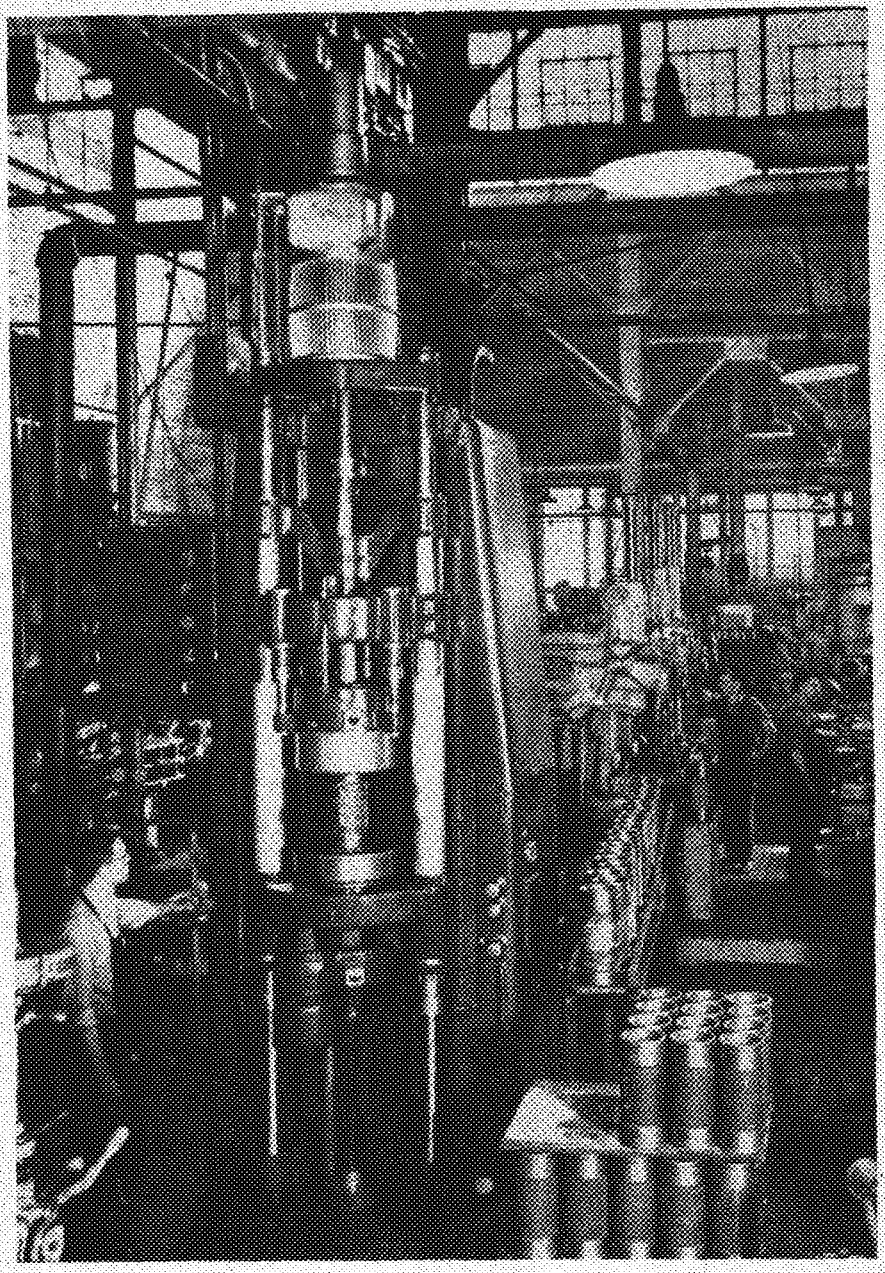
Surface Hardening

The high-temperature field is relatively untouched to date, though it offers great potential interest. The fields of fusion electrolysis, vaporization reduction of ores, and vaporization separation of metals all offer great possibilities and opportunities.

Induction heating is employed in the hardening of shear blades and rail surfaces, and in producing harder working surfaces for such articles as gear teeth and tool ends. A minor use to which induction heating is put is the removing and installing of rings, liners, and castings. In the installing process, a simple helical coil is placed inside or outside such annular pieces as rings or cylinders, and heating is very quickly effected. During the heating the ring expands and is placed over the piece to which it is to be shrunk.

This process is used to fit tires on railroad car wheels and to line guns. A low frequency is used for this operation. The process can also be reversed, and the ring or cylinder in place can be removed by heating it inductively and removing it before the base piece can be heated by conduction. However, this reversed operation requires a large amount of heat at a high frequency in order to limit heating to the piece to be removed.

The latest addition to induction heating processes is internal surface hardening. The purpose of this type of hardening is to harden the material just under the surface and leave the surface soft to retain its machineability. This process not only solves difficult machining problems, but also practically makes new material out of old. Iron and steel which was previously thought to be unable to withstand hard wear, can now be treated so that the internal surface is harder than many high grade alloys and the external surface retains its machineability.



INTERNAL DIAMETERS of all the liners for Diesel engines are inductively hardened in this heat-treating machine directly in the production line. More than a hundred liners can be hardened hourly on one machine.

The principle of internal surface hardening is much the same as that of external surface hardening. A thin layer of internal surface, usually not more than a few thousandths of an inch thick, is heated to a high temperature by induction and before the heat can spread inward, the hot surface is quenched. This produces a hard, wear-resisting portion and does not affect the qualities of toughness, ductility, and machineability of the surface and main body.

This method differs from external surface hardening only in the limits of work to which internal surface hardening can be applied. For example, it is not practicable to harden bores with diameters of less than one inch because of the difficulty in designing the induction apparatus. On the other hand, it is difficult to harden an internal surface when the diameter is greater than fifteen inches due to the great amount of power required and the speed with which it must be applied. This would involve a great deal of expense.

Induction heating and hardening is definitely on its way up. All the important steel mills of the world, as well as many of the arsenals, navy yards, and mints, use induction melting equipment; and in this wartime emergency, methods of heat treatment by induction are continually finding new and useful applications in the manufacture of airplanes, tanks, guns, shells, and the engines and machines needed to make them.

HIGHLY PORTABLE SWITCHBOARDS such as the one shown facilitate flexible communication between front line units during battle.

Know Your Army

SIGNAL CORPS

BY MAJOR CARL A. JACOBSON
ASSISTANT PROFESSOR OF MILITARY SCIENCE AND TACTICS

This is the second in a series of articles about the work of the various branches of the R.O.T.C. and the N.R.O.T.C. at the University of Minnesota.

Armies have always been made up of troops using various combinations of the best arms that their technological progress could devise. This progress has brought the equipment of fighting men from the sword and chariot of the ancients through the musket and brass cannon of the Colonials to the modern team of infantry, artillery, tank, and airplane. But whatever their weapons, armies have always needed and used communication, not only within the army, but also between armies, and to the home front to facilitate supply and evacuation. However, technological progress in communication did not keep pace with that of weapons. In fact, the "dark ages" of communication lasted until the middle of the nineteenth century when Morse invented the electric telegraph. Up to this time, there was no perceptible improvement in the speed of transmitting intelligence over that of Greece's marathon runners.

General Washington's communications during the Revolution were no better than Caesar's, 1700 years before. It was not until "electricity" that the upward spiral of progress began. As electrical means of communication were improved, the army seized on each new development as a long-felt want. In our Civil War, telegraph was the best we had. In the Spanish-American War, the telephone was a big help. In World War I, radio was available to supplement wire communication. The big advance of World War II is the development of "electronic sentries" which are on 24-hour duty today along the American coastline and at bases overseas—with communications coordinated by the Signal Corps whose listening posts cover hundreds of miles of territory.

History

After the advent of electrical means into Army communications it was decided that specialists were needed to operate these then complicated devices, and the Signal Corps was born in 1863 and charged with the installation, operation, and maintenance of signal communication. Under the able direction of the various Chief Signal Officers from Major Albert Myer, the first, to Major General Dawson Olmstead, the present Chief Signal Officer of the Army, the Signal Corps has also pioneered in the development and improvement of all means of communication for the lasting benefit of mankind.

The Signal Corps has had some very interesting sidelines in its history. Until October 1, 1890, the Corps performed the meteorological duties for the nation, using its extensive telegraph net to relay weather reports to the central forecasting stations.

Due to the interest of General Greely, the third Chief Signal Officer, in early

SIGNAL CORPS WIRE CREW laying wire for telephone communication. Wire can be recovered rapidly by the crew using a motor-driven reel mounted in the truck.

aeronautics, the Signal Corps was connected with the Langley trials. When the Army purchased its first airplanes they were given to the Signal Corps for the reason that the only foreseeable use for them was for communication. The "Air Corps" remained a part of the Signal Corps until well into World War I, when the fighting qualities of the airplane won it a separate and important place in our Army.

Present Duties

In this war the Signal Corps is charged only with communications, if aircraft detection and photography can be included in the term, and only with communication in the larger units from the division on up where the amount of traffic and the distances involved more nearly approximate commercial services. In the smaller units from the regiment on down the Signal Corps retains technical control, but the tactical operation is performed by troops of the using arm, such as infantry and artillery troops.

Although its mission is to increase the fighting abilities of the other branches of the service by furnishing communication, the Signal Corps is classed as a combat arm, along with the infantry, artillery, cavalry, coast artillery, engineers, air corps and armored forces. Signal Corps troops are well armed, some with carbines, others with pistols, submachine guns and heavier weapons.

Means of Communication

Many means of communication are used in the army, including wire, radio, messengers, pigeons, visual means, and sound. Of these, wire is the most important and the most extensive, except to airplanes and tanks, because it is faster, more dependable, and secret. "Wire" includes telephone, telegraph, and telegraph printer. In forward areas "field wire" systems are built using flexible, insulated twisted-pair wire which is laid on the ground or along roads at high speed by devices that literally throw the wire from a moving truck. Standard commercial type construction is used in rear areas where transmission distances are greater and a greater degree of permanency is desired. To make the most use of the wire available, telephone, and telegraph or printer are operated over the wires simultaneously by simplexing.

The use of radio in military operations has increased extensively in recent years. This is largely due to the rapid movements of ground forces and to the huge expansion of the armored and air forces—wire communication being impossible to moving airplanes and tanks. The Signal Corps Laboratories have developed a number of sets, varying in size and power from very small ones carried by one man to high power fixed stations designed for long range. Most of the sets are mounted in and operated from vehicles, and use both voice and code. The chief disadvantage of radio is that messages must be put in secret code, because enemy stations can pick them up as well as our own.

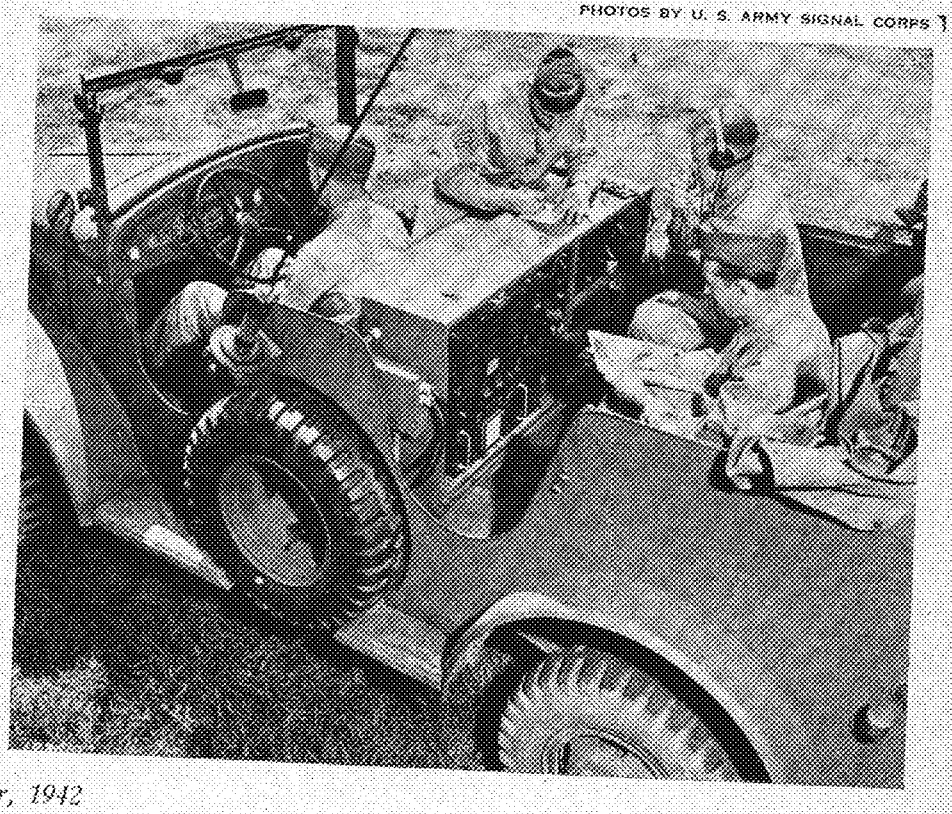
Messengers are also of great importance particularly in the smaller units where they may be the only means of communication. They use all forms of transportation from their own two feet to airplanes; anything to "get the message through."

Homing pigeons have been bred and trained to carry messages for centuries. Although they cannot carry much weight, they are still useful for emergency communication from front-line units to their home loft several miles back. The birds can be trained to fly reliably for several hundred miles at automobile speeds. They are seldom hit by gunfire while in the air, but there are several instances in World

(Continued on Page 56)

THE RADIO SHOWN is protectively mounted to prevent damage from shock. The set is equipped to receive and send both code and voice over short-wave bands.

PHOTOS BY U. S. ARMY SIGNAL CORPS



The Need for

ACCELERATION

BY DR. S. C. LIND

DEAN, INSTITUTE OF TECHNOLOGY

THE October issue of the TECHNOLOG contained an interesting survey of student opinion on acceleration written by Mr. Gerald Busch, based on replies received from thirty-five per cent of the total of eight hundred and seventy-six students who took summer courses in the Institute of Technology.

The Editor of the TECHNOLOG has asked me to reply to some of the points at issue. I am grateful for this opportunity since there seems to have been much misunderstanding.

Why Accelerate?

The whole object of acceleration in the Institute of Technology is, of course, to give adequate training to the greatest possible number of engineers and necessary scientists in the shortest practicable time in order that they may begin to render services essential to the war effort at the earliest possible moment.

If it had been felt that all or nearly all of our students would be able to accelerate, it would have been made obligatory, as Selective Service suggested in its statement that there is no more reason to allow summer vacation to students than to any other registrants under the draft.

But since a previous survey by the TECHNOLOG ("College By the Year," February, 1942) had shown that nearly half of our students earn all of their expenses in college, and seven-eighths earn some part, it did not appear feasible to force all to relinquish summer earnings to accelerate, unless some other means of support were provided. The University Loan Fund appeared insufficient to meet this demand.

Student Loans

Decision was, therefore, delayed in the hope that Congress would take favorable action upon a bill providing funds for student loans and also for cost of summer instruction. When it became evident that action would not be taken by Congress in time for the summer session, it was decided to proceed with acceleration on a voluntary basis. The preliminary plans for schedule, sections, and instruction had already been made so it was only necessary to have enough students accelerating to insure continuation of the program beyond the summer into the succeeding quarters.

The first reports of summer enrollment were very discouraging. Then both departmental and All-Institute meetings were held to explain the situation and to urge all those who possibly could to register for summer acceleration since there would be no opportunity to do so later, except for freshmen entering in the fall.

The enrollment then went up to nearly nine hundred or about fifty per cent of the three classes involved. This was a very satisfactory division for sectioning and made possible the operation of the two course progressions without interference and with an equal number of students in each.

Summer Fees

Some objection was expressed in the TECHNOLOG article; first, as to fees, and second, as to methods used to induce students to accelerate.

As to the matter of fees there is one thing which most students do not seem to realize; namely, that his fees pay for less than one-fourth of the cost of his education; the State pays the balance. But there has never been any appropriation for Summer School. It has to be self-supporting, that is, has to get along on student fees. If these pay only one-fourth of the normal cost it is evident that a full set of courses with a full staff cannot be given in the summer for normal fees although a regular quarter's work is offered.

Last summer there was a hope that fees for the two summer sessions might be changed as of a regular quarter. But this was decided by the Administration to be impossible. There is no definite assurance of lower fees next summer unless the Summer Session gets additional funds from some source such as Congress, the State Legislature, or the carry-over of any balance from the summer of 1942. This question has not been settled and may be considered in the near future.

In this connection it should be remembered that with a decreasing enrollment and with all of the uncertainties of the future, the University finances are faced with a question mark which may turn red at any time.

Future Acceleration

With reference to the advice to accelerate —it still stands—sounder today than when given last May. Several students have told me recently that they now regret not having begun acceleration in June. Unfortunately those who did not do so then cannot do so now, as it is impossible to run three sets of courses simultaneously. Only in case acceleration is made obligatory could the present slow rate be discontinued and a second accelerated schedule out of phase with the first be substituted. Recent action by Congress suggests something of the kind may later become necessary, but it is yet too early to draw conclusions.

Students who decided to accelerate are to be congratulated on doing so. Our total of fifty per cent, while fairly satisfactory, was exceeded in most engineering colleges of the Middle West. We should be in a sorry plight had we made no effort or been content with as small an enrollment as was first obtained.

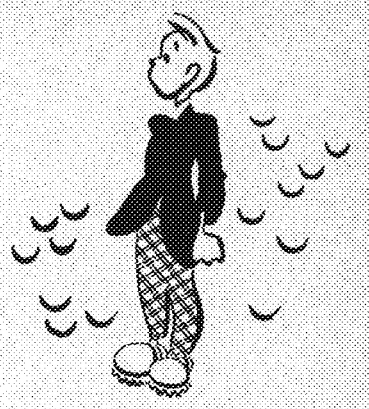
This Is War

Much water has gone over the dam since last May. Most, if not all, of our students must by now be aware that we are at war and that education may be going the same way as sugar, gasoline, tires, oil, etc.

In an emergency such as the present one, the needs of the country must take precedence over any personal desires. No student can expect to be deferred in order to continue or complete his education unless it will enable him to render greater national service while that service is still needed. It is needed at the earliest possible moment, hence the necessity of acceleration, regardless of hardships or inconveniences. Education is still necessary, but it is going to be harder to get, may not last so long, nor be of the same quality; but he who gets as much as he can and as soon as he can, is serving not only himself but his country.

Editorial Comment

AS WE SEE IT



Instructors! Your Obligation

Somebody should give a few of our instructors a shot in the arm. We have a number of them in this school whose sole purpose is to fill up their class time with words so they will be free to do something else. We want our instructors to have a firm desire to teach; not merely the desire to draw their pay and get their lecture over with.

It is good that we have many fine instructors, as we do. A large number of them are really exemplary; all that the student could wish for. They teach with the idea that their job is to make the students understand the material. They teach with a well-rounded knowledge of the engineering field and with a realization of what the engineer is going to be up against when he gets out on the job. Their driving motive is to transfer to the student all the knowledge that they can about a particular subject. Unfortunately all of our instructors are not of this happy breed.

It is not our purpose to find fault with the curricula as it is set up. In these wartimes it is necessary that a student should take courses which will be of benefit to him and to his country, either directly or indirectly. If there are any courses which do not contribute to the knowledge and understanding of the engineer, they should be removed. At the same time we recognize the need for a broad professional training and not a trade school type of education. Our courses seem to be well-balanced in this respect. Most of the trouble is not with unsuitable subject mater of the courses, but rather with the failure of some instructors to realize how necessary his own particular subject is to the student and how useful it will be to him after graduation.

There are many excellent instructors who have either worked in the field, or who through close study of trade journals and other professional contacts, are able to appreciate the students' future problems and teach their courses accordingly. They describe the different problems that will be met. They tell how their particular course applies to these problems. By doing so they help the student to fit a particular course into the body of his engineering training. These instructors make it possible for the student to see the value of his studies, and they use every available means to present their material in such a clear, usable form that the student will be able to apply his knowledge later. A large number of our instructors have the vision and devotion to their work which enables them to present their work in this manner. Unfortunately there are some who do not.

It would be a great thing for this university if the heads of the departments would speak to those few who are indifferent to their work and explain to them the importance of greater effort.

Our country has a vital need for well-trained engineers. Our instructors have the responsibility of providing students with that training. In their hands rests the future of hundreds of young engineers. If only those instructors who have no interest in their work could be made to realize the importance of the charge that is entrusted to their care, they could be made to see that their job is not over when the class bell rings. They must understand that their work is to train, not to use up class time; to guide and direct a man's studies, not to speak a lecture and let it go at that.

We may look forward to that time in the not too distant future when all our instructors will appreciate the importance of their jobs. They will be teaching with a purpose and the students will understand. Theirs will be diligent work. Their efforts will be directed toward a definite goal. Their single purpose will be to produce for this country the finest type of engineer they are capabe of producing.

Dear Engineers,

In reply to a letter in the October issue of the Technolog addressed to us, the following answer is given:

The Tech Commission is the governing or coördinating body of the group known as the Technical Association which is made up of all the students in the Institute of Technology. The Tech Commission comprises the student chairmen or presidents of each of the engineering societies and three members-at-large elected at spring elections. We act as an engineering student council.

Our aims are to coördinate departmental societies, promote the interests of the engineering societies and the Institute, coöperate with the All-U Council, take charge of Engineers' Day, and conduct Institute elections. Many of these things have already been discussed at our meetings and a preliminary course decided upon.

We are somewhat handicapped by the "space and antiquated" files. In fact the entire file consists of three or four different constitutions and last year's financial report. We are attempting to start a permanent file this year.

In the interest of those engineers who are following the accelerated program, we are attempting to get the summer session fees worked out on a quarter basis. This will make it easier for more engineers to attend summer school and take advantage of the accelerated program.

Engineers' Day is another problem that must be faced. How big should it be? Should the parade be dropped entirely? Should we have one at all? When should we have it to get the accelerated seniors in on the fun, too? All these questions and more remain to be solved.

The proposed Aero-M.E. Building has No. 1 billing on our docket. Much can be achieved in the way of obtaining the new building if every member of the Technical Association, which means every I. T. student, will get behind and push. We will lead the way, but we need your support.

The Technical Commission

TECH NEWS

EDITED BY DON FRANKE, E.E., '43

Tech Societies Resume Activities

After a summer of complete dormancy, the engineering societies are resuming activities in a big way, with the main emphasis being placed on the various membership drives.

ASME

The ASME started its ball rolling with an open meeting in the men's lounge in the Union, October 8. The meeting was conducted by Daniel Schiavone, and was high-lighted by the informal addresses made by the faculty members present. Refreshments were served in the Union Grille.

ASAE

The ASAE enjoyed an interesting discussion by Mr. Loyal Johnson of the State Division of Water Resources and Engineering, October 27. Mr. Johnson spoke on the opportunities for the Ag. Engineer in the various branches of the service, and touched upon the duties of the Water Resources Division.

This meeting was followed by the student faculty banquet of the ASAE, October 30, in the Union.

AIEE

The AIEE enjoyed an evening of bowling on the Union alleys, November 2. During the short business meeting conducted by Robert Engquist, the annual prize paper contest sponsored by the Minnesota Section of the AIEE was announced. The contest, open to all electricals, is under the direction of Don Franke, last year's winner.

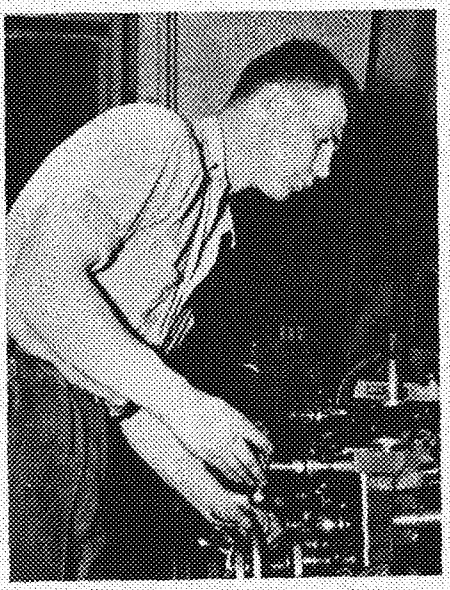
The well-attended meeting closed with the serving of refreshments.

ASCA

The first meeting of the ASCA was held October 20, with Dean Lind speaking on "Deferment and You." Refreshments were served.

That handsome bulletin case in the Main Engineering building was obtained through the efforts of Chi Epsilon, honorary civil engineering society.

Tech Commission Elects Officers



Ernest Bootz, Tech Commission President, shown at his work in the M. E. Department.

Newly-elected officers of the Technical Commission for the present school year were recently announced. Men selected to head the Institute's activities this year are Ernest J. Bootz, M.E. '43, president; Arthur L. Jones, Aero. '43, vice president; Eugene J. Dugan, Aero. '43, secretary; and John Glasrud, Mines '43, treasurer.

Duties of the Technical Commission include the coördination of the activities of the various departmental societies, the promotion of the interests of the students who elected this governing body to office, the conduction of Institute elections, and the operation of the Engineers' Day celebration.

That this year's board intends to do something more than attend luncheons is shown by the appearance of a letter, the first of a series, in this issue of the Log. It is the purpose of these letters to acquaint the Engineers with the activities of the Commission in their behalf.

The Commission has also released its financial statement for the past school year. From this statement can be learned the fact that the profit on the last Engineers' Day amounted to some $172.

E.E. Staff Men Publish Papers

The publication of two more papers relative to their studies of lightning protection research measurements and technique has been announced by J. M. Bryant, Professor and Head of the Department of Electrical Engineering, and M. Newman, Research Engineer in the same department.

Developments in High Speed Cathode Ray Oscillography gives sufficient detail so that any qualified laboratory may build a high-speed oscillograph capable of securing oscillograms of transients occurring in less than one-millionth of a second with an accuracy of about one per cent.

Abnormal Currents in Distribution Transformers Due to Lightning is a study of the effects of lightning on transformers based on the theoretical aspects of the subject and also field experiences. This paper was presented at the AIEE summer convention in Chicago, June, 1942.

Filing for Engineers' Day Chairman Opened

Juniors interested in heading this year's Engineers' Day celebration were recently urged to submit their platforms for General Chairman to the Tech Commission as soon as possible by Ernest Bootz, the Commission's newly-elected president.

Any Tech junior eligible to participate in extra-curricular activities may file, according to Bootz. All platforms should be turned in at Room 133 E. by 5:00 p.m., Monday, November 16.

Dr. Condon Speaks About Micro-waves

The AIEE was privileged to hear Dr. Condon of the Westinghouse Research Laboratories speak on "Micro-wave Developments" at a joint meeting with the Minnesota Section of the AIEE, October 15, in the Union. Dr. Condon again discussed micro-waves before an interested group of electricals and physicists the next afternoon in one of the physics lecture rooms.

Industry Seeks Engineers

Evidence of the need for engineers in industry is the fact that over 27 concerns have already interviewed this year's crop of seniors. The seniors must know what they want, also, for 20 men have accepted positions in industry. In addition, over 30 seniors will graduate into the services.

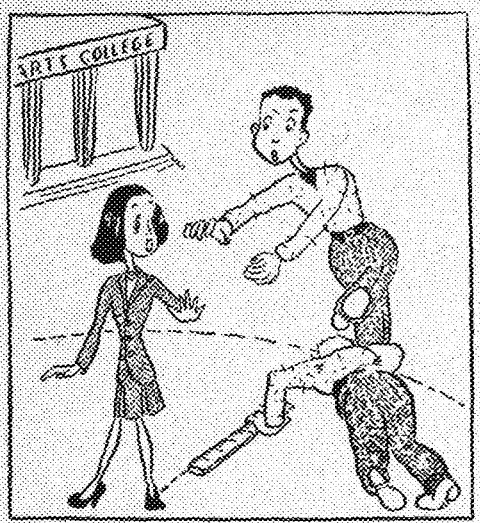
SLIDERULE ETIQUETTE

BY GORDON DICKSON, A., '44

ILLUSTRATED BY FAITH FOSTER, UC, '43

DO you feel slighted when people pointedly refuse to eat in the same room with you? Do you feel embarrassed when you are thrown out of Joe's lunch for lapping the soup off the floor? Well, don't be. You are an engineer, my friend, an engineer and an individualist. You have the constitutional right to eat any way and any how you please. Exercise the right. It is such bold striking out against restrictions that made our country the noble place to live in that it is.

You freshman engineers who still retain some shreds of decadent politeness must get rid of them at once. Remember that simply wearing a slipstick and having the ability to pick snipes out of the gutter with your toes does not necessarily make you an engineer. Drop these vile and sissified social graces. Step out with the bold, free attitude of a true engineer. Do you wear shoes? For shame! No one with the slightest touch of the engineer spirit would stoop so low. Burlap sacking for cold weather perhaps, but never shoeleather. Have you taken a bath recently—say in the last year or two? If so go over to the M.E. building and roll in the grease before you attempt to force your society upon real engineers. Have you gutted an Arts student recently? Why not? There are plenty of them running around in spite of all our efforts to keep their number down. This article is merely intended to sound a word of warning, but one of



AVOID lethal atmosphere around Folwell.

these days you are liable to be stopped on the campus by a hairy senior who has at least three inches of respectable dirt all over him and who will demand to see the bloodstains on your sliderule. Then what will you do? The weak excuse that you are new to the campus will not serve—because for the engineer who is truly one at heart, the slaying of Arts students comes naturally.

And there are many other little things you must watch if you wish to be a social success. How do you like your meat? Raw? Well, so does everybody else, so when two or three engineers are gathered together, don't try to hog it all. When you visit a fellow engineer in his cave, go easy on the rubbing alcohol. The stuff is rather expensive even when bought by the barrel, and if you have just dropped in for a friendly belch or two, you should limit yourself absolutely to a couple of gallons. At big social events, of course, the supply is unlimited—such as at the Engineers' Brawl. Don't, however, wallow in the trough as such action muddies the liquid to such a degree that fellow engineers on both sides of you have difficulty in swallowing. This is only a method of self-protection, as the engineer beside you may be one who wallows himself, and he will hold back when he sees the dainty manner in which you refrain from fouling the drink.

EAT MEAT raw, drink alcohol daintily.

Of course, the most important of the things with which the engineer occupies himself is women. Here politeness is the custom. A well-mannered engineer will always whistle first to give one a running start. After that, of course, there are no restrictions . . . It is, naturally, not sporting to hook onto a woman that another engineer has flushed. Sometimes the temptation is too strong, however, and for such exigencies the rule has been made that if she passes within ten feet of you it is perfectly legal to make a try. Usually, though, a running female will avoid all engineering buildings and places where engineers might lurk—usually by heading for the poison gas zone around Folwell where no engineer can live—or into the library.

Once you let them get away from you, naturally you're licked, but any normally fleet-footed engineer can snare a couple per week anyhow. There is only one other important point that comes up in connection with women. If any two engineers should happen to get their hands on one at the same time—don't let it be an occasion for bad blood. Let her go. She'll think it's safe to go past the haunts of engineers at any time and come back later. Then *you* will be able to have her all to yourself. This system is particularly recommended for Arts females, since G. C.'s will come back anyhow.

There are actually a few women in engineering—three in aeronautical that I know

BLOODY SLIDERULE, mark of a veteran.

of and one that used to be in architecture. These, however, are not for the freshmen. They are preserved as engineering curiosities whose movements are observed with great interest, mainly by professors, who have the science of observation down to a fine technique.

When a major social event such as the Engineers' Brawl looms upon the horizon, lonely and wolfish engineers begin to roam far from the engineering buildings just at dusk. Then the hunting engineer is prey himself to the embittered bands of Arts students who have many injuries to avenge and who see their women vanishing before their eyes. Mutual protection among the engineers at this time is impossible, since every engineer automatically suspects every other engineer at this dark season. So they fall. Those who survive, however, come back to be seasoned sophomores the next year and set an example to the still half-civilized freshmen who have just come in.

ONCE CONDEMNED by the State Fire Marshall, this antiquated engineering building still stands affording cramped quarters for military trainees and students.

Students and Faculty Ask

ACTION NOW

THE industrial and the military leaders have issued a call for trained engineers. With this in mind it is essential that engineering students be properly trained with modern equipment in a desirable atmosphere. Mechanical and aeronautical engineers, the two largest classes of engineering students in the Institute of Technology, are trained in quarters which are hazardous and a disgrace to the University and the State. This is very detrimental to these classes of engineers as well as to the University of Minnesota.

One would hardly expect to find the drafting room of any modern industrial concern located on the floor of an old swimming pool. Nor would one find a lecture room having inadequate lighting and ventilation located adjacent to a woodworking shop and above a machine shop, a forge, and a foundry. Nor would one find a research laboratory with delicate expensive equipment located in a low ceilinged, unlighted and unventilated basement room, nor a locker room to take care of 500 students located in a firetrap basement. Yet, the present Mechanical and Aeronautical Engineering Buildings on this campus possess all of these undesirable characteristics.

One can readily appreciate the true significance of the condemnation of the Mechanical Engineering Building by the State Fire Marshall several years ago if he but walks by the building and notes the decay of the several distinct structures. I might explain that the present Mechanical Engineering Building is a collection of several old buildings which were leaned together to form the structure. That accounts for the several different first-floor levels. The existing conditions inside the building are not only a hindrance to proper training, but are dangerous to all occupants. Many of the floors are overloaded. Classrooms are overcrowded. Beams which are not six feet from the floor present a serious mental hazard. Fire escapes are few, and those that do exist are of dubious nature. I think that it is obvious that the mechanical and aeronautical engineers need a new building.

The conscience of the State Legislature must be sorely troubled when they allow the University of Minnesota to continue using this decrepit collection of antiquated ruins as a building in which engineers, army trainees, ensigns, and defense workers are being trained. In view of this, a resolution for the appropriation of funds necessary to build the combined Aeronautical and Mechanical Engineering Building is coming before the State Legislature when it convenes sometime in December. This resolution must be passed. In order to help promote this bill, we hope you readers will comply with a suggestion which we have. If you send this page home to your friends or parents, along with the recommendation that they write to their senators and representatives asking them to support the bill, it will very likely mean much in the final voting. I am very certain that a visit to the building will convince you that a need for a new building exists.

Before you call Long Distance, please ask yourself:

1. *Is it really necessary?* 2. *Will it interfere with war calls?*

TELEPHONE lines—especially Long Distance circuits—are crowded as never before, these war days. Materials to build new lines—copper, rubber, nickel—are needed for the shooting war. So we must get the most out of present facilities.

You can help us keep the wires clear for vital war calls if you will do these two things: (1) Don't call Long Distance unless it's urgent; (2) Call by number if possible and please be brief. Thank you!

WAR CALLS COME FIRST!

X-RAY

(Continued from Page 41)

copper was examined radiographically and the good and bad tubes separated. This station now has its own machine and regularly examines its transmitter tubes. The other day a call came in for advice on the examination of heavy timbers in a building by means of x-rays.

Microradiography enables one to study the internal structure of minute objects. Using a small pencil of radiation and a fine-grain emulsion, a film less than one-eighth of an inch in diameter is made. The tiny radiograph is enlarged as much as 300 times to reveal structures that can be disclosed no other way. Sodium silicate bonds in corrugated fiberboard, plant and animal cells, and microporosity in beryllium foil have been studied. A satisfactory photomicrograph of the latter is almost impossible to prepare. Copper, supposedly in solid solution in an aluminum alloy, was found to be situated at the grain boundaries. Due to the three-dimensional nature of the technique, inclusions which are missed in a photomicrograph are found by means of microradiography.

There is another type of radiation which behaves like x-radiation but is more penetrating due to its shorter wave length. This is gamma-radiation given off by radioactive materials. Radium, radon (a radioactive gas), and meso-thorium all have been used for gamma-radiography, the latter chiefly on continental Europe. Radon is used very little because its strength decreases to one half in 3.85 days. Radium still has half its strength after 1580 years!

The most common method of utilizing radium radiation is to have 100 milligrams of radium sulfate contained in a small silver capsule held in an aluminum container about the size of a small plumb bob. To make an exposure the film is placed against one side of the object, the radium on the other side at a suitable distance and the setup left until the appropriate time has passed.

Because gamma rays are so penetrating, the greatest precautions must be taken to protect nearby workers and operating personnel. In the case of a 100 milligram unit the lead lining is two inches thick. Exposures are made in an isolated part of a plant, overnight or during week ends when few people are about.

Radium is especially advantageous because of its portability and great penetrating power. Exposures have been made through nine inches of grey iron in the Foundry Control Laboratory. Exposure time is much greater than in the case of x-rays and this must be offset by grouping a number of objects to be examined about the source of radiation. Radium is not preferred where x-rays can be used because it gives poorer sensitivity. The million volt x-ray machine competes with radium as far as penetration is concerned and in addition is much faster but is not widely used at present because of the high cost.

The most interesting work in gamma-radiography is done by means of materials which have been made artificially radioactive. By bombarding various elements in a cyclotron some of the atoms are rendered radio-active. Among some of the common elements which have been treated are sodium, zinc, phosphorus, iron, calcium, strontium, carbon, and potassium, the latter for a secret military purpose. The artificial radio-active materials can be fed to plants and animals and their course followed by means of an ionization chamber or by exposing films to portions of the tissue. A leaf, for instance, will expose a film placed next to it, greater exposure occurring where more of the radio-active matter has concentrated. In the laboratory of a steel mill radio-active phosphorus was added to a small experimental melt of steel and a test ingot poured. A slice of the ingot was sandwiched between pieces of film and left for a time in the dark. After processing, the film showed clearly where the phosphorus had segregated during solidification of the ingot.

The story of radiography in industry would be incomplete without mention of x-ray diffraction methods. By appropriate selection of wave length the x-ray reveals the chemical analysis of materials, the constitution of alloys, the effect of stresses in metals, the particle size of minute substances, and the nature of non-metallic materials—crystalline, amorphous, synthetic, natural, liquids, glasses, or whatever they may be.

SIGNAL CORPS

(Continued from Page 49)

War I where pigeons heroically got the message through even though seriously wounded.

Visual communication includes flags, signal lights, pyrotechnics, and panels. The latter are strips of cloth laid out in an open space on the ground in a pre-arranged code for communication with airplanes. The use of sound is limited mostly to alarms for air and gas attacks. The romantic bugle calls may be heard in camp, but are missing from the battlefield.

World War I showed the need for trained officers in the Signal Corps in time of war. Accordingly in 1919 a Signal Corps unit was added to the ROTC at the University of Minnesota.

The Signal Corps still needs technically trained men. Graduate electrical engineers may apply immediately for a commission in the Signal Corps by writing to the Chief Signal Officer, Washington, D. C. Students majoring in communications engineering or physics may enlist in the Electronics section of the Enlisted Reserve Corps. When called they will be ordered to duty with the Aircraft Warning Service.

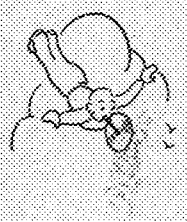
Gee, did you see her wink at me?

What Are The Grads Doing?

TECH ALUM NOTES

EDITED BY STAN GENDLER, M.E., '44

Ae.E.



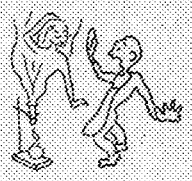
Lieutenant (jg) John R. McCarthy, Aero E., son of Dr. and Mrs. W. R. McCarthy, 813 South Cleveland Street, St. Paul, was awarded the Navy Cross last month for "extraordinary heroism and distinguished service in the line of his profession as a pilot of a Scouting Squadron during the battle of Midway."

Lieutenant McCarthy was stationed at Pearl Harbor at the time of the infamous Japanese attack. He was shot down during the battle, but was rescued after parachuting to safety.

He is now on duty at the United States Naval Air Station at Corpus Christi, Texas, as an instructor. He makes his home there with his wife, the former Elizabeth Rosacher of Minneapolis.

Robert Brattvet and **Kevin Winker,** both Aero E., are now working for Pan-American Airways in Liberia, Africa.

Ch.E.



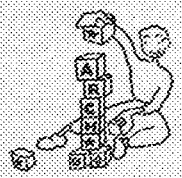
Charles S. Brearley, Jr., Ch.E., is now working on the production of synthetic rubber at the Universal Oil Products Company of Chicago. His residence is at 144 Fairbanks Road, Riverside, Illinois.

George Frank Cermak, Ch.E., who holds the rank of first lieutenant in the Army Air Corps, is a flying instructor at Gunter Field, Montgomery, Alabama. Cermak's home is at 870 Tuscarora Avenue, St. Paul.

Leonard Currie, Arch., is a supervising architect for an airport development agency at Guatemala, Central America.

Stanley Moe, Mark Hays, and **Eino Jyving,** all graduates in Architecture, are now doing construction work with Johnson, Drake, and Piper at Asmara, Eritrea, Africa.

Arch.



George L. Levin, Arch. and master's degree in '40, an officer in the United States Navy is now stationed at Midway Island. He fought in the Battle of Midway.

Lieutenant Gunnar Lie, Arch., is stationed at Pearl Harbor. As a member of the Coast Artillery Corps, he participated in the defense of Pearl Harbor against the Japanese attack of December 7, 1941.

E.E.

Lieutenant Willard Weden, E.E., son of Mr. and Mrs. E. A. Weden of 4650 Park Avenue, Minneapolis, was listed among the prisoners held by the Japanese at Tarlac camp in the Philippines. Lieutenant Weden was graduated with high distinction and was commissioned at the time of graduation. Members of his family said he had been stationed in the Philippines since August, 1941. A letter last November 28, and a short message telling his parents not to worry, received on New Year's Day, was the last word received from him.

M.E.

Jack M. Barstow, M.E., is employed by the Curtiss-Wright Aircraft Corporation in Patterson, New Jersey.

Gerald A. Block, M.E., is working for the Consolidated Aircraft Corporation in San Diego, California.

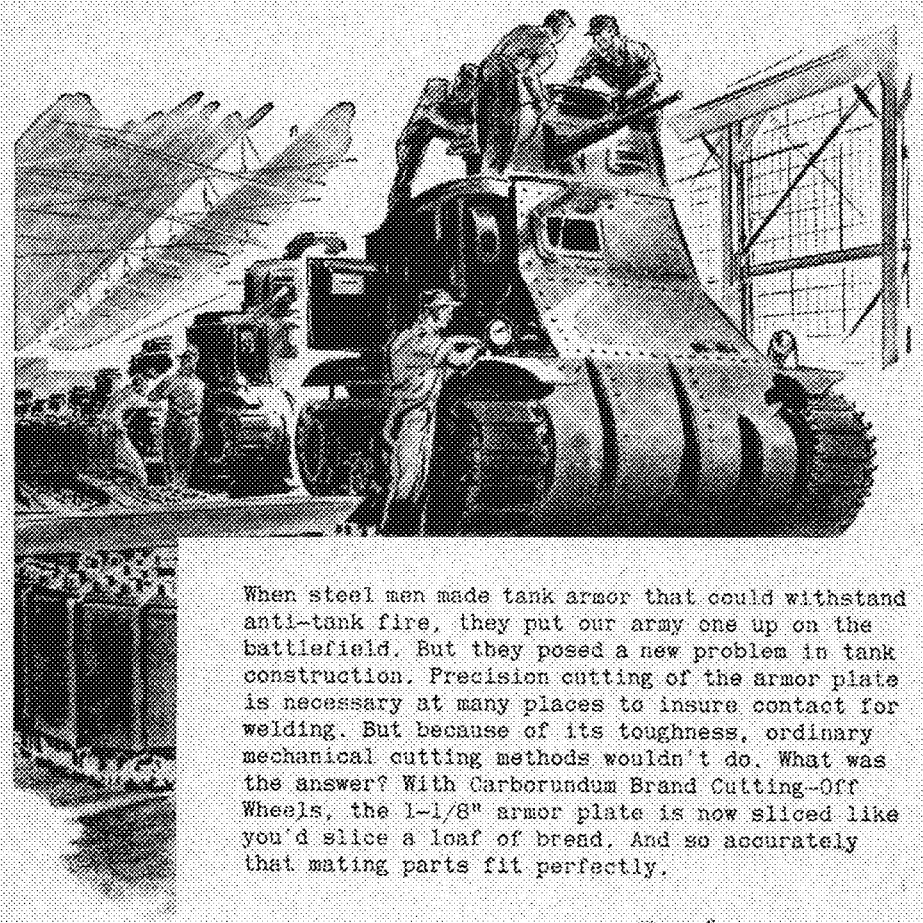
Lieutenant and **Mrs. Guy N. Gosewich** are making their home at Tonopah, Nevada, where Lieutenant Gosewich is weather officer at the Army Bombing and Gunnery Range. Lieutenant Gosewich was promoted on July 16 to the rank of first lieutenant. He was formerly stationed at Goodfellow Field, San Angelo, Texas, where he directed the Meteorology Department of the Army Ground School.

C.E.

Eric F. Nordlin, C.E., is working on the production of Hell-diver bombers and Seagull scouting planes for the United States Navy in the Columbus, Ohio, plant of the Curtiss-Wright Corporation.

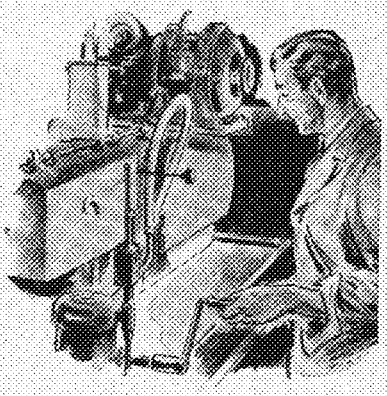
Gordon M. Anderson, C.E., has been working as an assistant civil engineer at the United States Naval Powder Factory, Indian Head, Maryland, for the past year.

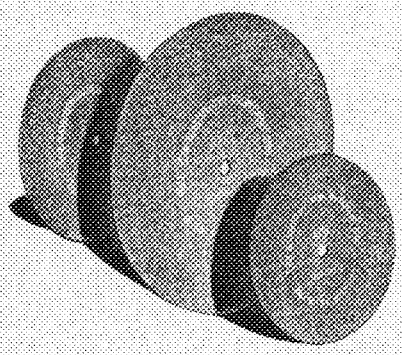
The wheel that cuts tank armor like a sharp knife slices bread!



When steel men made tank armor that could withstand anti-tank fire, they put our army one up on the battlefield. But they posed a new problem in tank construction. Precision cutting of the armor plate is necessary at many places to insure contact for welding. But because of its toughness, ordinary mechanical cutting methods wouldn't do. What was the answer? With Carborundum Brand Cutting-Off Wheels, the 1-1/8" armor plate is now sliced like you'd slice a loaf of bread. And so accurately that mating parts fit perfectly.

These abrasive wheels have revolutionized cutting-off methods. Often of extreme thinness, they even perform such delicate operations as slotting the points of fountain pens! Today Carborundum-made Cutting-Off Wheels are used to cut plastics, glass, brick, tile, steel and non-ferrous metals in plate and bar stock ...faster, more safely, and more economically. In most cases further finishing is unnecessary.

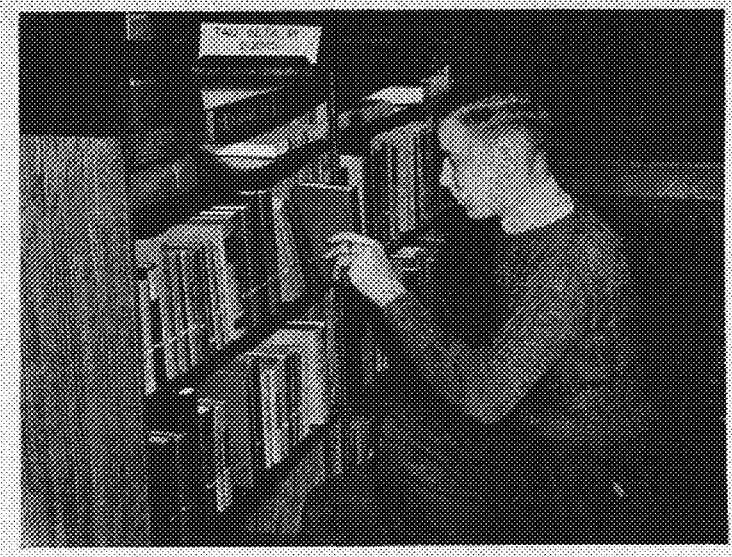




America's war program has thrown a new spotlight on the vital role which abrasives play in industry. This role is one which Carborundum "know-how" and skill have helped to create. When you take your place in industry, you'll find these same facilities ready and able to render an invaluable service. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.



Tau Beta Pi

BOOKSHELF

BY L. O. GUTHRIE

INSTRUCTOR OF ENGINEERING ENGLISH

Beside the globe of the world in the Engineering Library stand two new bookcases holding a hundred and fifty new books. Cases and contents are the gift of an engineering honor society, Tau Beta Pi; but by the donor's specification none of the books are technical. Tau Beta Pi designed its bookshelf as an oasis of pleasure reading.

In the rest of this article I should like to show how by imbibing at this oasis you may travel round the world in three different dimensions.

The first voyage is through geographic space. Not only are there *Van Loon's Geography* and Gunther's *Inside Asia*, but other works that sample the continents and nearly all the states. The hero of *Dr. Scarlett*, for example, wrecks a plane in Burma; the villain of *Prester John* stirs up unrest in Africa; and *The Bridge of San Luis Rey* contemplates the ways of God to men in old Peru. At home Dos Passos' *U. S. A.* sticks pins all across the map, while *Tee Tallow* shows our modern South and *Giants in the Earth* the prairies of Dakota.

The second of the three dimensions is historic time. From the Old Testament era of *Joseph and His Brethren*, by Thomas Mann, one may fare clockwise down the ages via Nero's gladiatorial Rome in *Quo Vadis*, through *The Crusades*, *Life on a Medieval Barony*, and *Life in Elizabethan Days* (the last two by a former professor of history at Minnesota), and join the American Revolution at sea with John Paul Jones in *Drums* or on land with our citizen army in *Drums along the Mohawk*.

The third dimension is along the axis of ideas. The wisdom of Aristotle, Epicurus, the Stoics, Plato, and Christ unfolds lucidly in *Five Great Philosophies of Life*, while essays by more modern sages, T. H. Huxley, William James, Bertrand Russell, play colored light upon the theories of our times.

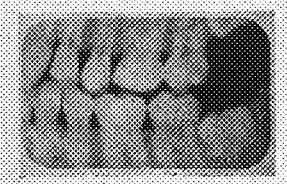
Go, in short, into the library and see the multi-dimensioned oasis we bought you with Tau Beta Pi's three hundred dollars. You will find books (1) that people are talking of just now, and (3) that people are still talking about after several years and using to measure what is good today in novels, plays, poems, biographies, letters, short stories, essays, and vivid science. Sea tales, westerns, and detective stories rub against *The Bible Designed to Be Read as Living Literature* and classics from Professor Richardson's course, Explorations in Literature.

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

Well, I've started off the month swell. Moitie, me girl, is sore at me. Someone told her I told Jack I tried out Ethyl in the Studebaker last week.

• • •



MARK HIMSELF

Two men were sentenced by a self-appointed court to be hanged for horse stealing. The place selected for the execution was the middle of a trestle bridge spanning a river. The first noose was insecurely tied and the prisoner dropped into the river. He swam to shore and made good his escape. As they were adjusting the rope for the remaining prisoner, the latter drawled:

"Say, pards, make sure of the knot this time, will yer? I can't swim."

• • •

"I sing a little, just to kill time."
"You certainly have a good weapon."

• • •

If I had held a hand like yours long ago, I would have a full house now.

• • •

NOW YOU KNOW

Men are what women marry. They have two hands, two feet, and sometimes two wives, but never more than one dollar or one idea. Like turkish cigarettes they are all made of the same material; the only difference is some are better disguised than others.

Generally speaking, they may be divided into three classes: husbands, bachelors, and widowers. A bachelor is a negligible mass of obstinancy entirely surrounded by suspicion. Husbands are of three types: prizes, surprises, and consolation prizes. Making a husband out of a man is one of the highest forms of plastic surgery known to civilization. It requires science, sculpture, common sense, faith, hope, and charity, mostly charity.

It is a psychological marvel that a small, tender, soft, violet-scented thing should enjoy kissing a big, awkward, stubble-chinned, tobacco-and-bayrum-scented thing like a man.

If you flatter a man, you frighten him to death. If you don't, you bore him to death. If you permit him to make love to you, he gets tired of you in the end, and if you don't, he gets tired of you in the beginning.

If you wear gay colors, rouge, and a startling hat, he hesitates to take you out, but if you wear a little brown beret, and a tailor-made suit, he takes you out and stares all evening at a woman in gay colors, rouge, and a startling hat.

If you join in the gaieties and approve of his drinking, he swears you are driving him to the devil. If you don't approve of his drinking and urge him to give up his gaieties, he vows you are a snob and "nice".

If you are the clinging-vine type, he doubts whether you have a brain. If you are a modern, advanced, intelligent woman, he doubts whether you have a heart. If you are silly, he longs for a bright mate. If you are brilliant and intellectual, he longs for a playmate.

"MAN IS JUST A WORM IN THE DUST. HE COMES ALONG, WIGGLES AROUND FOR A WHILE, AND FINALLY SOME CHICKEN GETS HIM."

• • •

Washington is the capital of the United States—Reno is the capital of the divided states.

• • •

I see by the papers that fringe will be in style this winter. I'm glad to hear that, as I will be wearing it on my pants.

PURLOINED PROTOTYPES

BY JOHN UPPGREN, M.E., '43 AND WILEY SOUBA, M.E., '43.

Dedicated to those who would if they could and do every time they get a chance.

* * *

ODE TO A WOLF

If he parks his little flivver
Down beside the moonlit river,
And you can feel him all aquiver,
Baby, he's a wolf.
If he says you're gorgeous lookin'
And your dark eyes get him cookin'
But your eyes aren't where he's lookin'
Baby, he's a wolf.
When he says you are an eyeful
But his hands begin to trifle
And his heart pumps like a rifle
Baby, he's a wolf.
If by chance when you are kissin'
You can feel his heart a-missin'
And you talk but he won't listen
Baby, he's a wolf.
If his arms are strong like sinew
And he stirs the gypsy in you,
So you want him close agin' you,
Maybe? Baby, you're the wolf.

* * *

And then there's the one about the impatient perch that said to the fisherman, "When you're ready, just drop me a line."

* * *

Smith: Robinson, the banker, has stolen $100,000 of the funds and run away with the hotel keeper's wife.
Jones: Good heavens, who'll teach his Sunday School class?

* * *

An inebriated man was trying to unlock the door of his house without success when a passing policeman asked if he could handle the key for him.
"Nope," the drunk said, "I can hold the key. You hold the house."

* * *

Have you chosen your profession? Our choice is music inasmuch as a musician only plays around.

* * *

Indian girl have plenty of fun with beau, an Aero.

* * *

E. John B.: They laughed when I stood up to sing. How did I know that I was under the table?

* * *

Pappy sez a lazy man is one that marries a widow with five children.

* * *

Mother: Daddy and I won't be home tonight, Johnny. Do you want to sleep alone or with nursie?
Johnny (after some deliberation): What would you do, Daddy?

Skum Bus. Mgr.: We certainly had a big time on a dime last night.

Coed: Wonder how little brother spent it.

* * *

Brown: Do you know the Jones have eleven children?
Smith: They've gone stork mad.

* * *

A well-built girl is like a three-ring circus. A fellow doesn't know where to look first.

* * *

The Queen Bee is a hardy soul
She thumbs her nose at birth control
This is the reason beyond a doubt
There's so many Son's a' Bees about.

* * *

Long Pine Creek, Tenn.

Dear Cousin:

Your uncle has a job at last. The first time in 48 years. We are rich now, $17.50 every Thursday. We went to Sears and Roebuck for one of them there new fandangled bathrooms like you rich people up north have. It came and we got her all put right. You should see it!

Over on one side of the room is a big long white thing, like the pigs drink out of. Only you can get in it and take a bath all over at once.

Over on the other side of the room is a little white gadget on the wall called a sink. This is for light splashing like hands and face. They also sent us a roll of writing paper, but it is kind of cheap I think, it rips easy.

But over in the corner now, they got a thing where you can put one foot in and scrub it till its clean. Then you pull the chain and get fresh water for the other foot. Queer world, ain't it?

Yours truly,
X (his mark)
Cousin Ephriam

P. S.: Two lids came with the damned thing, and we can't find no use for them, so Ma is using one for a bread board, and we framed Grandpa's picture in the other.

* * *

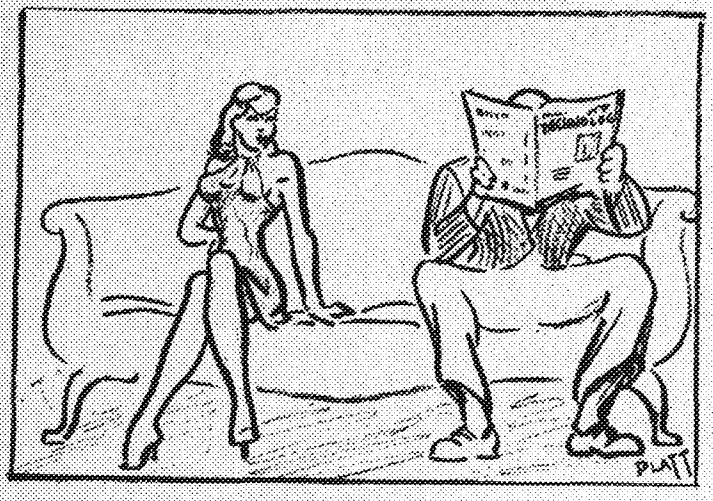
A retail dealer in buggies doing business in one of the large towns in northern Indiana wrote to a firm in the East ordering a carload of buggies. The firm wired him:

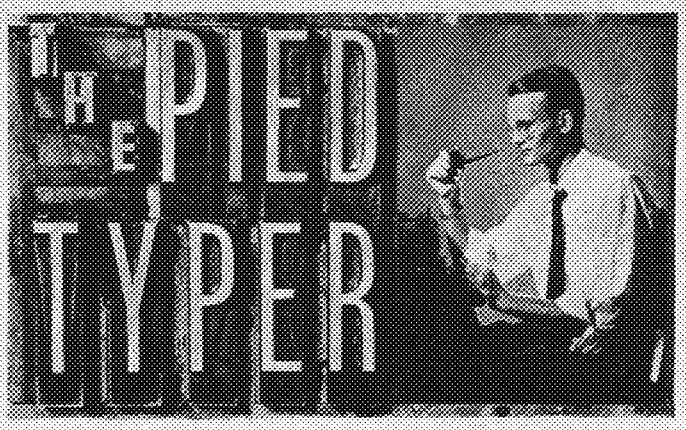
"Cannot ship buggies until payment made for last consignment."

"Unable to wait so long," wired back the buggy dealer. "Cancel order."

* * *

There is an engineer on the campus who never takes a drink. You gotta hand it to him.





We have just returned from our oculist, who tells us that we are going to have to give our eyes a rest. We are quite sure that the eye strain was not incurred by studying too much, and so can only guess that it must be caused by spending too much time looking at Minnesota's co-eds. We do not want to be misunderstood. We are not a wolf. But, after returning from the E.C.M.A. convention at Purdue where there are 4.93 men to every woman, we are just beginning to appreciate the fact that Minnesota girls aren't so bad.

• • •

We are proud to announce that the TECHNOLOG for last year received four E.C.M.A. awards including a first award for best illustrations. Our illustrations editor promptly claimed that this is the reason that the LOG is so popular with our semi-literate Arts college friends. Not that we think that all Arts college students are illiterate. We personally know two of them that can read quite well.

• • •

But while we are still on the subject of the convention, we would like to tell you about an unfortunate experience we had coming back on the train. As we were leaving the dining car Jim Johnston, our business manager, saw Dean Williamson, Dean of Student Affairs, sitting at the last table eating his seventy-five cent lunch. Just as we passed the dean's table, Jim patted his senatorial front and said in a confidential voice, "Gee, Dean, you'd be surprised what you can get for four dollars ala carte." Because all student organization funds are handled by the Student Affairs Office, we have our bag packed and ready to leave on a moment's notice.

• • •

Checking up to find out why so many M. E. instructors, profs, and students were looking a bit green around the gills a few weeks ago, we found that it was not due to a dog poisoner on the loose, but rather to those big black cigars that Art Brickman, popular M. E. instructor, was passing out to celebrate his engagement to Miss Martha Beach. It isn't spring, so we can only guess that it is the thought of a long cold winter ahead. What with fuel oil rationing and a possible shortage of coal, a feller has to do something.

• • •

Our word of advice for this month is to be sure you notify your draft board of a temporary change of address before going to eat in the Gopherette Grill.

• • •

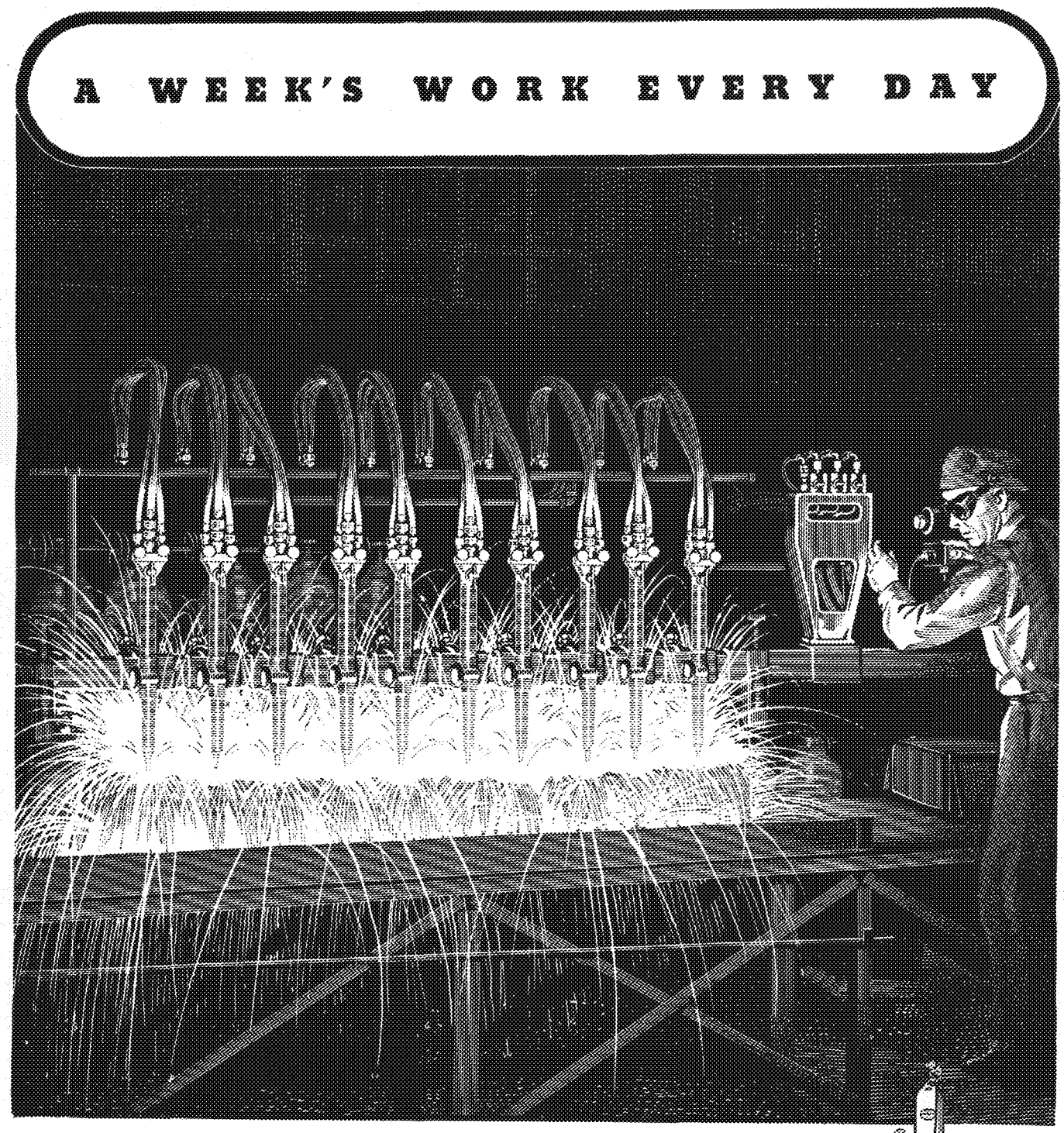
Much as it pains us, in the interests of honesty we are forced to publicly admit that the *Greater Minnesota* TECHNOLOG staff is in debt to the GOPHER staff to the extent of one case of brew. All of which goes to prove that if the GOPHER staff is as good at yearbook editing as they are at touchball, they have another All-American yearbook in the making.

• • •

Never again can it be said that the TECHNOLOG is sterile. If you are not convinced, just thumb through this issue until you come to Bob Platt's cartoons. Even Norm, our engraver, emitted a long low whistle when he saw them. "What an imagination that guy has got," said Norm. We're not so sure that it's all imagination, but we do heartily agree with that long, low whistle.

J.E.

A WEEK'S WORK EVERY DAY



TUBULAR headers now race off the production line at Combustion Engineering Company's Chattanooga, Tenn. plant at the unprecedented rate of 100 a day — with the aid of this Airco 10 cutting torch Oxygraph. Compared to the 19 a day formerly produced, it's practically a week's work every day. This Airco oxyacetylene cutting machine is making metal-working history — never before was such an elaborate multiple torch arrangement deemed practicable. Yet, as perfected by Airco, every beneficial feature of flame cutting is retained. Steel is accurately cut to the desired shape with amazing speed. And there is no time out for sharpening or regrinding.

New, faster, better ways of producing more planes, ships, tanks, guns and machines are made possible by the efficient and proper application of the oxyacetylene flame.

To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

AIR REDUCTION

General Offices:

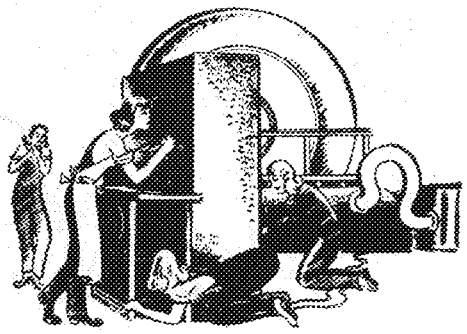
60 EAST 42nd STREET, NEW YORK, N.Y.

In Texas:

Magnolia-Airco Gas Products Co.
General Offices: HOUSTON, TEXAS
OFFICES IN ALL PRINCIPAL CITIES

ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING

G-E Campus News



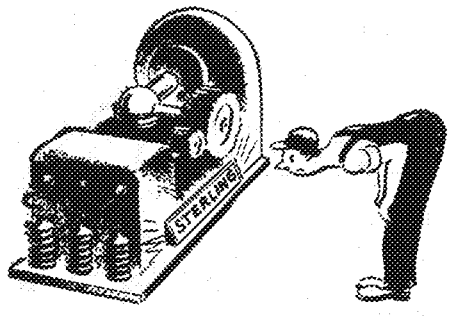
GIRLS, GIRLS, GIRLS

INASMUCH as only one-third of the 12,000 engineers who will graduate in 1943 will be available for private industry, General Electric is hiring young college women to do work formerly done by male engineers.

Forty-four "test women" are on the job now, and others will report each week until the quota (150) is reached. The girls will make computations, chart graphs, and calibrate fine instruments for use in the machine-tool industry.

Miss Virginia Frey (U. of Michigan), one of the 12 women in the country who received engineering degrees this year, is the only graduate engineer in the group. However, each of the others has majored in either mathematics or physics and has received training in both.

Although no one expects these girls to become full-fledged engineers, most of them will be given the Company's famous "test" course.



HI-YO, SILVER!

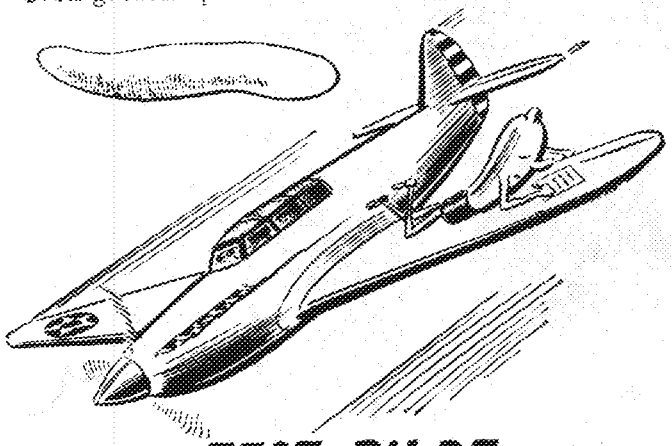
BROTHER, can you spare a dime?

Manufacturers don't really need it yet, but they are using more and more silver as other metals become increasingly difficult to get. G-E engineers, for example, are using silver in the manufacture of electric apparatus in order to conserve tin, copper, and other scarce materials.

There is now at least a little of the precious metal in almost every motor, generator, transformer, and other piece of equipment built by General Electric for the war.

In many cases the use of silver adds to the cost—a consideration secondary to production at present. Here its use is probably temporary.

But in current-carrying contacts and in brazing alloys, the use of silver results in an improvement in quality sufficient to justify the greater cost. For these purposes, silver will very likely be used in even greater quantities after the war.



TEST PILOT

THE versatile electronic tube has now become somewhat of a test pilot. On test flights, it goes along and writes a complete record of the strains on certain structural parts of the plane as it dives and twists and streaks across the sky.

When a fighter plane goes into a power dive at 500 miles an hour, for example, it has to withstand terrific strains. How great a strain is a vital question to the designer, who wants to know whether he can reduce the weight of the plane to give it greater speed.

Here's how the electronic tube helps furnish the answer to that question: strain gages measure minute changes in dimensions, converting them into tiny electric impulses which electronic tubes amplify sufficiently to drive a highly sensitive oscillograph galvanometer; the galvanometer makes a permanent record of the impulses on a photographic film. *General Electric Company, Schenectady, N. Y.*

GENERAL ELECTRIC

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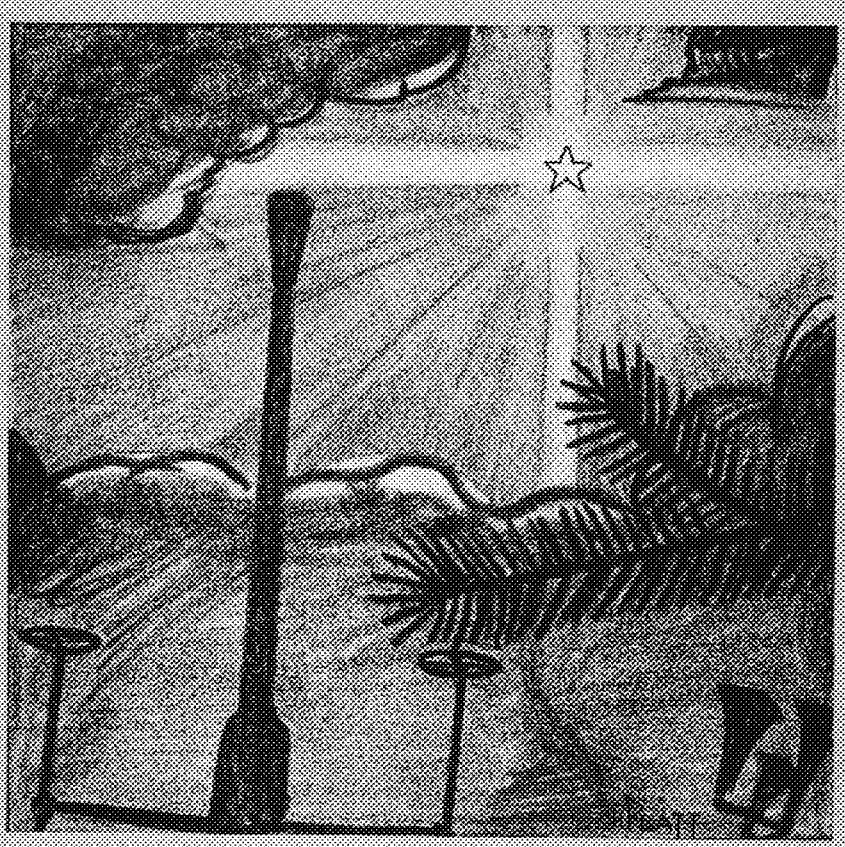
MINNESOTA TECHNOLOG



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CHEMISTRY IN WAR
SEA PUPPIES
FIGHTING SCRAP
NEW ME BUILDING
THOSE SOLOMONS

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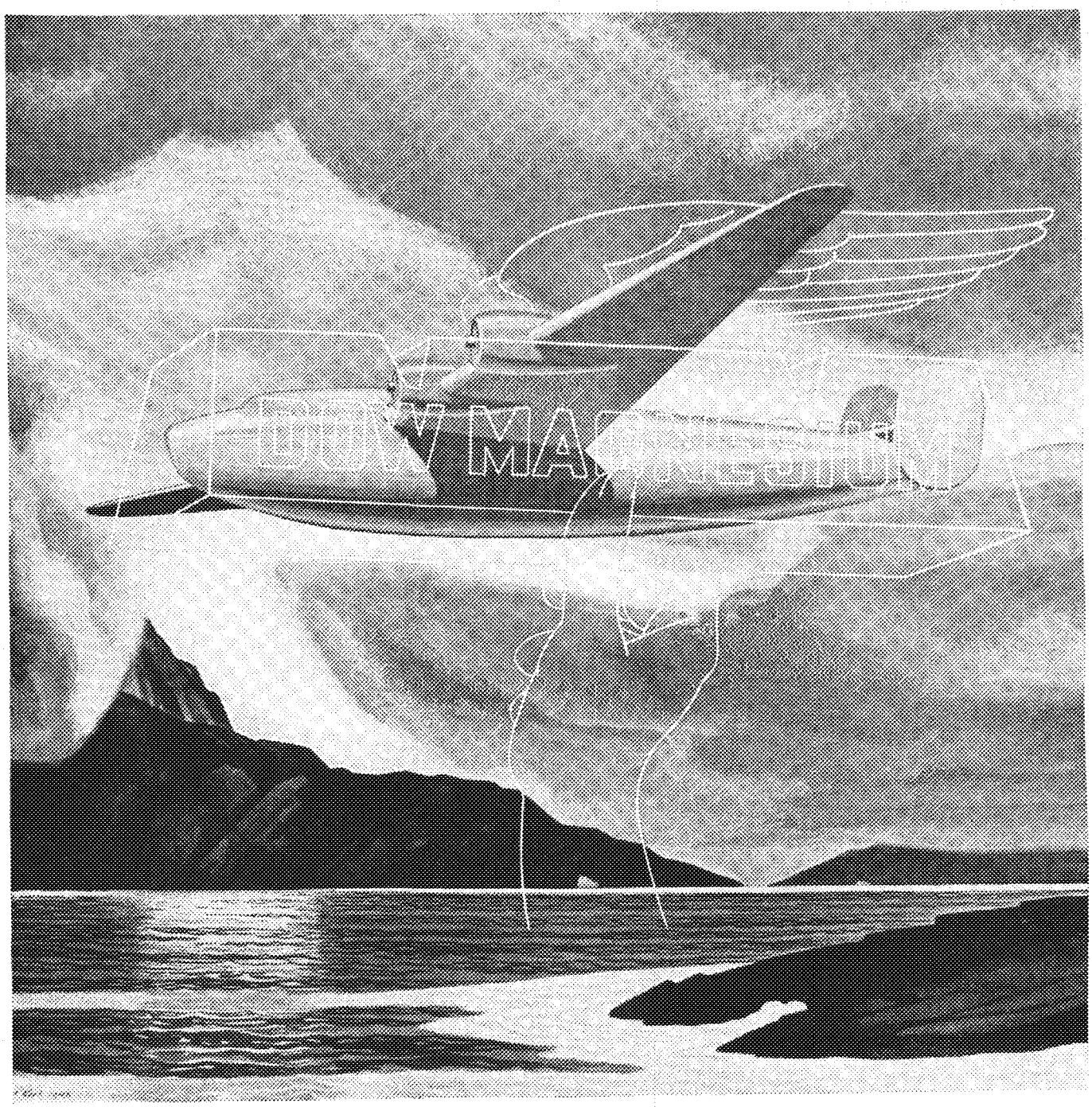
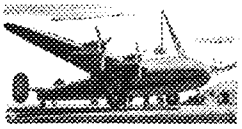




FOR MORE THAN a decade designers of aircraft have foreseen the day of freight-carrying planes flying the airways of America. Now, with Dow successfully extracting weight-saving magnesium from sea water, the era of commercial freight transport by air draws measurably closer. Vast quantities of this lightest of structural metals are being used in the construction of aircraft for our armed forces and will eventually be available for industry at large after Victory is won. Thus from the waters of the sea will come wings destined to transport many of the nation's products of peace by air.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York, St. Louis, Chicago, San Francisco
Los Angeles, Seattle, Houston

MAGNESIUM

DOW

CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

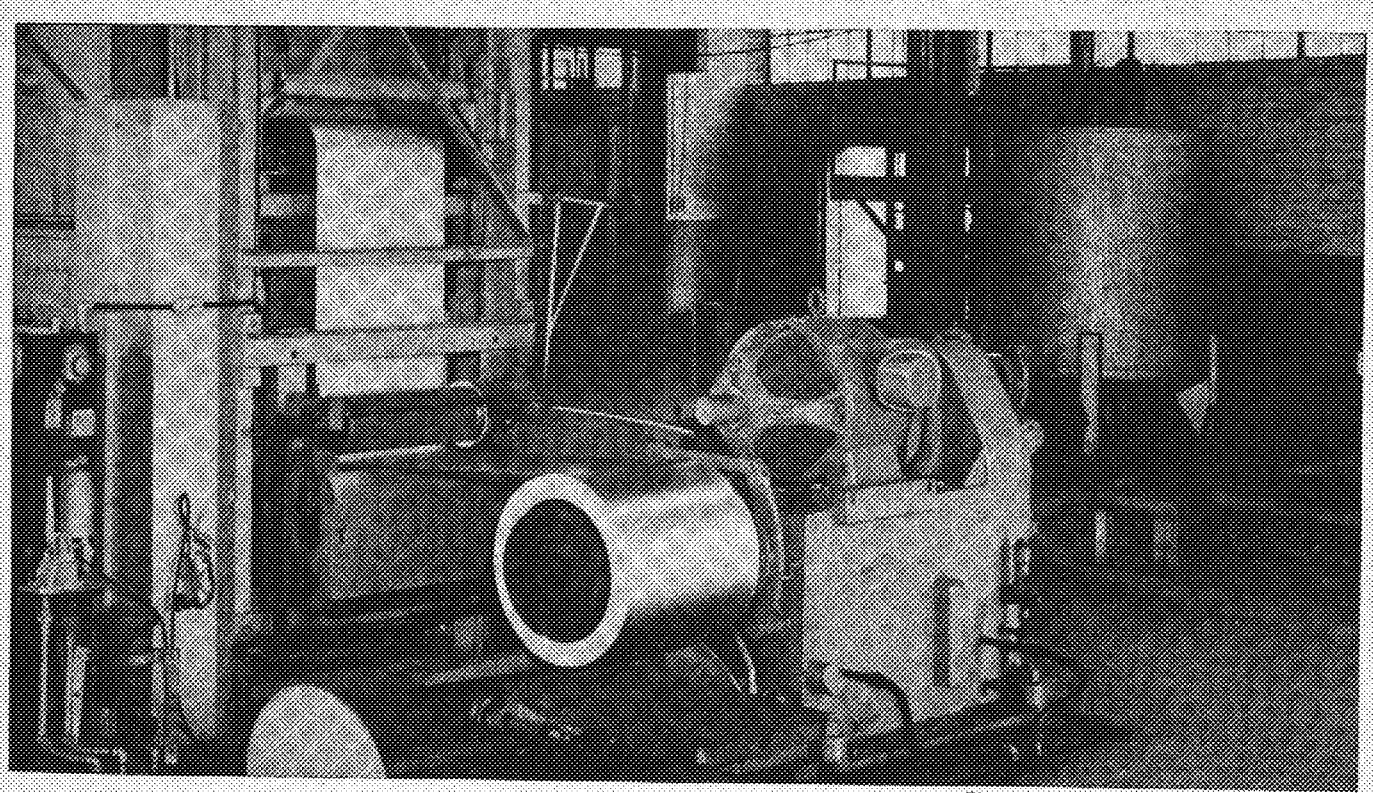


Photo courtesy of the Crown Cork & Seal Company

The best news about tin since we went to war

WHEN THE JAPS overran Malaya and the East Indies, they thought they had dealt a staggering blow to America.

For, overnight, tin became a most critical raw material, because America relies upon this bright metal for tin plate, bearing alloys, solder, collapsible tubes . . . *but mostly tin plate.*

However, Uncle Sam had an ace in the hole . . . *electrolytic tin plate.* In this process tin is deposited electrolytically . . . not hot-dipped . . . on steel strip. And only *one third* the normal thickness of tin is required.

Unfortunately, electrolytic tin plate is far from perfect as it comes from the plating baths. It is porous and not completely resistant to corrosion.

In order to make electrolytic tin plate usable, the tin deposit must be re-heated and *flowed* after plating. But until recently, even the best available re-heating and flowing processes were painfully slow.

Right here is where Westinghouse "know how" stepped into the picture.

R. M. Baker, Westinghouse Research Engineer, together with Glenn E. Stoltz, of the Westinghouse Industry Engineering Department, decided that the porous tin coating could be *fused* . . . through the magic of electronics . . . to give the tin plate the desired corrosion-resistant property and surface brightness.

Baker and Stoltz built a high frequency coil, using radio broadcasting oscillator tubes for their power source. Through this coil they passed electrolytic tin plate. The inductive heating effect melted the tin coating . . . and it fused smoothly and evenly over the porous surface.

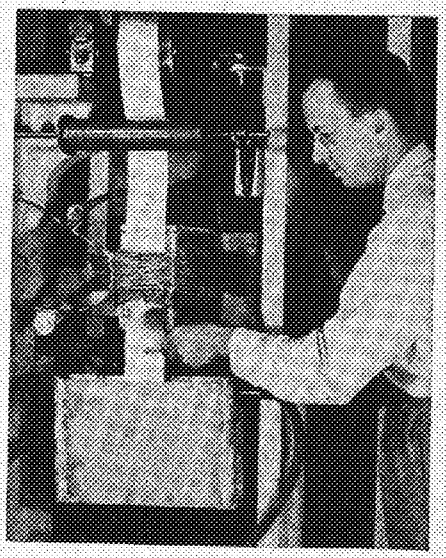
The new Westinghouse tin reflowing process is now in actual use, turning out gleaming ribbons of tin plate at better than 500 feet per minute. It will save many thousands of tons of tin every year!

* * * * *

What Baker and Stoltz did for the tin plate industry many engineering students in college today will do for other industries tomorrow.

Westinghouse knows where to find the future scientists America needs so badly on the industrial front . . . many will be among the technical graduates of the Class of '43.

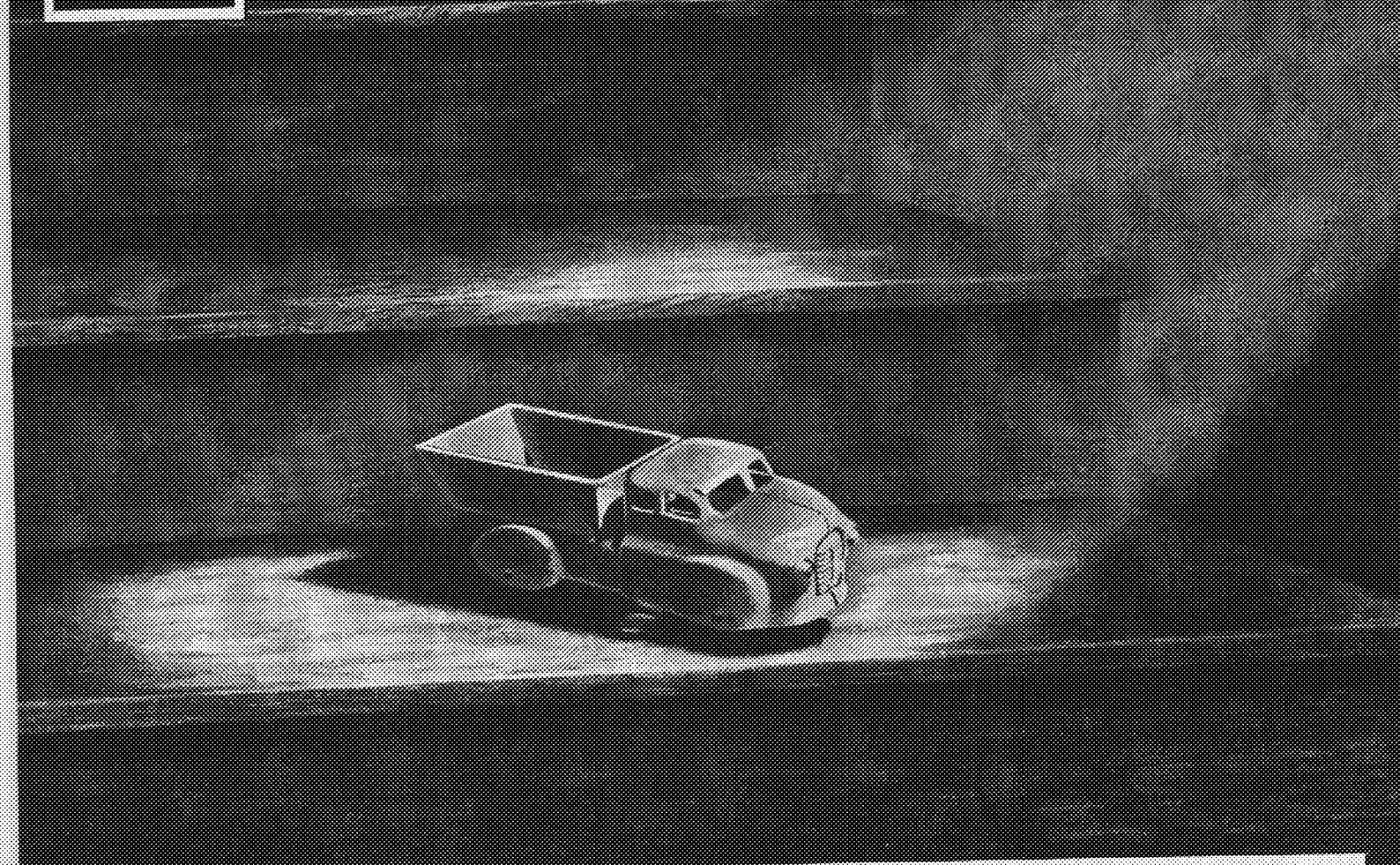
Westinghouse Electric & Manufacturing Company, Pittsburgh, Penna. Plants in 25 cities, offices everywhere.



RADIO WAVES FUSE TIN . . . R. M. Baker, Westinghouse Research Engineer, examines a test strip of tin plate which is passing through the experimental tin flowing mill. Baker joined Westinghouse after receiving his B.S. at Texas University. He earned an M.S. degree at the University of Pittsburgh.

Westinghouse

. . . making Electricity work for Victory



DEATH CAR . . .

ONLY A CHILD'S TOY on an unlighted stairway. Yet as lethal as a speeding truck for killing or crippling. For causing heartbreak and tragedy in someone's home.

Accidents . . . in the home . . . on the highways . . . in factories and offices . . . cost this nation 102,500 lives last year. This tragic toll, preventable to a great extent, was augmented by the permanent disabling of 350,000 other people . . . by 9,000,000 lesser casualties.

Production-wise, America's war effort lost heavily. In all, 430 *million* man days were lost forever. Enough to have built a total of 20 battleships, 100 destroyers, 9,000 bombers, and 40,000 tanks! Money-wise, the loss was almost 4 *billion* dollars!

Where did these accidents happen? Two-thirds of them happened outside of industry. In the home, where workers take chances they would not dream of taking on the job. They happened in darkened hallways . . . in bath tubs . . . in garages and basements. They happened in industry where someone gambled with safety.

No matter what you do, your life is precious to this nation. Don't take chances with it. Guard it for America . . . at day . . . and at night. Fight carelessness, the Master Saboteur! Join the anti-accident crusade! Help save a life!

The perfection of the famous "Eveready" fresh DATED flashlight battery called for coordination between various Units of Union Carbide and Carbon Corporation. The exact grade of graphite necessary for the "mix" was developed by the Acheson Graphite Corporation. Special alloy for protecting molds and machinery was produced by the Haynes Stellite Company, and Carbide and Carbon Chemicals Corporation provided a specially prepared paint made of "Vinylite" resins for the spun metal cap.

"EVEREADY" FLASHLIGHTS AND BATTERIES

NATIONAL CARBON COMPANY, INC.

30 EAST 42ND STREET • NEW YORK, N. Y.

Unit of Union Carbide and Carbon Corporation

UCC

The words "Eveready" and "Vinylite" are registered trade-marks.

Author of the Month

BY STAN GENDLER, M.E., '44

John Uppgren, M.E. '43, is the first of the two TECHNOLOG humorists to be spotlighted this month. John, or "Uppy" as he is often called, is pictured washing his column, "Purloined Prototypes." To see whether or not he did a good job you *might* turn to his column.

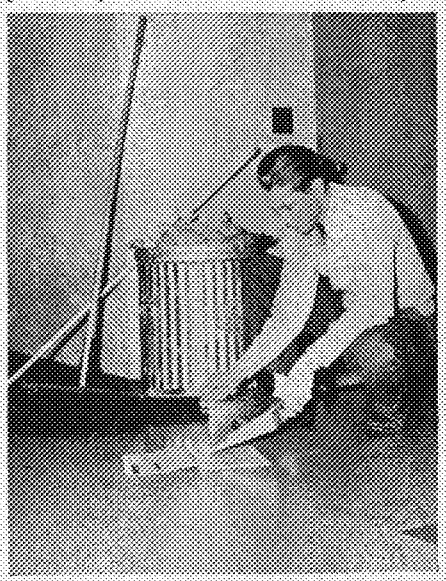
CLEANS UP COLUMN

John has been very active in the Institute's extracurricular activities. Last year he was treasurer of the Engineers' Day committee and feature editor of the TECHNOLOG. This year he is chairman of the Technolog Board. He also belongs to the American Society of Mechanical Engineers and the American Foundrymen's Association.

John likes to play squash, fish, and skate. He also enjoys symphonic music and good plays. But he spends most of his spare time in the fall hunting upland game and waterfowl.

• • •

Wiley Souba, C.E. and M.E. '43, is the other writer of "Purloined Prototypes." Wiley is shown sweeping up his blue penciled jokes to save for another day. In spite of his humorous work, Wiley is quite a studious fellow. His efforts in school have earned him memberships in Pi Tau Sigma, Tau Beta Pi, and Chi Epsilon, honorary fraternities.



COLUMN NEEDS DIRT

Mr. Souba lives in Minneapolis and graduated from Washburn High School in 1938. At the University he has followed a combined civil and mechanical engineering course and he will graduate with a degree from both colleges. Wiley likes to play basketball and diamond ball but when he is at home he likes to putter around in his own workshop. Last summer he was an assistant instructor at the civil camp at Cass Lake, Minnesota.

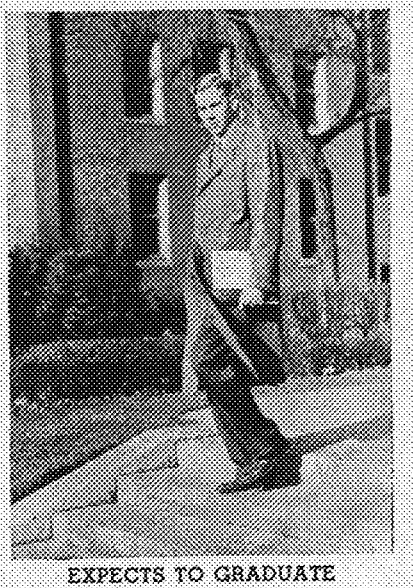
• • •

Dr. Lloyd H. Reyerson, whose article on chemical warfare appears in this issue of the TECHNOLOG is Administrative Assistant and Professor of Chemistry at the University of Minnesota. He graduated from Carleton College in 1915 and received his Master's degree at the University of Illinois in 1917. In 1920 he obtained his Doctor's degree from Johns Hopkins University. Dr. Reyerson was commissioned in 1918 as a second lieutenant in the Chemical Warfare Service. The next year he left the Army and came to the University of Minnesota as an instructor in chemistry. In 1927 he went to Warsaw, Poland, as a United States delegate to the International Union of Pure and Applied Chemistry.

EIGHT SOCIETIES

Dr. Reyerson has written many articles for professional journals and was an associate editor of the Journal of Physical Chemistry in 1937 and 1938. He is chairman of the Scientific Advisory Committee to Minnesota War Industries. This committee recently, at the request of Governor Harold E. Stassen, prepared a booklet, "Heating Your Home in Wartime." He is a member of the American Chemical Society, American Physical Society, Minnesota Academy of Science, American Association of University Professors, Sigma Xi, Phi Beta Kappa, Phi Lambda Upsilon, and Alpha Chi Sigma.

Emery Hanson, M.E. '43, presents in this issue an article on one of the major industrial problems of today, monotony. In addition to material from his courses in industrial engineering, Emery received information from both observation and practical experience in several manufacturing plants. He first became interested in industrial personnel problems when he was a sophomore at the University. After graduation he intends to go into the industrial engineering field.



EXPECTS TO GRADUATE

Emery's home is in Leominster, Massachusetts. He enjoys traveling around the country by plane or in his own car. His extracurricular interests include golf, tennis, swimming, skating, piano playing, color photography, and technical writing. He is a member of the American Society of Mechanical Engineers and expects to graduate in March, 1943.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

TECHNOLOG

DECEMBER, 1942

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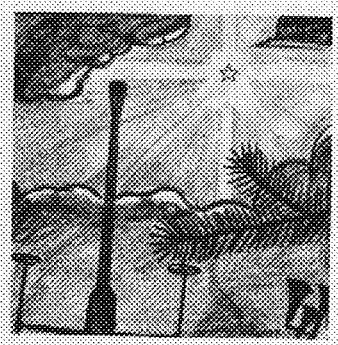

THE COVER PICTURE is a grease-pencil drawing by staff artist Bob Platt showing anti-aircraft equipment in the Near East.

THE FRONTISPIECE shows a 190 thousand-pound ingot which will be forged into a turbo-generator motor. It has just come from an annealing furnace. The cut is through the courtesy of Allis-Chalmers.

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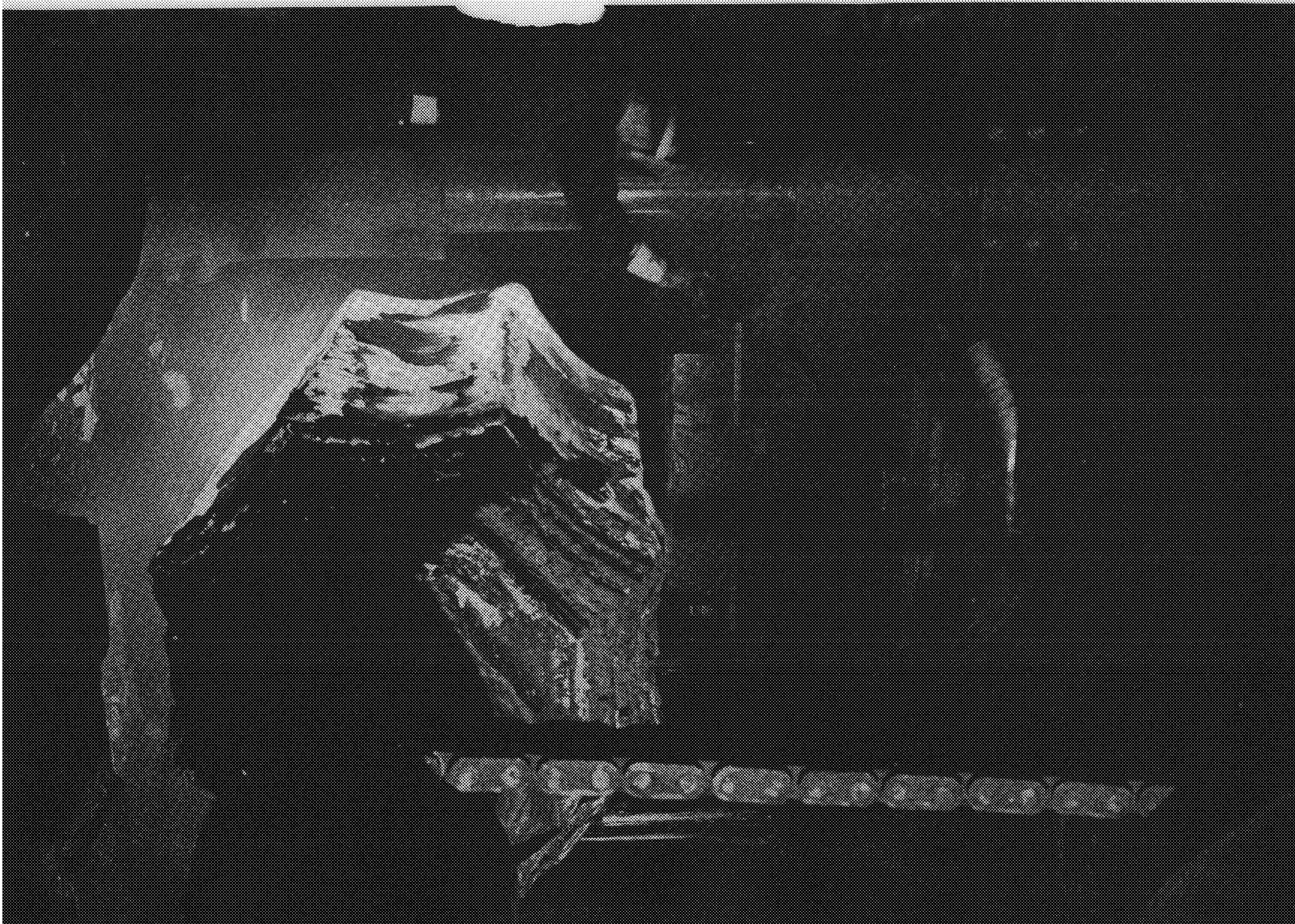
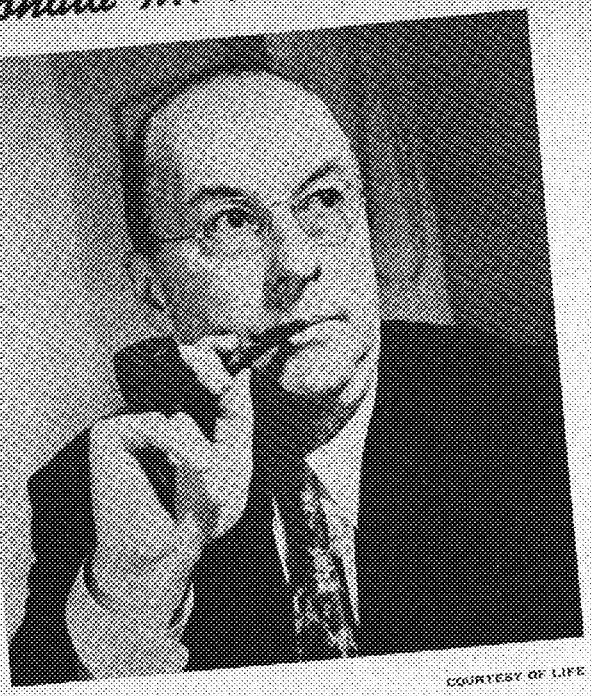


Donald M. Nelson



COURTESY OF LIFE

"WE NEED . . . MORE ENGINEERS"

The head of the WPB points out the need for trained technicians. In this editorial we will tell you why we should have a new Mechanical-Aeronautical Engineering building to supply these vital men, both now and after the war.

WHEN one views the tottering old Mechanical Engineering Building, whether he be a casual visitor or a student or graduate engineer, he can readily understand why it has for several years been condemned by the State Fire Marshal as a fire hazard not safe for student training. He must share the sentiments of Donald M. Nelson, who said at his dedication address of the new Technological Institute at Northwestern University, "I, of course, do not need to tell you that mechanized warfare calls for industrial operations on a scale and at a speed never before contemplated. I need not point out the great importance of the work that will be done here—the extreme importance of providing the most skillful training and finest technical research. I am sure you recognize this; yet, even though it requires no emphasis, let me say again—we need and must have more engineers, civil, mechanical, electrical, and chemical, not only to help us speed up the war, but to aid us with the great tasks which will be ours when peacetime comes, as come it will. We are going to need engineers to mobilize for peace with the same enthusiastic determination that we are mobilizing for war."

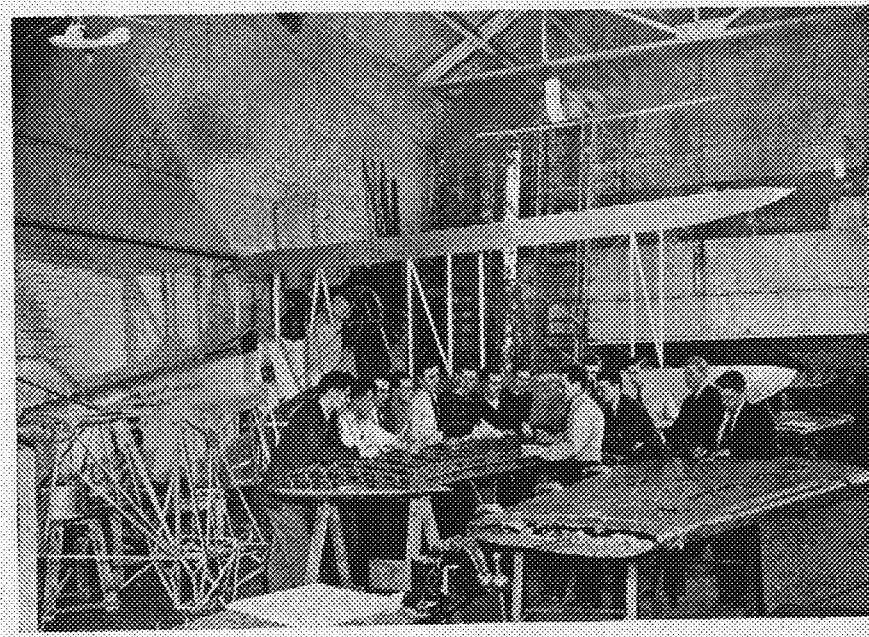
The Chairman of the War Production Board clearly expressed the need for engineers and skilled technicians both during this war and after the last gun has been fired. However, this essential wartime and peacetime training and research cannot be carried on in the present dilapidated Mechanical Engineering Building on the campus of the University of Minnesota. This building has not only been condemned, but has furnished surroundings akin to medieval ruins instead of ones of mechanical skill and ingenuity to serve as inspiration to future engineers. This collection of condemned structures leaned together to form the present Mechanical Engineering Building is a hazardous firetrap which is a disgrace to the University and to the state. One might easily wonder if it is possible to train Army trainees, engineers, ensigns and war workers in the cramped, crowded and poorly ventilated quarters.

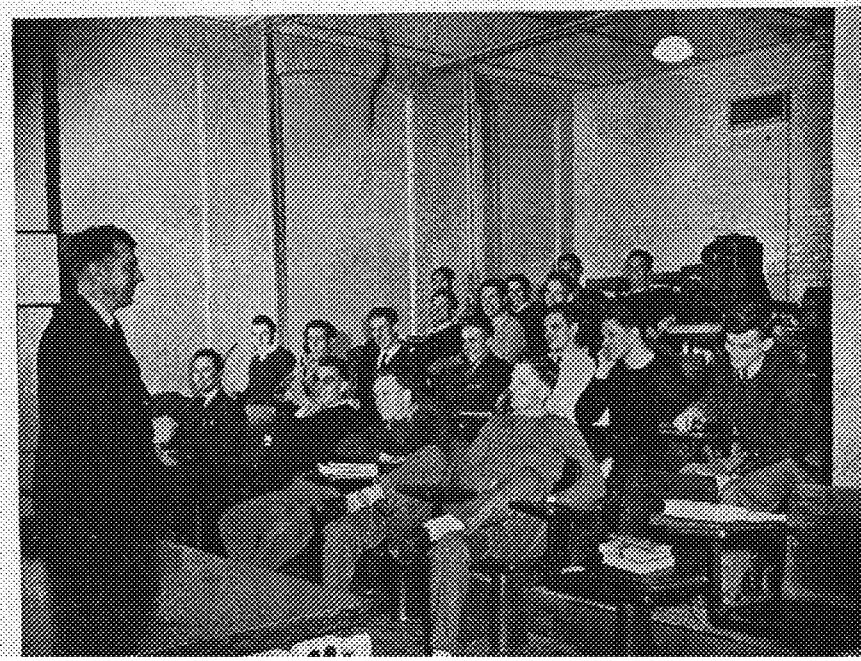
Vital defense workers are trained here and actual war production and inspection are carried on under the black tarpaper roofs. The foundry control laboratory is utilizing its x-ray equipment to inspect various products, and the machine shop and heat-treating laboratory are engaged in producing tools and machine parts for local war plants. The quality of the work is excellent as is evidenced by the small number of rejections, but the quantity of work is limited. One can readily visualize the quantity of work which might be turned out in adequate surroundings.

If we win the war sooner than we anticipate, the need for a new Aeronautical and Mechanical Engineering Building will be even more urgent. It is easy to see that skilled technicians and engineers will aid their country in the reconstruction period which will follow the war. The proper training of engineers must continue.

It is our hope and urgent request that when our State Legislature convenes it will pass the bill providing for an appropriation for the new Aeronautical and Mechanical Engineering Building. The bill must be passed now. However, if there is a shortage of labor and materials, the passage of the bill now would mean that plans could be drawn and construction started as soon as materials are available. Soon many of the ordnance and war plants in this area will be completed. This means that the labor and the supply of materials which has been used for the construction of these plants will be available for constructing the proposed building. This plan would permit the completion of the building in the shortest possible time in an era when time is at a premium. This bill must be passed now so that engineers and technicians can be trained at the University of Minnesota in a building which will be a credit to a great institution such as ours.

GIVE US

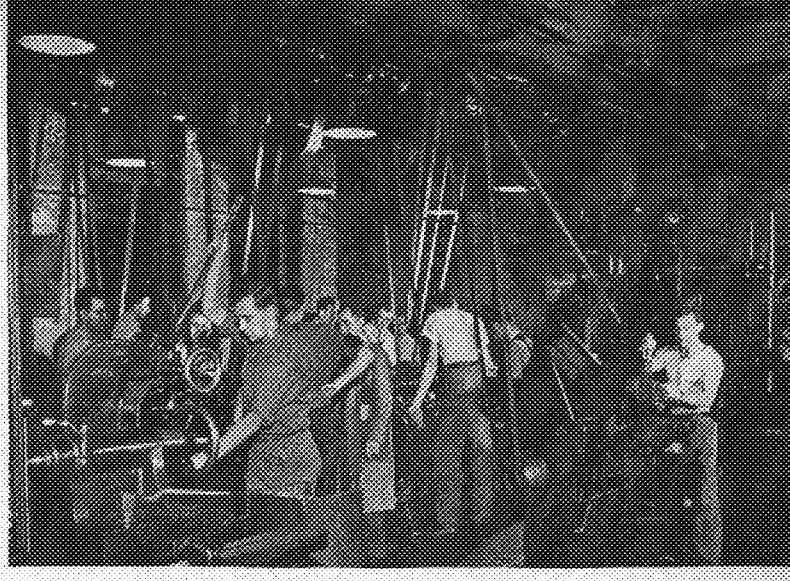




Can a man do good work in classrooms and labs so dingy and crowded?

Poorly Ventilated, Poorly Lighted

This is the inside of the foundry control laboratory, capacity limited to thirty persons . . . limited to eliminate the danger of the floor's supports from giving way and dropping the lab into the foundry below.



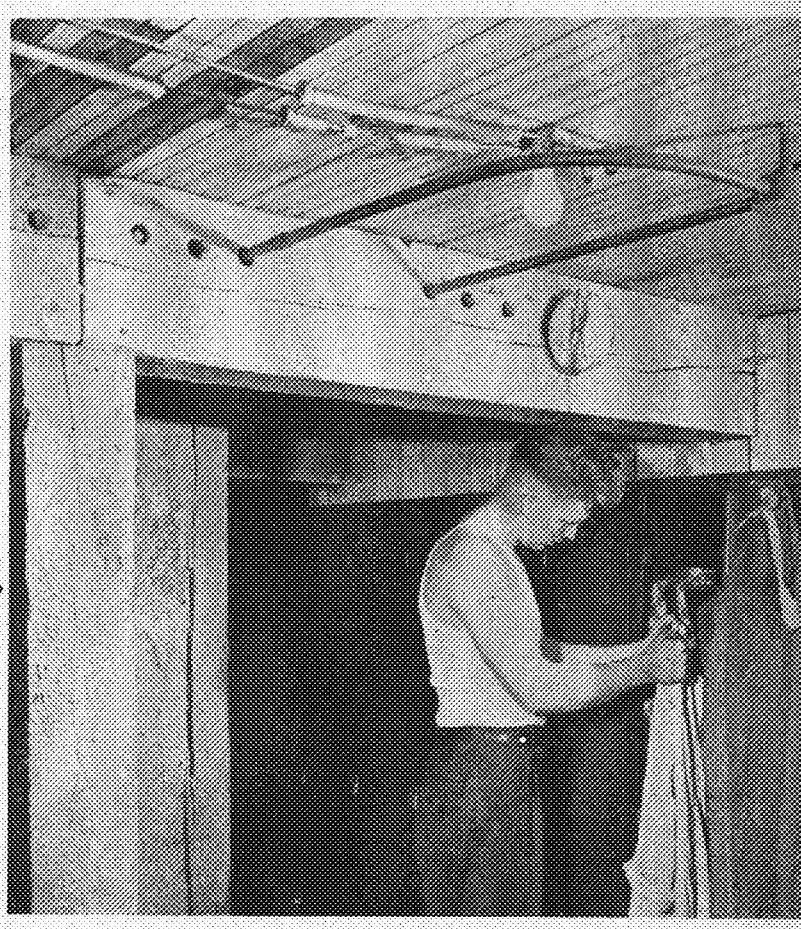
Cramped Quarters, Dangerous Belts

In this machine shop defense workers and student engineers get their experience and vital war production is carried on. The machines are driven by dangerous open belts. The shafts, fastened to wood beams on the ceiling, shake the shop on the floor above.

O O M !

Biggest Class, Only One Laboratory

The University trains one of the biggest classes of aeronautical engineers in the U. S. The aeronautical engineers must use this big, barny room as their airplane construction lab. Ceiling too high, floor space too small, it has to hold numbers of bulky airplane parts. It had better been used for a storeroom than a classroom.

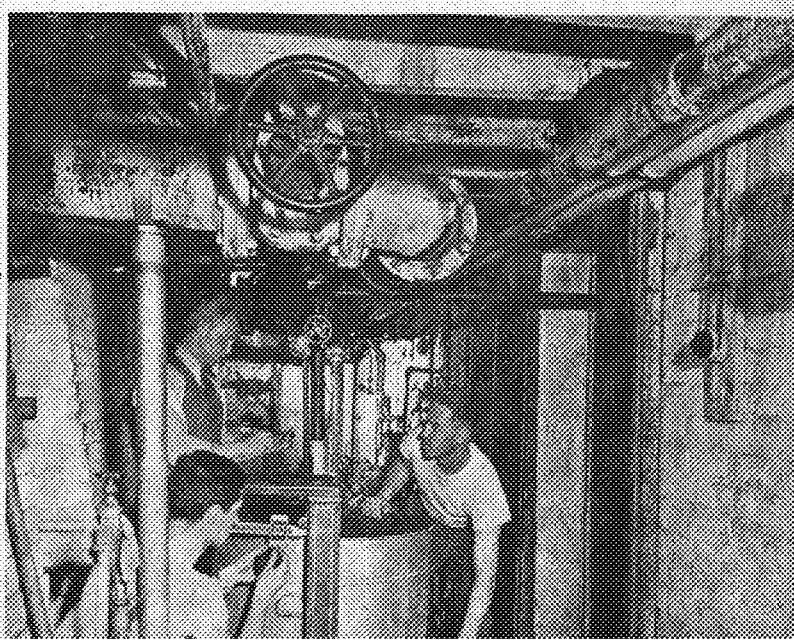


Exposed Wiring, Low Wooden Beams

This is the mechanical engineer's locker room . . . . not the best example of a fireproof basement. The ceiling is low enough, but has beams which bulge down lower still . . . makes it mighty tough for a fellow to walk to his locker without ducking. The raw, exposed wires and cracked beams give you evidence of the condition of the building.

Windowless Classroom, Dark, No Air

This room can take the record for being the world's worst classroom. It is windowless, being built as an addition between two old buildings, the outside windows of which are visible. Is this the kind of rooms you want to see our engineers trained in?



Steam Lab, Dirty Basement Tunnels

Is this your idea of the ideal steam lab? Sure, it works . . . but how would you like to study in a place like this, ducking through tunnels and dodging overhead pipes? WE ASK ROOM TO DO OUR WORK, WE DO NOT ASK LUXURIES.

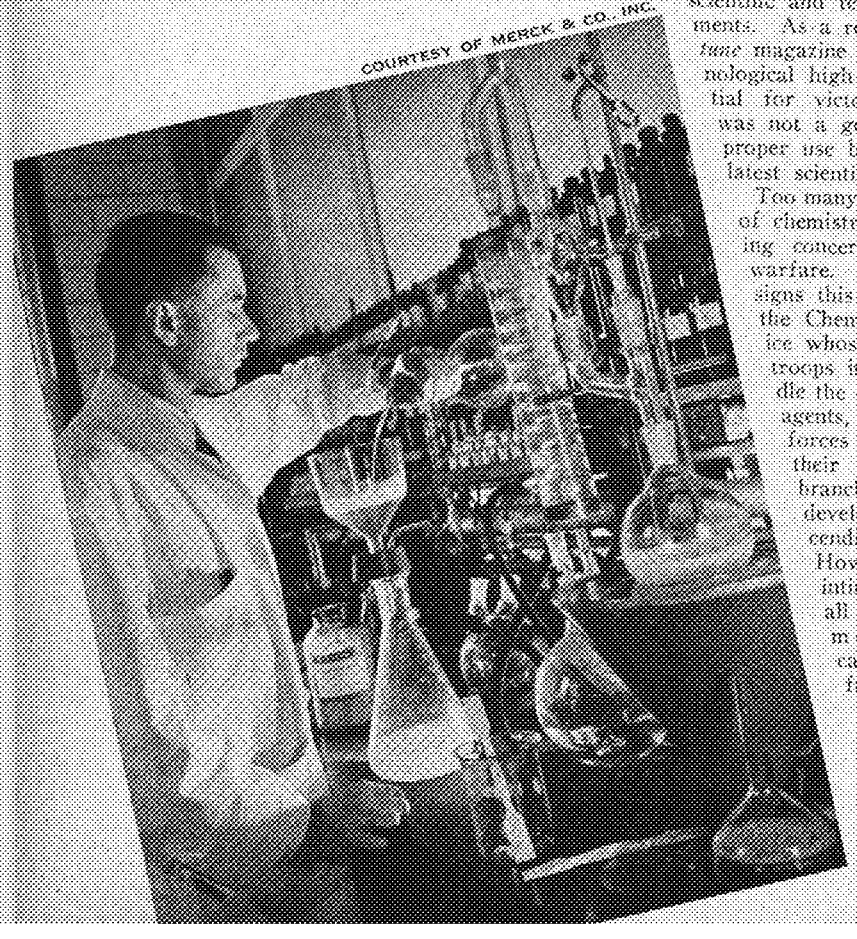
Victory Through

MOLECULES AT WAR

BY LLOYD H. REYERSON
PROFESSOR OF CHEMISTRY

IN the period up to 1914 when World War I began, the United States occupied a relatively weak position in the world of chemical industry. It is true that a reasonably strong inorganic chemical industry did exist but almost nonexistent was an industry based upon the developments in research laboratories. In fact outside of university and government laboratories very little research in the field of chemistry was in progress. Many students felt that it was necessary to attend European universities in order to receive proper training in this fundamental field of science. During the four years of war it was clearly demonstrated that the United States had been dependent upon outside sources for more than forty materials that were essential to the welfare of the country. Some of these strategic materials became vitally important when the United States entered the war in 1917. American chemists and chemical engineers made the important decision that if it was in their power to do so, they would free the country from foreign domination in this all important phase of our industrial life. As a result new fields of fundamental research were entered by American scientists and numerous research laboratories were established. In fact there are now more than two thousand such laboratories where in 1908 there were but three. Researches in these laboratories have given this country a major synthetic chemical industry. Drugs, medicinals, and dyes were largely imported prior to 1914; today there are practically no imports of these substances and large quantities are exported. It has often been said that World War I gave America her important chemical industries and made her people chemically conscious.

RESEARCH LABORATORIES provide the latest in scientific and technological development for our expanding industries. Our synthetic chemical industry is now one of the world's best.



COURTESY OF MERCK & CO., INC.

Technology and Tanks

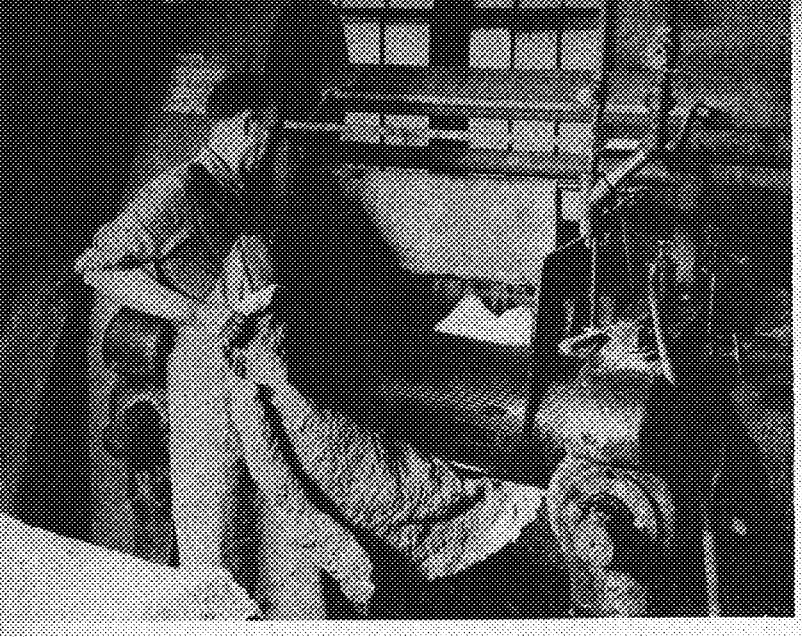
War demands a great deal from chemistry and metallurgy. Chemical and metallurgical engineers must create most of the sinews of war. Explosives, metals and their alloys, together with petroleum products, provide the principal materials which the Army and the Navy need to fight efficiently and effectively. In addition the armed forces must be able to protect their troops against poison gas and other hazardous chemicals. They must also be trained to use these same types of materials against the enemy. In the present conflict, victory is most likely to go to that side which has and uses the latest scientific and technological developments. As a recent article in *Fortune* magazine puts it, a real technological high command is essential for victory. Pearl Harbor was not a good example of the proper use by Americans of the latest scientific developments.

Too many of our citizens think of chemistry in warfare as being concerned only with gas warfare. Even the Army assigns this type of warfare to the Chemical Warfare Service whose duty it is to train troops in gas warfare, handle the dispersal of chemical agents, and direct the armed forces in the protection of their own men. This branch of the Army also develops and uses incendiaries and smokes. However, chemistry is intimately connected with all of warfare than merely this phase called chemical warfare.

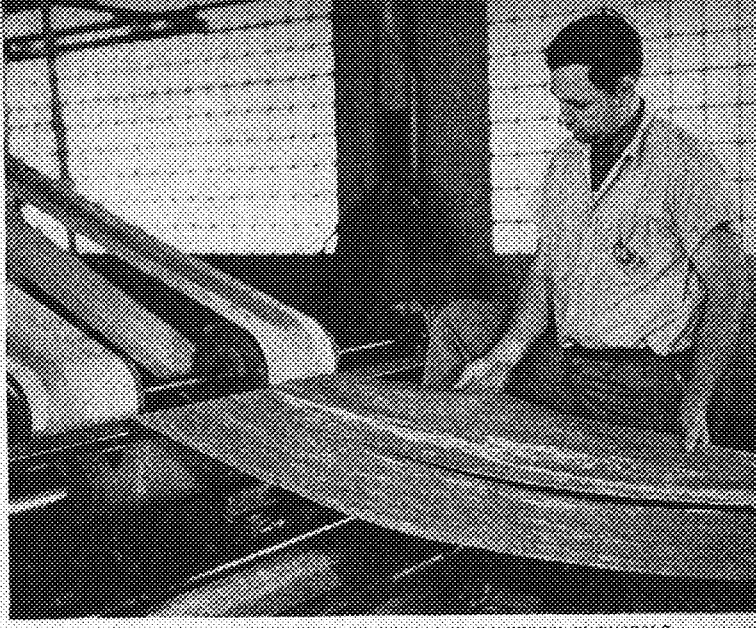
For example, modern armies move and fight with petroleum products. Here the United States has a real lead over the enemy. In addition to controlling over 60 per cent of the world's production of petroleum this country has the world's leading petroleum chemists. The developments of the cracking of oil, the polymerization of small hydrocarbon molecules to form high octane motor fuels, the hydrogenation of unsaturated hydrocarbons, and the synthesis of isooctane all occurred in this country. It has been said that the petroleum chemist can do almost anything he wants to with the molecules in crude oil. About seventy-five per cent of the crude oil is now converted into gasoline and it is reported that one pilot plant can start with one thousand barrels of crude oil and end up with one thousand and ten barrels of gasoline with nothing left over. This is done without violating the law of the conservation of mass. Already gasolines are being made that have an octane rating of one hundred and fifteen for the best aircraft and the chemists in this field now talk of one hundred and fifty octane motor fuels.

Flying Metals

Similar progress is being made in the field of light alloys but here such a distinct lead over the Axis does not exist. Production of aluminum had risen during the fifty years which followed Hall's discovery to about 300 million pounds annually; war has pushed it up another seven-fold until there will be a production of over two billion pounds next year. The expansion of magnesium production is still more startling. Less than a decade ago only a million pounds of this light metal were made annually. The demands of aircraft for alloys of magnesium and aluminum became so prodigious that 400 million pounds were demanded for 1942. This figure will not be met but already there is talk of doubling it for 1943. No one connected with these developments in light metals and alloys believes for a moment that the country will return to a pre-war rate of production when the war has ended. With confidence it is predicted that ample use for them will be found in many phases of postwar expansion based on new creations by science and technology. New motor fuels and the light alloys together with plastics will be combined to make the present motor car obsolete. Postwar transportation by train, by car, and by plane will be as radically different from the transportation of 1940 as that of 1940



THIS SLUMPY MATERIAL which is a polymerisation product of butadiene is squeezed through rollers into thin sheets before the synthetic substance is dried and cut into standard size.



COURTESY OF SOAP AND SANITARY CHEMICALS

THESE SHEETS OF RUBBER are carefully inspected after coming from a milling operation. The synthetic material is shown emerging from the machine which cuts it into long ribbons.

Block-buster Chemistry

Everyone knows that armies need explosives to fight but few realize the complexities in the chemical industries which supply them. In World War I America imported most of the nitrates needed in the manufacture of explosives and used the cellulose of cotton and the toluene from coal tar to produce most of the varieties that were used. Today more than eighty per cent of a bomb load is ammonium nitrate. This has necessitated a tremendous expansion of the synthetic ammonia plants of the country. Using hydrogen from water and nitrogen from the air, ammonia is produced under high pressure when passed over suitable catalysts. This ammonia can be oxidized to nitric acid which then reacts with ammonia to give ammonium nitrate, with toluene to give T.N.T., and with cellulose to give nitroglycerine. The demand for these explosives is so much greater than in any previous war that new sources of materials for their manufacture had to be found. Housewives are saving fats so that the supply of glycerine will be ample, woodpulp is being used in addition to cotton for cellulose, and the chemists have learned how to produce large amounts of toluene from petroleum. All of these new additions to the raw material supply require new chemical plants with highly trained personnel. Much of the country is as yet unaware of these demands and draft boards are draining off more and more scientists and technologists into the armed forces. Modern wars cannot be won by having chemists and engineers serve in the armed forces instead of the essential industries where they really are effective producers. The implements and materials used in this war do not create themselves, nor can soldiers create them on the field of battle. It is high time that Selective Service and the Man Power Commission correct the mistakes that have already been made.

At no time will the shortage of chemists and chemical engineers be so seriously felt as when the synthetic rubber program really gets under way. Synthetic rubbers, several of them, have been made for a number of years in this country but the quantity produced has not been large. Because of the blundering of governmental agencies we started expansion in this field rather late. Had there been vision in Washington there might now be a producing capacity of a half million tons annually and the rubber situation would present a brighter picture. However, the best has been made of a bad start, and chemists and chemical engineers must work at top speed to create and operate this vast new program. By the end of 1943 the rate of production may reach a half million tons.

Stretching Rubber Quota

The ultimate program contemplates the production of more than 700,000 tons of Buna S, about 130,000 tons of butyl rubber, 40,000 tons of neoprene, and more than 30,000 tons of Thiokol. This is on the basis of having available ample raw materials for plant construction and operation, plus the skilled technologists needed to run such complicated processes. It may well be that the real bottleneck in the rubber program will turn out to be an inadequate number of chemists and chemical engineers.

When the Edgewood Arsenal put its 100 tons a day chlorine plant into production in 1918, it was considered a great achievement. It enabled the Chemical Warfare Service to produce large quantities of mustard gas and other poison gases being used at that time. Such production would be relatively small today because more than 700,000 tons of chlorine were produced in 1941, but this was not enough for our needs and it had to be rationed to its industrial users. In a military way chlorine is of the greatest importance because it is absolutely essential in the preparation of all of the important war gases, when and if they are ever used.

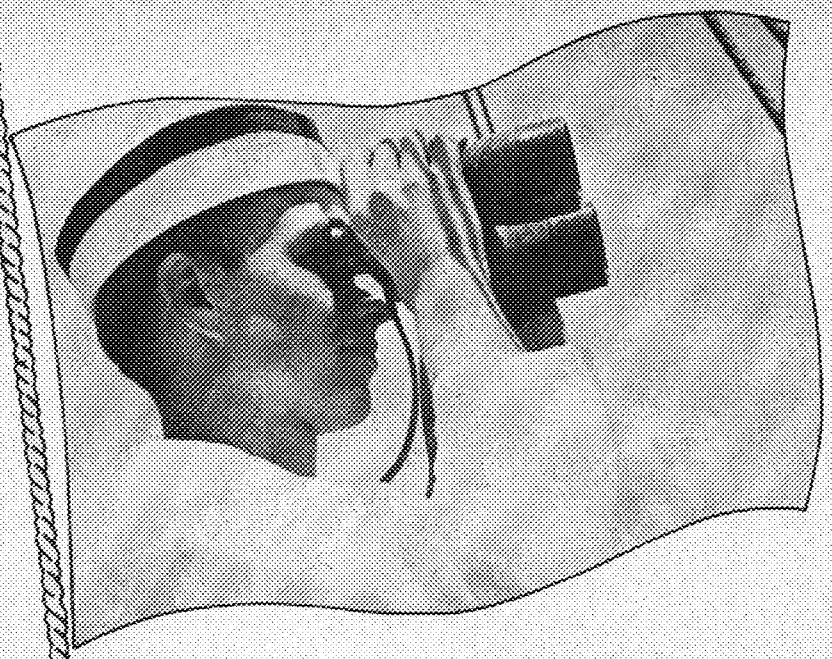
In considering the major importance of chemistry in the war effort one must not lose sight of the part this science has played in the field of medicine. Chemists are often compelled to produce materials of destruction, but they also give the world its beneficial drugs and healing agents. The wounded of this war will have a far greater chance to fully recover than ever before. Preventive medicine will eliminate many of the scourges which sapped the strength of the armies of earlier wars. Sanitary water supplies and the proper refrigeration of foods all depend on chemical science for their successful maintenance. Coupled with new knowledge in the fields of nutrition and vitamins it is now possible to feed our armed forces better and also maintain their health at a higher level.

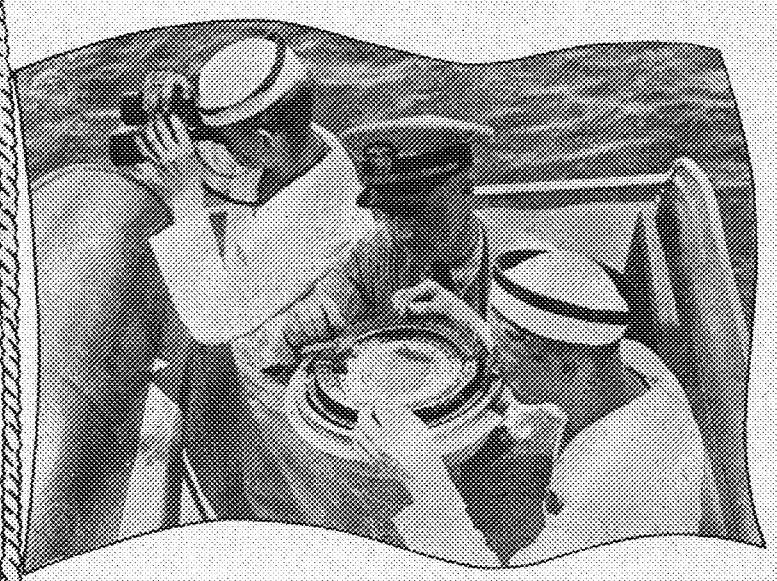
Thus we see that chemistry and chemical engineering occupy indispensible places in our war effort. It has only been possible to sketch some of the more important phases of chemistry's activity. No mention has been made of the remarkable gas masks which our scientists have created and nothing can be said of the secret researches which may have an important bearing on the outcome of the war. Since chemistry deals with all of the materials of the world it touches war activities everywhere. One of the surest ways to lose the war would be to place in the Army any fair percentage of the 70,000 chemists and chemical engineers in the United States. There would soon be little to use in effective combat.

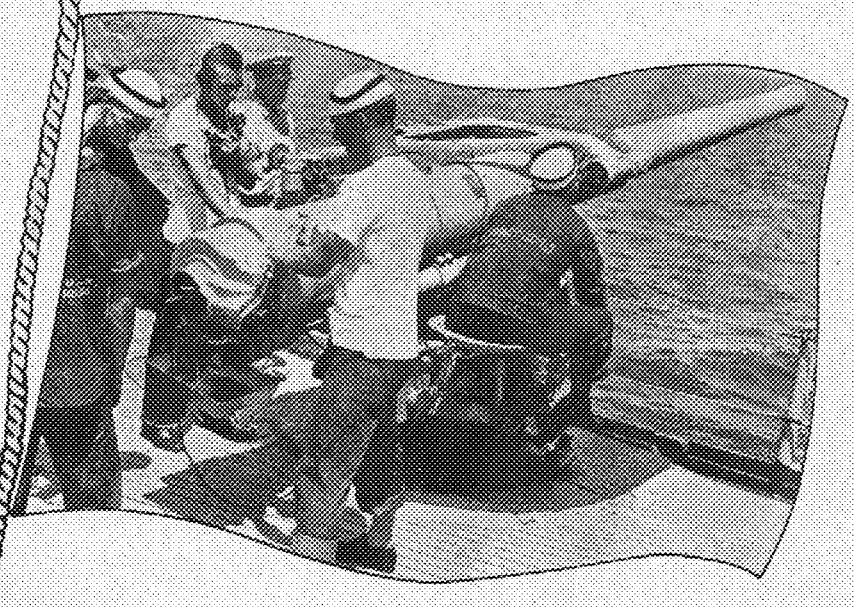
Chemistry Opens the Door

Finally it should be once more emphasized that war accelerates change and in no field is this more true than in science. Chemistry has developed and is developing a vast array of new products which will change the world's style of living far more than it was changed after 1918. Among other things the nation is fighting for the right to use and enjoy these new things. An age of plenty is staring the world in the face once the war is won. Scientists and technologists have the added obligation of seeing to it that the benefits they have helped to bring about are made available to all of mankind.

SEA







OFFICIAL U. S. NAVY PHOTOGRAPHS

THE Navy in 1939 had 8,612 officers. The annual attrition rate was approximately 4.3 per cent, requiring annual replacement of 363 officers. Each year the Naval Academy at Annapolis graduated a class of about 500 men. Thus the officers requirements of our Navy were met.

From 1939 until the present time the number of officers on active duty represents a substantial increase over the 8,612 officers mentioned above. The demand for this increase is being supplied from every source available with the ever-present prerequisite "a college degree," as the first factor to be met. From some of these sources are being supplied officers, college graduates who receive their commissions as line officers after three or four months indoctrinational training under The Reserve Midshipman Training Program, an emergency measure. From other sources officers are being obtained from among college graduates who have taken such courses that indoctrinational training is not considered necessary by reason of their special training and education and, resultingly, their assignment to duty is limited to that employing their specialty.

In order to provide many additional officers educated and trained to a standard similar to that of the U. S. Naval Academy, the Naval Reserve Officers' Training Corps was first established in six universities and later expanded. In 1926 Naval ROTC Units had been established at Harvard, Yale, Georgia Tech, Northwestern, the University of California and the University of Washington. In 1938, the commencement of the expansion period, additional units were established at Tulane and the University of California at Los Angeles, in 1939 at the University of Minnesota, in 1940 at the Universities of Michigan, Oklahoma, Brown, Marquette, North Carolina, Pennsylvania, South Carolina, Texas, Southern California and Virginia, in 1941 at Colorado, Duke, Holy Cross, New Mexico, Notre Dame, Rensselaer Polytechnic Institute, Rice and Tufts. The average unit has 260 student members and approximately 50 in its graduating class. Thus when all units have reached the point at which students com-

BY COMMANDER JOSEPH BAER
COMMANDER NROTC UNIV. OF M.

P U P P I E S

plete the course in Naval Science and Tactics, approximately 1,350 trained officers will be furnished to the Navy per year. These graduates will have been trained similarly to graduates of the Naval Academy and will be prepared to take their places in the fleet with no further indoctrinational or other supplementary training. They, with the graduates of the Naval Academy, will form the nucleus upon which the newly commissioned and relatively briefly trained officers from other sources will depend for guidance, supervision and further training.

The average unit takes in about 100 freshmen per year who have been carefully examined physically, interviewed, and examined as to general aptitude. During Freshman Week for 1942 in this University 361 applicants sought enrollment in the Naval ROTC unit. Of this number 45 per cent failed the physical examination and of the remaining 163, those considered to be qualified in all respects as potential officer material numbered 138.

THE staff of a Naval ROTC Unit is usually headed by a captain, U. S. Navy who ranks in the faculty of the educational institution as Professor of Naval Science and Tactics. The officers attached to his staff, usually five, are of varying naval rank and are ranked academically as Associate or Assistant Professors of Naval Science and Tactics. The Navy Department to date has adhered to its policy of detailing to Naval ROTC duty only those officers who are graduates of the Naval Academy and who have had several years practical experience in the fleet. In this adherence to policy it is believed that the staff will, in addition to its work in the class-room, furnish the Naval ROTC students with valuable information and guidance which will assist the student in the pursuance of his naval career.

During the summer months it has been possible to arrange and conduct practice cruises in naval vessels on Lake Michigan. In peace-time these cruises would be conducted at sea on battleships or destroyers. An innovation commenced this past year at the University of Minnesota, which it is hoped will be continued in subsequent years not only here but in other units, is the ROTC river cruise conducted in conjunction with the U. S. Coast Guard Auxiliary. On these cruises, normally lasting from Friday through Sunday, operations were conducted on the Mississippi River in the private boats of the U.S.C.G.A.J. which were manned by Naval ROTC students. The boats were organized into squadrons and divisions and the entire cruise period devoted to intensive training in seamanship, communications and tactics. The cruises were of benefit to the students as they conducted operations and tactics similar to those in which they will participate in the fleet after graduation. While the fleet operations are on a grand scale and the Naval ROTC river cruises are on a lesser scale, both operations are governed by the same principles.

The Department of Naval Science and Tactics is an integral part of the University of Minnesota and credits earned in the department by Naval ROTC students are applied to the credits required for a University degree. For the Basic Course, freshman and sophomore years, a total of 9 credits are allowed; for the Advanced Course, junior and senior years, a total of 18 credits; for the Navigation Course, 9 credits. Thus a Naval ROTC student through successful completion of his NS&T course will have earned a total of 36 credits towards his degree.

AFTER being awarded a degree by the University and successfully completing the four-year Naval Science course, those who are physically and scholastically qualified are recommended by the Professor of Naval Science and Tactics for commissions and ensigns in the United States Naval Reserve or as second lieutenants, United States Marine Corps Reserve, or as ensigns, Supply Corps, U. S. Navy, in accordance with the preferences of the individual members and the requirements of the services. Upon reporting on board ship or in the field for active duty, a Naval ROTC graduate may make application for a commission in the regular Navy, the same as held by graduates of the U. S. Naval Academy. Thus, under existing laws, the only method by which a commission may be obtained in the U. S. Navy is by successful completion of the U. S. Naval Academy course, the Naval ROTC course or through V-5 (for a limited number).

A Naval ROTC junior or senior is not subject to the provisions of the Selective Service Act. Naval ROTC freshmen and sophomores may enlist in Class V-1, U. S. Naval Reserve, as apprentice seaman, and thus attain the dual status of "V-1 ROTC." Upon the attainment of this status they are no longer subject to the Selective Service Act since they are already in one of the armed services, the Navy.

The life of a Naval ROTC student, so far as the Naval ROTC is concerned, is not a boring and onerous one. The extra-curricular activities which he enjoys are many and serve as part of his training as well as pleasant diversion from his studies and drill.

WITHIN the unit is the Anchor and Chain fraternity which sponsors naval events, meetings of professional interest, and social events; the Scuttlebutt, a quarterly periodical of timely and newsworthy interest; the rifle team which engages in rifle matches with other Naval ROTC units and in competition for the national Randolph Hearst Trophy; the drum and bugle corps which furnishes the stirring music for drills and parades; the Naval Academy preparatory class which prepares candidates from the Naval ROTC and selects three of them per year for examinations for the Naval Academy; the crack drill squad; the intra-mural athletic teams; and the student drill squad which is engaged in drilling the male high school students of Minneapolis. Further, each class is organized as a separate unit with its own officers for the purpose of furthering the unit as a whole, and of sponsoring professional and social events.

Fighting Scrap Goes Into

STEEL FOR WAR

BY JOHN GLADSRUD, MET. E., '43

ALTHOUGH great emphasis has recently been placed on the production and application of the light metals, steel is still the basic metal in our war effort. Its use is imperative where high strength and rigidity are required. Moreover, it is comparatively inexpensive and large tonnage are available as a result of mass production methods.

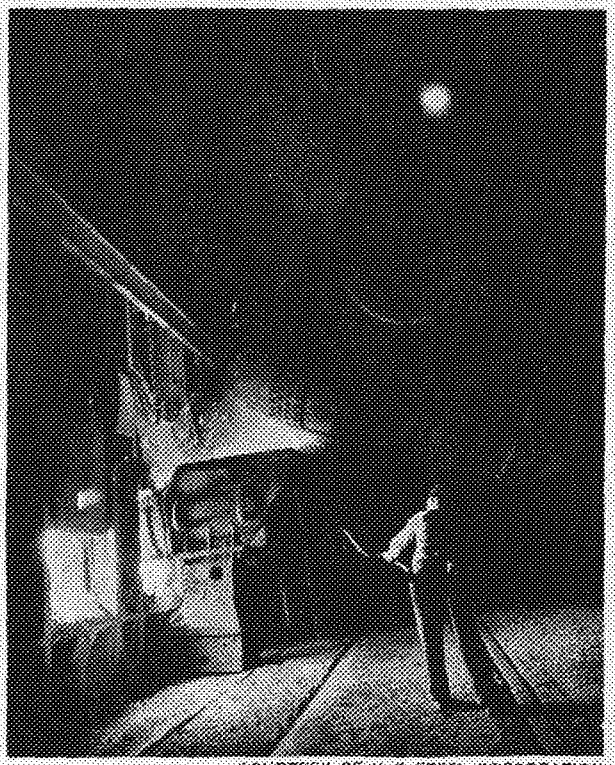
Steel is production in two stages. In the first stage iron ore is converted into pig iron in the blast furnace. Coke is used as a fuel and limestone is used to flux impurities in the ore. The reducing agent is carbon monoxide which results from the combustion of the coke. A single blast furnace may produce 1,450 tons of pig iron per day so that the production of each furnace is a large factor in our war effort. The problems encountered in the mining and transportation of raw materials can be appreciated from the fact that it takes about 900 tons of coke and 400 tons of limestone to produce 1,000 tons of pig iron from 1,900 tons of Mesabi ore.

In the second stage the impure pig iron, along with scrap and more iron ore, is converted to steel by eliminating impurities such as silicon, manganese, carbon, and phosphorus. This may be done in several ways. The molten pig iron may be placed in a Bessemer converter and air blown through the metal to oxidize impurities. If very fine quality steel is desired, the electric furnace is used, but large quantities of steel cannot be produced in this way. About 90 per cent of all the steel produced is made in open hearth furnaces.

It is in this second stage of steel production that scrap is important. Iron, which is the basic element in steel, can be obtained from pig iron or from scrap. In normal times the proportion of pig iron scrap used depends upon the relative prices of scrap and pig iron; if scrap is comparatively cheap, it tends to replace the pig iron in the open hearth charge. At present, scrap is indispensable to our steel production as furnace practice is based upon the use of a certain amount of scrap. If scrap is not available the only alternative is to produce more pig iron.

Production Lag Hurts

During an emergency such as this it is natural to think of every industry as producing a greater amount than previously. It is thus very surprising to learn that this year's steel production, instead of increasing, is hardly keeping pace with last year's production. The lag in production can be traced to two things: lack of pig iron and lack of scrap, and neither shortage can be easily remedied. Our blast furnaces are running at capacity, and it takes time to build new ones. The amount of scrap available is less because of restrictions on the use of steel and the hesitancy to scrap old machines or metal parts because they cannot be replaced.



COURTESY OF U. S. STEEL CORPORATION

MOLTEN PIG IRON is laden into an open hearth furnace to be refined into steel. The metal charge also includes scrap ore and solid pig iron.

War's Furnaces

To meet this situation the government has projected a program that involves the construction of new blast furnaces, to increase the production of pig iron and is aiding in the collection of every bit of available steel scrap. Until new blast furnaces are completed it is highly important that as much scrap as possible be made available. The estimate of pig iron production for several years is as follows:

January, 1941—56,522,370 tons
January, 1942—59,211,830 tons
January, 1943—63,092,200 tons
January, 1944—70,351,410 tons

The increased pig iron production will be brought about by the building of 20 new blast furnaces, restoring six abandoned furnaces, rebuilding nine others, and by increasing the capacity of existing furnaces. Decreasing the thickness of furnace linings and sintering of very fine ore which would normally be blown out of the furnaces are examples of methods of increasing output. The increase in the production of pig iron will require an expansion of related industries. For example, the number of coke ovens will have to be increased.

Minnesota Mines

Although new iron ore mines have been opened in New York, New Jersey, California, Utah, and Texas, the open pit mines of Minnesota will supply the major part of the required ore. About 21 new boats are being built to transport the additional ore to steel producing centers.

But what about production while the blast furnaces are being completed? We will need about 4,500,000 tons of steel scrap per month just to maintain our present rate of production until the new blast furnaces are completed. This figure is easier to understand when it is remembered that it requires about 200 tons of scrap and 200 tons of pig iron to produce 400 tons of steel in one large open hearth per day. In other words, it requires *275* pounds of scrap per minute for each furnace. The open hearths of the nation would be furnished with scraps for just one hour by 8,700 old cars.

Table I shows our steel production for 1941 and what it should be by June, 1943.

Table I. Steel Production

	Dec 31, 1941 Tons	June 30, 1943 Tons
Pig iron	59,522,370	70,351,410
Steel Ingots		
Electric	3,741,310	5,759,310
Bessemer	6,721,400	6,721,400
Open hearth	78,107,260	85,799,260
Total steel	88,569,970	98,279,920

The scrap collected from the public is heterogeneous, of course, and must be separated according to chemical composition before it is used. Certain elements such as tin, antimony, lead, and zinc are very harmful in steel when present even in small amounts. For example, many metallurgists claim that tin in excess of .02 per cent makes deep drawing difficult. It is important to recover the iron in tin cans but they must be properly detinned before they are used in the open hearths. Desirable alloying elements in scrap, such as nickel, chromium, molybdenum, and manganese, must be controlled in order to meet specifications of the finished steel.

Classifying Sparks

There are several methods of separating scrap. One method of determination used extensively is the spark test. In this test the color and length of sparks from steel of unknown composition are compared to sparks from steel of known composition. By this method a rough separation of scrap can be made when nothing is known about it. For example, the steels can be separated into plain carbon, low alloy, stainless, and tool steel classes. These classes produce very distinctive sparks. Carbon steel gives a spark forked at the end; manganese sparks come in bursts and are fairly large; nickel gives a bright lash at the end of a carrier; tungsten sparks are dull red; and chromium produces a very short, bright spark.

For separating nonferrous from ferrous metals, magnetic methods are used. All these methods depend upon the fact that iron adheres to a magnet while nonferrous scrap does not. The equipment used depends upon the type of scrap which is classified according to the degree of entanglement. The classes are:

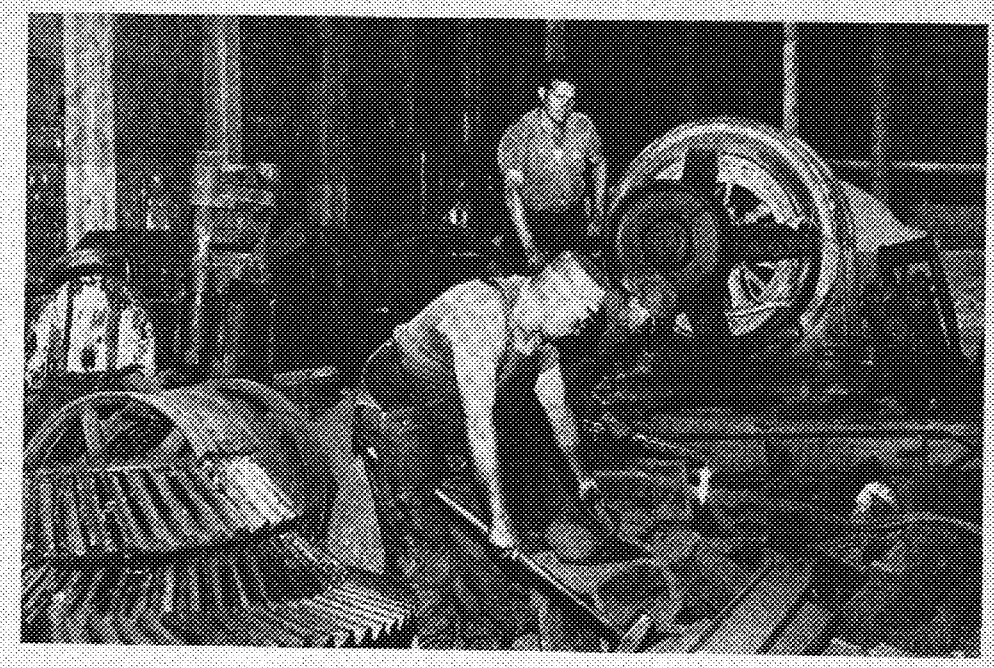
1. Junk-yard scrap
2. Borings and turnings
3. Intimately entangled scrap.

The magnetic pulley is commonly used for separating junk-yard scrap. The metal is placed on an endless belt which passes over a pulley having magnets on its inner periphery. The nonferrous metal will tend to fall away from the pulley while the ferrous metal will tend to follow it. Similar equipment — magnetic drums, dual pulleys, and revolving disks — is used on the turnings and borings. Recently, turnings and borings have been briquetted because otherwise they are partially lost by oxidation during melting.

Agitation as well as magnetism is needed to separate badly entangled scrap. In one machine the metal passes under a series of magnets which alternate in polarity. This allows the scrap to jump from pole to pole and disentangle itself. The tray in which the metal is contained also moves to help disentanglement.

Although these methods are available, they have not been fully utilized. Consequently, alloying elements like nickel and chromium are being wasted. As a result, the OPM has set up requirements for classifying scrap into eleven types.

When there is plating of value on steel or iron, chemical methods may be used. Recently it was decided to use brass-clad steel for bullet jackets instead of solid brass. The scrap from the clad steel is being separated into its component metals by dissolving the copper and brass with cupric ammonium carbonate. This allows 96 per cent recovery of copper, 82 per cent of brass, and leaves the steel in condition for melting. In Texas, a solution of what to do with galvanized (zinc-coated) scrap has been found. Galvanized products have been frowned upon as feed to the open hearth. The galvanized scrap is piled, oil is added, and the pile is ignited. Much of the zinc burns off so that the remaining steel is suitable for use in steel production.



COURTESY OF U. S. STEEL NEWS

ALL CORNERS OF INDUSTRIAL PLANTS are being searched for old machinery parts which are no longer usable in an endeavor to increase the amount of available scrap iron. A diligent worker is shown burning the steel castings to charging box size.

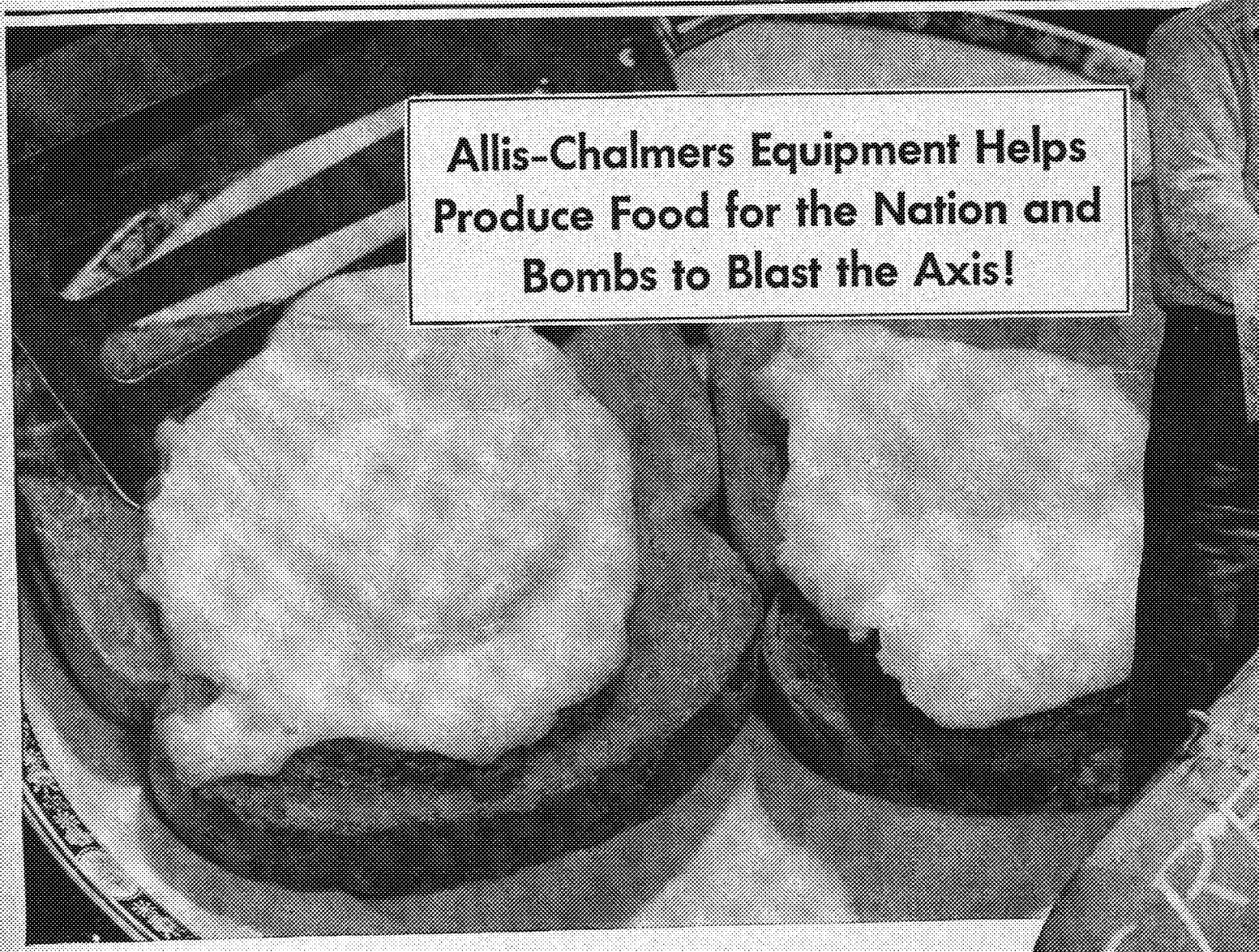
THE SEVEN-TON DROP BALL is about to be raised fifty feet in the air and dropped on the obsolete open-hearth casting which will be melted with more pig iron to make steel for war production.

COURTESY OF U. S. STEEL NEWS

And Still Not Enough

Now, what has been the effect of the scrap drive? In order to maintain production of steel in 1943 at last year's level of 83 million tons, we must collect a total of ten million tons of scrap in 1942. This must be done to make up the deficiency in scrap this year. Up to the last of November six million tons of scrap were collected throughout the nation, so we still have about four million tons to collect before we have made up the deficiency. This means that just to maintain production every person in the United States would have to turn in 50 pounds of additional scrap before the year is out. It should also be remembered that public scrap is only 90 per cent useful for steel production. All of these figures apply, of course, only to this year. During the first half of next year we will have to make collections at the same rate to maintain production until new blast furnaces are put into operation.

EGGS...ON TOAST OR



Allis-Chalmers Equipment Helps Produce Food for the Nation and Bombs to Blast the Axis!

HENS' EGGS—BOMBERS' EGGS...both are needed for Victory. And both are symbols of Allis-Chalmers all-out participation in the Nation's war effort!

From Allis-Chalmers plants come more than 1,600 different capital goods products...

—Tractors and other farm equipment which help feed the U.S.A. and the United Nations!

—Mining equipment, electrical equipment, pumps, turbines, drives...the greatest variety of machinery in the world to help manufacture bombs, bullets, guns, tanks, planes, ships!

Backing up the men and women working for Victory in our plants are Allis-Chalmers engineers in the field. They are helping manufacturers produce more—not just with new machines, but with machines now on hand!

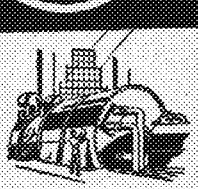
Allis-Chalmers past experience is vital to the Nation now. Its present experience will be invaluable *after* the war to help produce more and better peacetime goods for everyone!

ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.

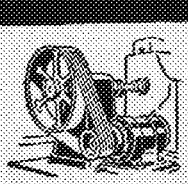
ALLIS-CH

OFFERS EVERY MANUFACTURER EQUIPMENT AND ENGINEERIN

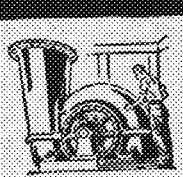
ELECTRICAL EQUIPMENT



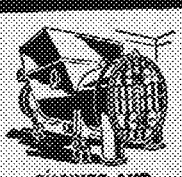
STEAM AND HYDRAULIC TURBINES



MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS

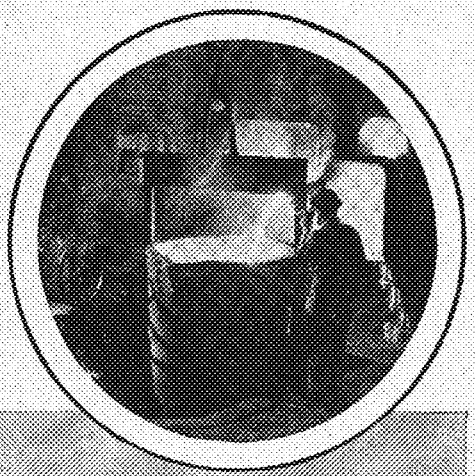


ENGINES AND CONDENSERS

CENTRIFU PUMP

TOKYO!

A-C Equipment helps produce both steel and explosive charge for demolition bombs like the one here.



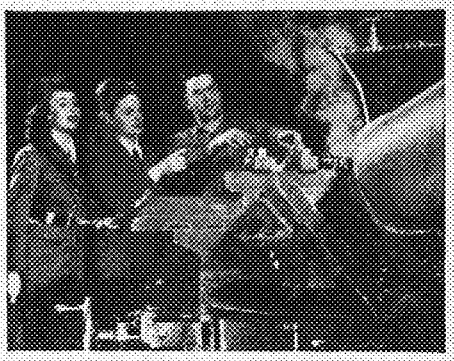
A-C Plants are casting and finishing industrial machinery at a record rate!

Allis-Chalmers tractors and grading equipment are helping build military roads and airports.

VICTORY NEWS

Rosiclare, Ill.—91 Allis-Chalmers motors constitute the major portion of a connected load of close to 1,000 hp driving the new fluorspar mill of the Mahoning Mining Company here.

The efficient layout of flexible motors and drives is largely responsible for the plant's record production of high-grade fluorspar zinc-lead ore. Throughout the mill, the Allis-Chalmers motors operate dump hoppers, flotation cells, vibrators, kilns, pumps and many other machines.



"We're Buying and Building," an A-C workman tells MGM bond rally starlets, as he machines a Navy propeller shaft.

Milwaukee, Wis.—The "feed-back" system, which utilizes 85% of the enormous power expended in breaking in aircraft engines on test stands, has been adopted by Buick in its new plant in a mid-western city.

The new engines are connected by flexible shaft couplings to water-cooled magnetic couplings, which transmit power to 1200 kva synchronous generators.

Allis-Chalmers alternating current units are at work here. They not only help to crank the new engines, but they also operate as current absorption-type dynamometers—receiving power from the aircraft engine, turning it into electrical energy and feeding it back into the line. This test set-up provides a high percentage of the power required by this company's manufacturing operations.

FOR VICTORY
Buy United States War Bonds

ALLIS-CHALMERS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

OPERATION TO HELP INCREASE PRODUCTION IN THESE FIELDS...

FLOUR AND SAW MILL EQUIPMENT

CHEMICAL PROCESS EQUIPMENT

CRUSHING, CEMENT & MINING MACHINERY

BOILER FEED WATER SERVICE

POWER FARMING MACHINERY

INDUSTRIAL TRACTORS & ROAD MACHINERY

Those Solomons

BY RODERICK W. SILER

ILLUSTRATED BY BOB PLATT

TOWARDS the end of the last century, as I remember, there were probably several million Americans of the male sex who dreamed of eventually emigrating to the South Seas. This could not be blamed on the movies or Hedy Lamarr in a sarong, for Hedy and the movies were not in existence then. It was simply due to the spell which stories coming out of the South Seas for a century past had cast over the white world. The stories stressed palm trees, white beaches, beachcombers, trading schooners, a stimulant known as "Kava," native girls who swam out to meet incoming ships, and cannibalism. Today about all that remains of that happy picture are the beaches and trees.

Yes, things have changed greatly in such places as the Solomon Islands. For instance, men don't eat each other down that way any more. But as late as the last quarter of the 19th century they were doing so. In fact, by all accounts coming down to us from travelers of the time in that part of the world, Solomon Islanders were very slow to change their ways.

An Englishman named Romilly, a Deputy Commissioner for the Western Pacific, published a book in 1886 which is a record of how interesting life once was in the South Seas dodging such things as uncharted reefs and natives with peculiar eating habits.

Romilly tells, among other things, of being present at a cannibal feast, and in a particularly happy position for reporting it. That is, he could be impartial, because he was neither an eater nor to be eaten. This was in New Ireland, one of the Solomons. Romilly had landed there to visit a beach tribe, few of whom had seen a white man before. The natives pinched him to see if he was real, and rubbed their hands over his face to make certain it was not painted. Satisfied that there were such strange creatures on earth as men whose skin was white and so tender that it had to be covered with coats and pants, the tribe gathered to hear what Romilly had to say about the situation.

While Romilly was talking, telling the islanders how white men were always willing to swap valuable clay pipes, glass beads and gin for such trifles as copra, sandalwood and *beche-de-mer*, there was an interruption. This was caused by the appearance seawards of a fleet of war canoes full of enemy islanders blowing war horns, beating drums and shaking spears. Naturally Romilly's audience decided to postpone listening to his sales talk. The men of the tribe seized their weapons and drew up in two lines along the beach. The women and children stood back of the men with extra spears and the native wooden swords.

Being savages, Romilly's islanders gave the attackers time to land and form, the idea being that in a fight it was the sporting thing to give all participants an equal chance. Also, before the battle began, a few men from each side stepped out in front and addressed each other. What they said was purely personal, and indicated that each side regarded the other as being entirely composed of utterly worthless, cowardly nobodies. These preliminary talkers indicated that the islanders were not so old-fashioned as we might imagine. Having decided on war, they showed why peace was impossible.

Actual fighting began when spears began to fly through the air. Romilly and his men, armed with Winchesters, kept out of the battle. After all, they were here on business. The natives were very nimble in jumping aside and dodging the spears, Romilly noted. But all the spears did not miss. Men began to fall. The island women rushed in and dragged the wounded off. The enemy wounded they killed. In the end the attackers were defeated, and those of them that could, fled to the boats and made off for islands unknown.

Romilly was invited to the victory feast that followed. But, as I have indicated

(Continued on Page 90)

COMMUNICATIONS
...directing arm of combat

This battle drawing was prepared with the aid of Army and Navy authorities.

IN modern battle, our fighting units may be many miles apart. Yet every unit, every movement, is closely knit into the whole scheme of combat—through communications.

Today much of this equipment is made by Western Electric, for 60 years manufacturer for the Bell System.

Here are some examples of communications in action.

1 Field H. Q. guides the action through field telephones, teletypewriters, switchboards, wire, cable, radio. Back of it is G. H. Q., directing the larger strategy . . . also through electrical communications. The Signal Corps supplies and maintains all of this equipment.

2 Air commander radios his squadron to bomb enemy beyond river.

3 On these transports, the command rings out over battle announcing system, "Away landing force!"

4 Swift PT boats get orders flashed by radio to torpedo enemy cruiser.

5 From observation post goes the telephone message to artillery, "Last of enemy tanks about to withdraw across bridge . . ."

6 Artillery officer telephones in reply, "Battery will lay a 5 minute concentration on bridge."

7 Tanks, followed by troops in personnel carriers, speed toward right on a wide end-run to flank the enemy. They get their orders and keep in contact—by radio.

Western Electric
ARSENAL OF COMMUNICATIONS

Wide-Awake Industries Prevent

DAILY DOZING

BY EMERY HANSEN, M. E. '43

WILLIAM JAMES, the great American philosopher and psychologist, once stated, "A day full of excitement with no pauses is said to pass ere we know it. On the contrary, a day full of waiting and unsatisfied desire for change may seem a small eternity." This tells the story of the modern industrial worker. Some have interesting work; others have tasks that are very monotonous. If the worker is interested in his work, all problems are solved; but monotony is a problem of utmost importance in this progressive age of industrial production and specialized defense work. This problem is caused by the effects of repetitive work upon the workers' welfare and efficiency. The unceasing repetition of work on the moving belt, typewriter, bookkeeping or calculating machines in the office represents a very monotonous life.

The defense program has increased the importance of new methods of alleviating monotony. Because the work in war industries, such as airplane and tank factories as well as plants producing guns and ammunition, is all on high-speed mass production, the work of most of the personnel is very specialized, and very often the worker must be on the job long hours up to even seven days a week. Despite the fact that the workers are all out for victory, the feeling of monotony creeps in because of fatigue. Thus, industrial engineers are constantly striving to find new methods of relieving this detrimental force, and thereby make our victory certain as soon as possible.

Mass Production Personality

There are three very important factors involved in this industrial problem which include: the type of work, the intelligence of the worker, and also his personality. These three are leading factors in the cause of monotony, and vary to such a degree that each individual presents a new situation.

The type of work undoubtedly plays an important part in causing monotony. Today, industry is highly specialized, and the workers in large industries very often perform a simple operation day after day, down through the years. Seldom does the worker ever see the completed product, unless he takes time to see it after working hours. This procedure, in peacetime, inevitably creates dullness, fatigue, and monotony; however, the fact that he can see the increased number of planes, tanks, and guns being added to our war effort does help to alleviate these hindrances.

Compare this situation with the job of the worker of years ago, before the industrial revolution started job standardization. He used to take a genuine interest in his work. He could use his ingenuity and creative ability, and could also take pride in his completed task. He dealt personally with his customers, and each new endeavor created a revived interest in his work. The intelligence of the worker also has much significance, because an intelligent person is much more apt to be bored by a simple task than a duller one, and in the opposite case, the dull worker may be well satisfied with the same task. Very often, a dissatisfied intelligent worker when not given a chance to advance himself, may be the ringleader in strikes or other labor troubles; therefore, it is wise for the employer to recognize ability and ambition and eliminate this hazard.

The factor of personality in the problem of monotony also is very important. Susceptibility to monotony is basically a personality trait, and as a result, even though the work may be generally considered monotonous, and the worker may be intelligent, it is the factor of personality that decides his satisfaction or lack of it, which subsequently determines the amount of monotony. The effects of a monotonous task vary in most cases according to the personality of the worker; therefore, the matter of choosing men for certain tasks is now being done according to the type of personality that is required for the job.

The first symptoms of monotony are restlessness, yawning, loss of interest, difficulty in keeping at the task, and an increased amount of effort required to maintain efficiency. These symptoms are characteristics of the work progress of the day. In general, the rate of work and the amount of production tend to increase during the middle of the working period; that is, after a short warming-up period there is a spell of relatively high efficiency followed by a gradual and consistent drop in production. Thus, rest periods are provided so that instead of production dropping below normal, it is increased because of the restored energy and interest produced by the new and shorter, yet more efficient working period.

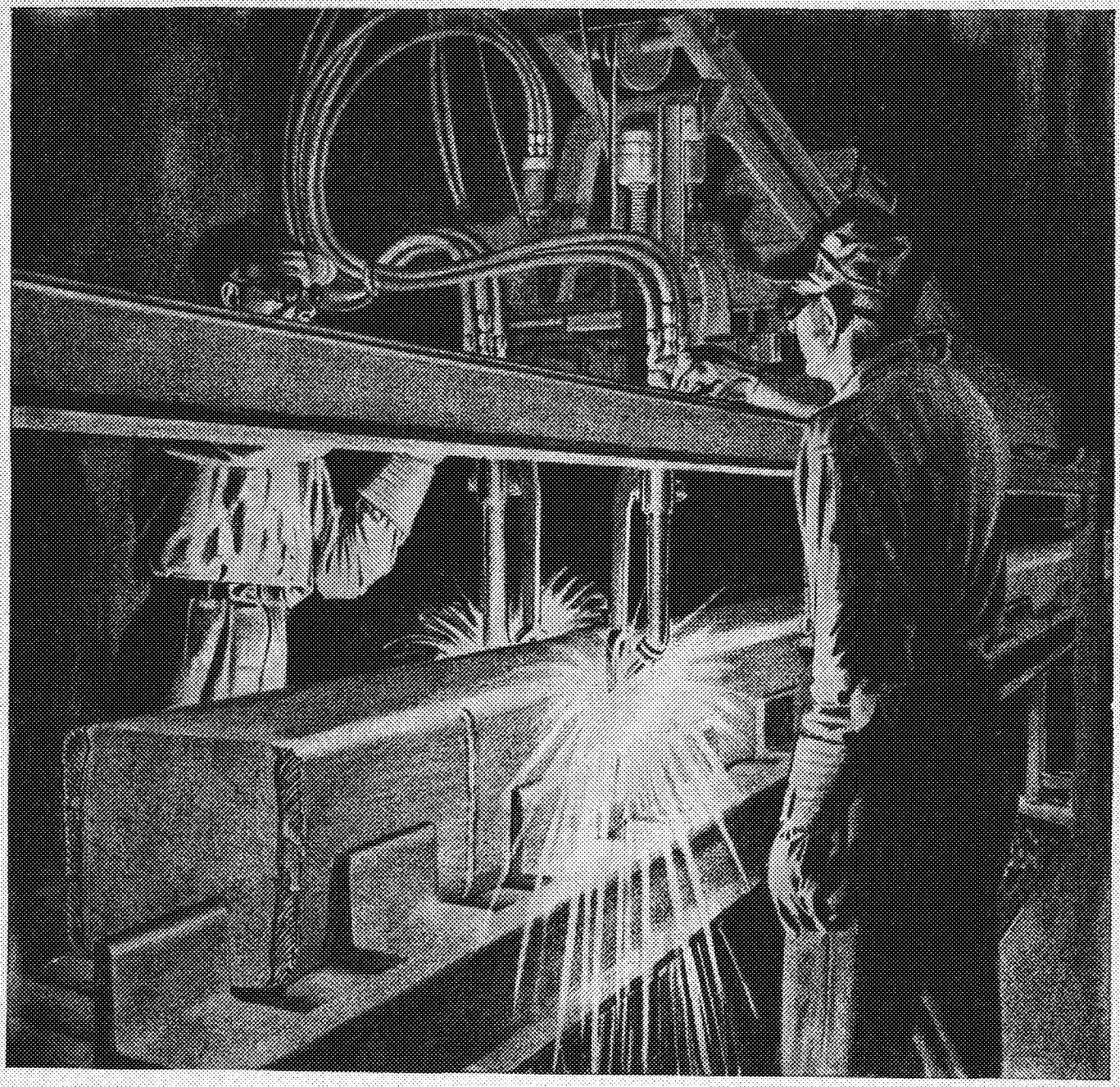
Experts at Excuses

There are many noticeable effects of monotony. Many people feel that it takes the very soul out of a man and makes him a slave to his machine, and because of his small task he loses his pride in his work. The creative impulse is definitely thwarted, and as a result much of the joy is taken out of life. This is true in some cases, but usually new methods may be found to relieve this force. Other effects consist of an unpleasant restlessness, which creeps over the worker, and the tension becomes increasingly great. The constant never-ending job creates a great deal of nervous strain of the worker, and he often begins to worry and search for an explanation for his troubles. These grievances induce pessimistic reveries, or an obsessional concern on the part of the worker with his difficulties and disappointments until finally he begins to criticize and complain about his work; and if the task becomes over-monotonous, he is apt to stop at the slightest excuse, or even use destructive behavior in order to relieve himself from the monotony. The repetitive work of the modern factory offers a great deal of time for dreaming and worrying. The

(Continued on Page 87)

TWO ATTRACTIVE EMPLOYES are shown picking out their favorite recordings which will be broadcast over the amplifying system throughout the plant for the enjoyment of their co-workers.

COURTESY OF WESTINGHOUSE



BILLETS TO BULLETS FASTER!

BY reducing billets to slugs faster, this recently perfected Airco machine gas cutting application speeds shell production. The Airco cutting torches — as many as ten can be mounted in this new Billet Nicking Machine — make simultaneous cuts a fraction of an inch into a billet, at a speed of from 20" to 30" per minute. After nicking, a sudden blow produces a clean break.

This new Airco developed cutting application reflects the ability of Air Reduction's Research and Development Engineers to quickly fulfill new industrial needs. Thus, Air Reduction customers are first to benefit from many oxyacetylene applications now speeding war production.

Even as they have revolutionized all-out war production, so in the peace to come these processes will show the way to better products, machines and structures at less cost.

To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

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ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING

Here Are the Engineers of 1946

Tech News

EDITED BY DON FRANKE, E.E., '43

This is the first picture ever taken of a freshman class in the Institute. The five coeds in the insert are: left to right, Marie Vachon, Mary Teigen, Pat Soper, Marjorie Pearson, and Bev Shores.

M. E. Plastics Press to Be Completed by Next Quarter

The plastics press being built by the mechanical engineering department will probably be in operation before winter quarter, according to Professor F. B. Rowley, head of the mechanical engineering department. The press is being built under the supervision of Professor Fulton Holtby, and the gas-fired boiler installation is also being directed by him. installation is also being directed by him.

The press is designed to exert a total pressure of 50 tons on the molten plastic. The upper and lower dies are heated by steam from the boiler, which is thoroughly projected by automatic safety controls.

The completion of the press has been delayed many times by material and labor shortages, but it is expected that a course in its techniques will be offered next quarter.

Soil Conservation Discussed

The November 19th meeting of the American Society of Agricultural Engineers in the Union was highlighted by an address on "The Place of the Engineer in Soil Conservation" given by H. B. Woolery. Mr. Woolery, a recent graduate of the University of Minnesota, is now with the Minneapolis-Moline Power Implement Company.

Tau Beta Pi Elects

Two juniors and twenty seniors were elected to membership in Tau Beta Pi, all-engineering honorary society this fall.

Juniors informally initiated November 12 were Arthur Kemppainen, and Robert Batzli, both electricals.

Seniors honored were Dave Phillips, Bob Hansberger, Frank Galbraith, Lislie Welch, Ed Quest, and Marvin Deers, mechanicals; John Spreiter, Bob Stewart, Phil Rush, Carroll Martenson, and Clarence Wild, aeros; Bruce Rhodes, Arnold Satz, Ed Persh, Harry Connors, and Bob Acker, chemicals; Wallace Leland, and Bill Kaye, electricals; Henry Doepke, civil; and John Glasrud, mines.

The fall formal initiation for these men was held December 1, in the Union.

It Is Largest In I. T. History; 5 Coeds, Too

The class, numbering approximately 700, is the largest in the 20 year period that O. S. Zelner, Associate Professor of Surveying, has conducted it. The first assembly showed the Chemistry Building auditorium too small, so that the weekly meetings are now held in Burton Hall.

According to Professor Zelner, however, the effects of the drafting of the 18 and 19 year old men are already noticeable. Of five cancellation slips received in one day, three gave joining the Army or Navy as the reason for leaving the University.

The present trend for women to enter the industrial field is also in evidence here at Minnesota, for five women are currently enrolled in the regular engineering courses. (Chemistry, Architecture, and Mines do not participate in the regular freshman orientation program).

"The orientation class is unique in that it is probably the only place on the campus where all persons of the same classification meet regularly," Professor Zelner said.

M. E. Dept. Resumes War Courses

After a short period of relative inactivity, the M. E. department is again conducting a large night school to train men and women for jobs in war industries.

Conducted as part of the Engineering, Science, and Management War Training (ESMWT) program, which is under the general direction of Professor B. J. Robertson of the M. E. department, the M. E. department at present offers nine courses, with more to follow.

Enrolled in classes like Safety Engineering, Heating and Ventilating, and Tool Design, are over 340 men and women.

M. I. T. Man Speaks On Bomb Damage

At the student-faculty meeting of the Architectural Student Council held November 24, Mr. John E. Burchard of the Massachusetts Institute of Technology, and head of the Bemis Foundation, a housing research body, spoke.

Mr. Burchard, on leave from M. I. T., is doing research on bomb damage and post-war housing for the government. He returned from England after a nine weeks' study of bombings and reconstruction there just two days before Pearl Harbor.

DAILY DOZING

(Continued from Page 84)

worker will often use an escape mechanism and day-dream or take flight into fantasy, which results in further dissatisfaction in the mind of the worker, and a problem in the mind of the employer, which may in some cases result in a complete maladjustment. In a recent book, *Plant Production Control* by Professor C. A. Koepke of the University of Minnesota, various examples are cited which "illustrate what job standardization can do."

Professor Koepke also states that "too much of the writing on the evils of division of labor, job standardization and monotony has been done by sensitive, highstrung, imaginative individuals who tried the line and obviously did not fit the job or by others who have never worked under such conditions but try to picture their reactions if they were forced to do so." This statement is entirely true, but because of these misfits unrest is frequently created in other employes and hinders production. This factor makes monotony an important problem to consider.

Another important effect of monotony is an increase in the number of accidents. Monotony seems to be related to accidents in a positive direction. According to the Industrial Series Book, *Safety Supervision*, "the greater the feeling of monotony on the part of the individual, the more prone he seems to be to get into trouble. The feeling of monotony is usually followed by a loss of interest in the task. This loss of interest probably accounts for the relationship between monotony and accidents, for the disinterested person is not attentive to correct and safe practices in the performance of his task." Incorrect and unsafe methods are then used to escape monotony, which endanger the individual and decrease his efficiency.

Organized Loafing

The modern industries are making great steps toward the relief of monotony. Rest periods are being provided, activities are changed from time to time, the workers may even be shifted over a long period, with a promotion if possible. In most large corporations, short vacations are provided, except just at present when the war effort requires all of our time, so instead, the work is being adjusted. Men are frequently placed on the piece-rate or the separate allotment basis in order to make the work interesting and create an incentive to work harder.

During the duration of this war, the interest that can be created in the war effort has greatly reduced monotony, because of the increased interest that can be aroused in the hearts of the workers. Many of them have sons or brothers in the armed services, and the thought that they are doing their part to help their country gives many of them a renewed interest in their work. Then too, many of the men who have felt that their work has been monotonous, can now join the Army or Navy and have adventure. In fact, that is

(Continued on Page 92)

Those Who Have Gone Before Us

OUR ALUMNI

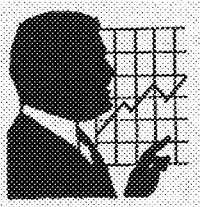
Envied They Be

EDITED BY STAN GENDLER, M. E. '44

All This and Money Too

DESIGNS NYLON MACHINES Robert N. Peterson, M.E. '42, is doing machine design work for the Nylon Division of the Dupont Company at Charleston, West Virginia.

LOCAL BOY MAKES GOOD



L. M. Mitchell, who graduated in Civil Engineering at Minnesota in 1915, is a vice president of the contracting firm of Merrit, Chapman and Scott of New York City. This firm of engineers and contractors is doing construction jobs for the United States Army all over the world.

WITH BELL AIRCRAFT AT BUFFALO Norvin Erickson, AeroE '40, is now working in the flight research department of the Bell Aircraft Corporation at Buffalo, New York.

WITH ALCOA IN CLEVELAND Thomas B. Carlson, M.E. '41, is working in the permanent mold plant of the Aluminum Company of America in Cleveland. His residence is at 1544 Delmar Road, Cleveland, Ohio.

These Boys Are Traveling At Government Expense

GOPHER ABROAD Carl T. Nordstrom, E. '14, formerly with the State Highway Department, Saint Paul, now holds the rank of Lieutenant Colonel and is on active duty overseas.

WITH GROUND CREW IN AUSTRALIA Lieutenant John K. Gerrish, M.E. '39, stationed in Australia, wrote his father, Harry E. Gerrish, M.E. '05, and his mother that he was able to get pictures of General and Mrs. MacArthur. He is with the ground crew and is in charge of 25 planes.

ARCHITECTS AT M.I.T. David Griswold, '40, Eugene Flynn, '42, Harold Teague, '42, Rex Galles, '35, and Richard Taylor, '42, Minnesota Architectural graduates, are all ensigns in the United States Navy. They are studying naval architecture at the Massachusetts Institute of Technology.

MAJOR AT THE EDGEWOOD ARSENAL Major Marvin C. Rogers, Ch.E. '26, is on active duty with the Chemical Warfare Service at Edgewood Arsenal, Maryland. He reported for duty on September 25 and was assigned to training work at the arsenal. Major Rogers' original commission was obtained in June, 1926.

IN CHIEF OF ENGINEER'S OFFICE Lieutenant Colonel Hilbard Hill, C.E. '23, is now attached to the Chief of Engineer's office, United States Army, Washington, D. C.

Water On Their Brains And Under Their Feet Too

FATHER AND SON IN NAVY Elwood Vern Hathaway, Aero E. '42, has been commissioned an ensign in the Navy and is now stationed at the Naval Air Station in San Diego. Following graduation last spring he went to work in the Glenn L. Martin airplane plant at Omaha. He remained there until August 1 when he entered the Navy. His father, John A. Hathaway, chief pharmacist's mate, U.S.N. (retired) was called back into the service last spring, and is now attached to the Naval Training School (Electrical) located on the University campus.

Lest We Forget

KILLED IN ACTION Lieutenant Kenneth Anderson, Aero E. '39, has been reported killed in action over western Europe. The War Department notified his father, Emmett Anderson of Kenora, Ontario, Canada, that his death occurred three weeks ago. At that time Lt. Anderson was the interceptor commander of his bomber squadron.

He entered the Air Corps in June, 1941. On September 27 of this year, just before he left for overseas duty, he was married to Delight Travis of Los Angeles, a niece of Larry Armstrong, Minnesota hockey coach. In 1938-39, Lt. Anderson was captain and a star of the Minnesota hockey team.

Son...

HE has just turned eighteen. Shaves twice a week and maybe a hair or two is sprouting on his chest. He shies away now when his dad tries to be affectionate and we noticed some lipstick on one of his handkerchiefs after a country club junior dance not so long ago. But it seems only yesterday, perhaps it was the day before, that he was a chubby legged kid swinging from the arch of the doorway, leading to the dining room, in a gadget that was something like a breeches buoy and he was sucking at the end of a turkey bone.

He went back to school this Fall, a tall, athletic lad, budding into manhood, but there was something else on his mind beside the football and hockey teams or the little blonde girl with whom he had "palled" around during the Summer. It seems as though he was listening for a certain call—the Clarion call that poets sing about—and, perhaps we just imagined it, but we thought we saw an upward jutting of his chin, a certain light in his eyes, and a sort of a rearing-to-go expression in his face.

It chilled us a bit in the region of our heart, when we thought of his discarding the sports coat for the "O.D." of the Army or the blue of the Navy. There was a bit of a catch in our throat as we thought of his putting aside his football helmet for one of steel; of his hanging up his hockey stick and reaching for a gun. After all we still regard him as just a little boy.

They tell us that the eighteen and nineteen year old lads are to be called to the service. When that day comes to us there will be prayers, but no tears. We shall not mourn nor shall we be fearful. Rather there will come welling up from our hearts that warm feeling of pride that millions of other parents will sense when their beloved lads marched away. Our lad is no different than the others. We are no different than other loving parents, nor is our sacrifice any greater. They are going to make great soldiers, sailors, marines and fliers out of these youngsters. And they will become a mighty force when they take their places beside their brothers in arms. They too know what they fight for. They too know full well of the sacrifices that must be made before the evil powers that threaten the world can be overcome.

And let us not forget that they are counting on us. They know that we shall not fail them.

God be with them and their brothers.

THOSE SOLOMONS

(Continued from Page 82)

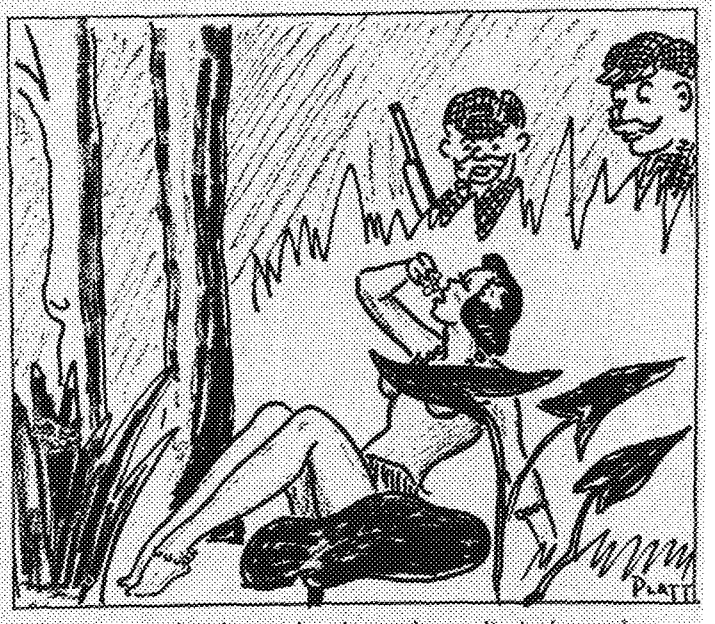
previously, he had old-fashioned prejudices he found impossible to overcome, and so contented himself with merely recording for posterity what he saw. Six of the enemy dead were eaten. Romilly gives a recipe of how everything was prepared that strikes me as being a masterpiece of detailed and scientific observation. He also comments to the effect that some of his own boat crew, natives from Bougainville Island, criticized the preparations as being definitely inferior to the way they did such things at home.

Romilly tells of a peculiar institution called Duk-Duk, carried on in New Britain, another of the Solomons. It seems that in the islands the men were much inclined to get in touch with the supernatural as they advanced in age. That is, they took to witchcraft and sorcery. Romilly regards this as a very natural development. Old fellows, says he, not being as handy with war clubs as formerly, nor as spry in dodging spears, have to use their wits more in meeting the competition of the youngsters. It may be that Romilly has something here.

The Duk-Duk always put in an appearance about the time of new moon. Previous to that all women were warned to keep out of sight. If they did not they were killed. The Duk-Duk was strictly a stag affair. The Duk-Duk came in at dawn from the sea, and on a platform lashed to six canoes. On this platform were two gigantic figures, each ten feet high, and with hideous faces and worse manners. The two disguised ones landed, and found awaiting them all the young men lined up along the beach. The young men were always nervous. This for them was an initiation into the mysteries, with the drawback that they could never fully comprehend the mysteries until they had reached a ripe old age. The two mysterious figures carried clubs, which were for use on the backs of the young men. It was noted that they dropped hardest on the backs of young fellows most inclined to question the authority and wisdom of the elders. Thus it was that skepticism never became prevalent among the younger set in the Solomons.

The only way to get rid of the Duk-Duk was to feed it. This was eventually done by turning over a great supply of food to the older men, who guaranteed to see that it was delivered where it would do most good.

As I have said before, the tales of men who traveled in the South Seas and East Indies in the last century are interesting in the face of present conditions there. But lack of space prevents my repeating these stories. Besides as Christmas approaches, who wants to hear of Bully Hayes, the great American pirate of the South Seas, or the lone Sulu who broke into the town of Jolo and with a parang cut down seventeen Spaniards, or the skull of Peter Elberfeld built into the wall in Batavia, or the Susuhunan of Java who had a solid gold spittoon, or the famed bird of New Guinea with a wing spread of twenty feet which carried off full grown men?



No, no, Bathershy, we've bagged our limit for today.

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

I guess that they'll have to change the unit of magnetic flux as they aren't making Maxwells any more.

* * *

It seems that a fair size bridge, which had been under construction for quite a while, was nearing completion. One evening after the men had quit for the night, the entire structure collapsed. On the following morning, the "big shots" went down to the scene of the accident to determine what could be done. When they arrived they saw a lone figure sitting atop one of the girders which jutted from the water. He was furiously pushing a slide rule back and forth, and seemed to be muttering, "Damn that decimal point!"

* * *

This gas rationing is really going to hit the boys pretty hard. Fellows who drive big cars should take the advice of Bob Geisenheymer who says he'll "get more enjoyment out of drinking the four gallons."

* * *

Formula for a nice night's entertainment:
So-fa and no father.

* * *

She was only an optician's daughter, but two glasses and what a spectacle she made.

* * *

Up to sixteen a lad is a Boy Scout, but after sixteen he becomes a girl scout.

* * *

When I was young and in my prime,
I used to do it all the time.
But now that I am old and grey,
I only do it once a day.

Burma Shave

* * *

The Japanese proudly announce that they have a thousand men who are willing to drive torpedoes at the risk of their own lives. We have several million who are willing to drive autos.

* * *

God's most beautiful and inscrutable creation is a woman. She is the Creator's masterpiece. Man's most incomprehensible creation is an automobile engine; it is his masterpiece. What we know about both is as zero is to infinity. They both furnish the broadest field for speculation and the greatest subject for enthusiasm and radiant praise, and both properly belong in the field of doubt and speculation. When they will, they will; and when they won't, they won't. It would seem, therefore, that we can best approach a serious discussion of a gas engine cycle by first getting our minds in a highly speculative mood—Note to Mr. Arthur Brickman.

* * *

More men are educated in women's colleges than in men's.

* * *

It isn't often that married people are faced with the problem of illegitimate children.

* * *

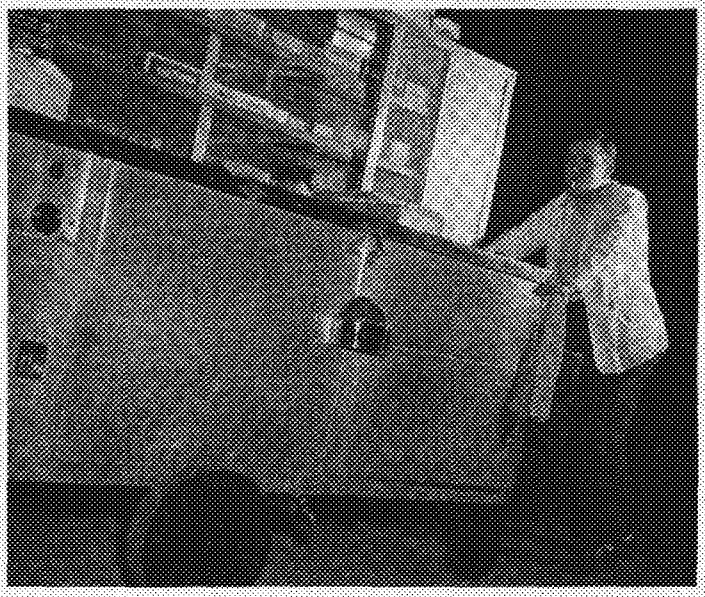
Many of our young engineers are spending a lot of time tinkering around with the Misses in their motors.

* * *

Worst pun of the month: Speaking of heating stations, I wonder if the steam said to the boiler as it flowed out—
"Well, I'll B T'ing U."

And so will I.

DAILY DOZING *(Continued from Page 87)*



COURTESY OF WESTINGHOUSE

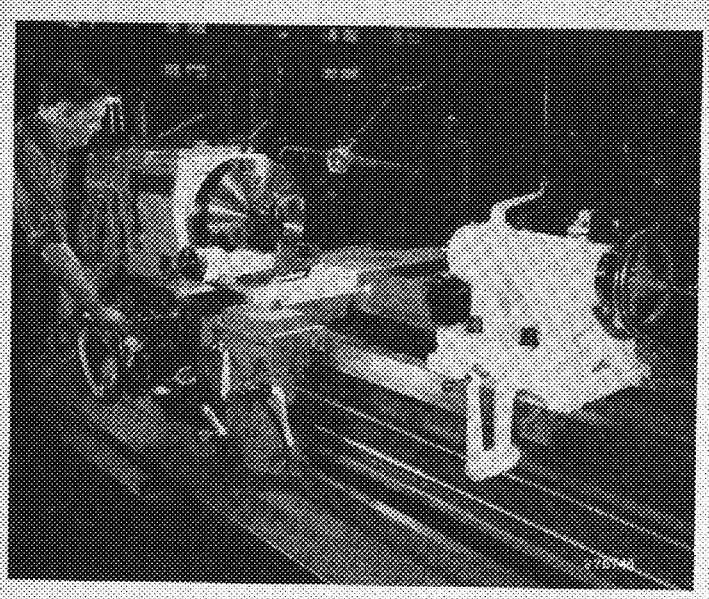
THE LUNCH WAGON provides an occasional break in the routine duties of an industrial worker and gives him an opportunity to pause for refreshments, relaxation, and a conversation period.

one of the main reasons why many men would rather join the armed services than continue to work at a job which has become monotonous. But for those who are essential to industry in this national emergency, their interest should be kept high by references to the importance of production in winning this war, and thereby help eliminate one of the greatest hindrances to our war effort.

Music is now becoming a common thing in the large defense plants and airplane factories. For several years, industrial engineers have been working on this means of eliminating monotony and increasing production. In this September's *Reader's Digest*, there is a condensation from an article in *Forbes* by Doron Antrim, entitled "Music Goes to Work in War Factories." This article tells the amazing tale of the increased production due to the effects of music. It is an immensely interesting description of one of the most fascinating methods of eliminating monotony, but it covers too much material to be discussed in this article.

Improvement of working conditions has also proved to be a method very valuable in increasing the interest of the workers. For example, the use of color combinations has not only improved the interest of the workers, but has also reduced monotony. I was interested to note that in a recent Minneapolis *Star Journal*, Cedric Adams wrote: "Factory workers may soon be faced with a lavender drill press, a soft peach lathe, a lavender assembly line. Du Pont has carried on experiments in St. Paul whereby the various machines in a plant were painted in pastel shades to relieve the monotony for the worker and results have been so satisfactory that the move may be made nationwide." To a large extent the use of various color schemes is already nationwide. Several textile mills in Massachusetts found that by the use of various color schemes, monotony was decreased and production increased because of the competition set up among various departments. Each had a color combination of its own, and all work could be traced to a specific department, the colors aiding in checking and inspecting. The laborers also took a greater pride in their work and in the appearance of their machines and the department as a whole. This method has been used extensively and has made tremendous improvements in the attitude of the workers.

The improvement of working conditions very often solves this problem of monotony, and the sure cure on the part of the employer is the choice of men on the basis of personality and interest in the type of work involved. Tests are now being given which help to determine the degree of susceptibility to fatigue of the worker on the basis of personality, and this method has met with tremendous success. There are many industries, which either have not confronted this problem, or have completely eliminated it,

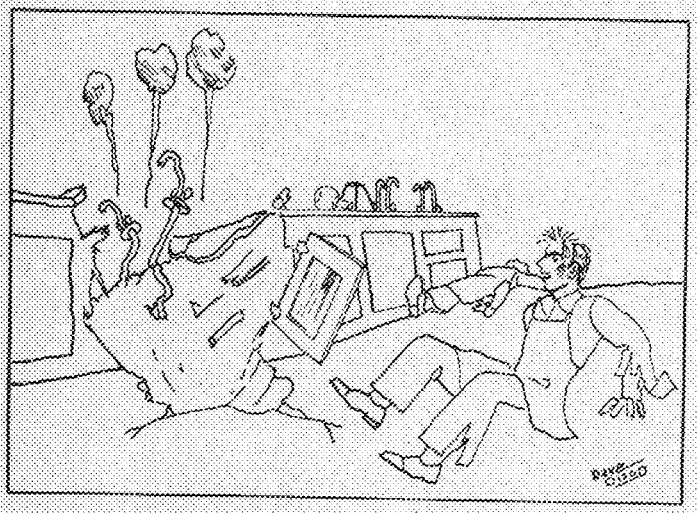


COURTESY OF WESTINGHOUSE

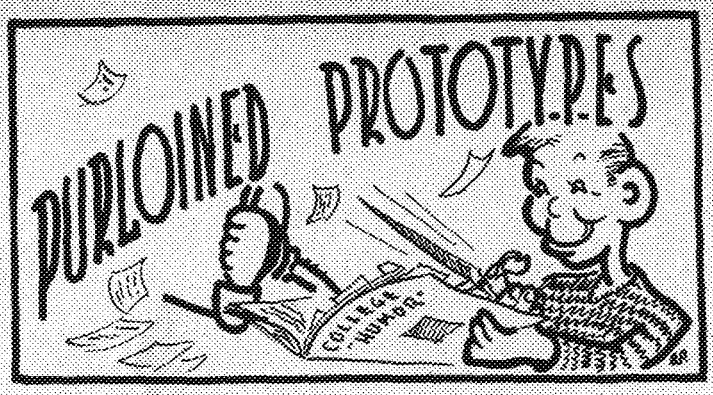
VARIOUS POWER TOOLS are at present being painted in pastel shades to reduce eye strain and glare for the workers and to prevent monotonous appearance in the machine shop.

but most large specialized plants are still working on methods to increase the interest of the worker in his job. Henry Ford, in his reply to complaints regarding monotony, stated, "It is true that repetitive work will almost kill some men, but others prefer it to anything else. An attempt was made to shift the men every three months and was met by such opposition on the part of the workers that it had to be stopped. It was apparent that some men would rather work mechanically and almost automatically rather than use their brains. One branch of the employment department of the Ford plant does nothing but attend to transfers, and if a man finds the monotony of his job getting on his nerves, he asks to be transferred, and this is done as soon as there is an opening."

The machine age is here to stay and we are in the midst of a tremendous war effort, so that we must all work hard for ultimate victory however tedious our task may be. It is entirely possible that machine production may become increasingly dull and uninteresting, but those who are the leaders of men must keep their interest strong and use all their ingenuity to reduce fatigue and monotony. The new methods of selecting men and recent improvements are aiding the psychologist, industrial engineer, and employer in solving this problem. The managements of the large industrial concerns are discovering the results of this work, so that today, great strides are being made toward the elimination of this industrial plague.



Hot dog! It worked!



BY JOHN UPPGREN, M.E., '43 AND WILEY SOUBA, M.E., '43

To you, oh gentle readers, and the one Chi Omega wot blushes, we dedicate this super-purified column.

* * *

A LETTER TO SANTA CLAUS

At sweet sixteen I first began
To ask you Santa for a man.
At seventeen, you will recall,
I wanted someone strong and tall.
The Christmas when I reached eighteen
I fancied someone hard and lean.
And, then at nineteen, I was sure
I'd fall for someone more mature.
At twenty I still thought I'd find,
Romance in someone with a mind.

I retrogressed at twenty-one
And found the college boys more fun.
My viewpoint changed at twenty-two,
I longed for someone who would be true.
I broke my heart at twenty-three
And asked for someone kind to me.
Then begged at blazing twenty-four
For someone who wouldn't bore.
Now Santa, that I'm twenty-five,
Just send me someone that's alive!

* * *

"What did you do when her dress started coming off?"
"I helped her out as best I could."

* * *

By special request:

Beneath this stone lies Murphy,
They buried him today;
He lived the life of Riley—
While Riley was away.

* * *

Speaking of these short skirts—it's not the initial length, it's the up-creep.

* * *

She reached below her dimpled knee
Into her rolled down stocking,
And there she found a roll of bills . . .
Ah me, 'twas sweetly shocking.
"Why don't you keep them in a bank?"
Inquired a nosey prier.
"The principle is the same," she said
"But the interest here is higher."

* * *

He was deeply in love with his wife, but awfully careless about money matters. He started away on a long business trip, leaving her short of money, and promising to send her a check—which he forgot to do. The rent came due and she telegraphed:

"Dead broke. Landlord insistent. Wire me money."

Her husband answered:

"Am short myself. Will send check in few days. A thousand kisses."

Exasperated, his wife replied:

"Never mind money. I gave landlord one of the kisses. He was more than satisfied."

"F-e-e-t," the teacher declaimed. "What does that spell, Johnny?"
Johnny did not seem to know.
"What is it the cow has four of and I have only two?"
The class was dismissed.

* * *

Pealing Belles

Two maids by the river were kneeling,
To disrobe for the swim they were stealing.
Said the owl in the tree,
"How'd you like to be me?"
"When the belles of the village are pealing."

* * *

The Termite

By Emmerson Edgar Allen' Gnash

(The po' man's Poe)

Once, while in a chem class dreary, while I pondered weak and weary,
Over the tedious lesson that was due two weeks before,
While I nodded, nearly napping, suddenly there came a tapping,
As of ginger-ale bottles uncapping, underneath the hard oak floor.
"Must be termites," (this I muttered), "scraping underneath the floor."
Only this and nothing more.
Ah, how softly I did mutter—soft as a lukewarm plate of butter,
But that Termite must have heard me, for he chewed right through the floor.
As I looked downward, slowly waking, saw his knees a-shaking,
I asked if he'd been making the tapping in the hard oak floor.
"Are you the one" I said to him, "that's been scraping on my floor?"
Quoth the Termite, "Hmm? Why, shore!"
No, I don't envy your position, or even your nutrition—
Is there any Vitamin B-1 in that hard and oaken floor?
And don't you ever feel the yearning to do a bit of journ'ying,
Outside this place of higher learning? Tell me—isn't it a bore?
Or ain't you heard of the "Bored of Education" underneath your hard oak floor?
Said the Termite, "Hmm? Why shore!"
I would rather be a candle or a drinking fountain handle,
Than be you, oh little Termite, down in your oaken floor,
Or a fancy blue-plate order, or our old pal Whistler's morder.
Or I think I'd even sorter like to be an apple core.
Don't you ever have the urge to do something else but bore?
Quoth the Termite, "Hmm? Why shore!"
Yes, I guess I *AM* grieving at the thought of leaving,
But darned if I'd like sleeping in your hard and oaken floor.
Then I heard a little stirring, as of a yo-yo gently whirring,
And I saw my friend go scurrying back into the floor,
"You wanna flunk?" said the teacher, "and be here *forever* more?"
Quoth yours truly, "Hmm? Why shore!"

* * *

A.S.M.E. now means Alvin Society for Male Entertainment.

* * *

He: "What are my chances with you?"
She: "Two to one. There is you and me against my conscience."

* * *

She: If wishes came true, what would you wish for?
He: Gosh, I am afraid to tell you.
She: Go ahead, you sap, what do you think I brought up this wishing business for?

* * *

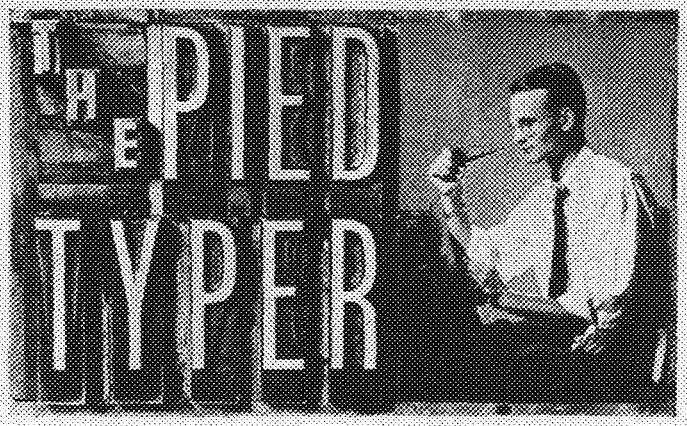
"Honey, would you mind if I kissed yo' all?"
"Ain't my lips enough?"

* * *

Practically all the engineers we know always breathlessly await those three famous words, "It's on Me."

* * *

Draft Examiner: "And now are you ready for the 50 dollar question?"



Even during the hurry and hubbub of the last minute rush that always goes with getting the magazine on the press, it makes our heart grow warm to know that we have at least one loyal reader in S.L.A. The reason that this fact is so gratifying is that we didn't know that any of the people in "Arts" really appreciated the finer things in life such as wolfing and the TECHNOLOG. The proof of this reader's enjoyment of the Log comes in the following letter.

S.L.A.
Nofember, 1942
The 15

Deer Surs,

I hav seene the latext edishun of yore hoomerus magazin an I tink it,s a very fanny book. I wood rather reed it then my Sooperman magazin becuz yore jokes are so scientifik and tecknical an' you don't waste time like Sooperman does. Did you notiz that he takes off his clothes every time sumpin happens to that babe? I did! He gets too excited, I tink. Also I dont tink a injuneer would do things in reverse too.

Wel, I jus wanted to tell you that I like yore book reel wel an that I can even unnerstan some of the very menny teknicul points that you talk about in it as I wuz born with some wolf blood in me too. Pleez dont get insulked as mine is only of the Scandinuvian Range tipe an not much corn hikker in it.

Wel, I mus close now as it,s very late for my biurgoly class an I want to reed over yore book agin so I kin unnerstan what the teecher sez about the bees. Also I wont get a Sooperman for one hole week so I kin save my money and by anudder of yore Tecknolug joke bookes nex time.

Yores troolie,
A. F. Arts Jr.

• • •

We would like to send copies of the TECHNOLOG to all former Minnesota engineers now in the service as a Christmas card from us. Because this is impossible, we can only suggest the next best thing. That is that each of you send your copy to a friend in the service. It will only cost you a three cent stamp to mail it anywhere in the United States, and we're sure that those pals of yours will appreciate hearing about what's cooking on the engineering campus. Just stop into our office (or orifice, as some would have it) and we will supply you with one large mailing envelope for free.

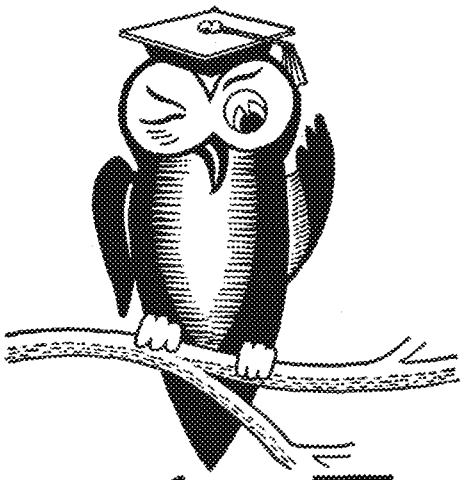
• • •

The Coffman Union has chalked up another distinctive first. It is about the only place in town where you can pay sixteen cents for a package of cigarettes and still not get any matches. We suppose that it is all right for the students to pay for the Union, but as one of the boys we talked to put it, "Why in hell do they have to pay for the whole thing in the four years that I'm here?" Maybe they're trying to protect the health of the students by making it too expensive for them to smoke.

• • •

One of our spys just rushed in in time to meet the deadline with his capsule review of the United States Army Signal Corps' film on hygiene. His review, "Don't do it boys!" Merry Christmas, and a happy final week.

J. E.



Get Ready Today

FOR THE ENGINEERING TASKS OF TOMORROW . . . LEARN TO KNOW YOUR BEARINGS . . .

The thousands of experienced engineers who are doing so much to help win victory were students once, and no doubt often wondered what they would do after graduation—just as you probably do now.

But they didn't permit thoughts of the future to interfere with the present. They prepared for whatever might be ahead. Among other things *they learned to know their bearings*—knowledge that has proved to be one of their most useful engineering assets. You'll find it one of yours, too.

After world-wide destruction must come world-wide reconstruction; Timken Tapered Roller Bearings will play as important a part in the new machines of peace as they are doing in the machines of war.

If you have not done so already, begin now to acquire a thorough understanding of the design and application of the Timken Bearing. Our engineers—bearing specialists of many years' standing—will be glad to help you.

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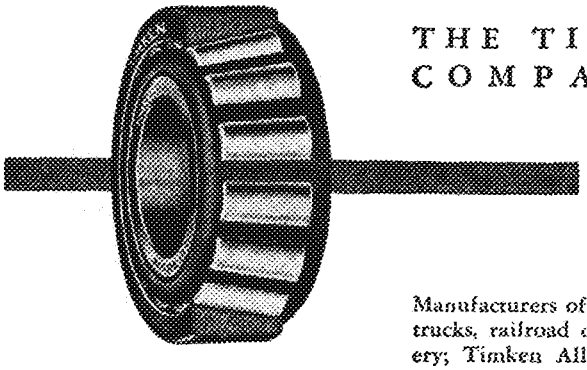

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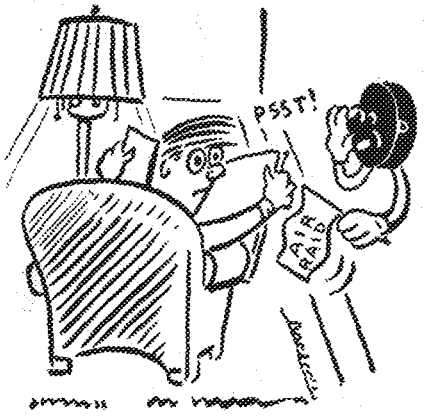
TRADE-MARK REG. U. S. PAT. OFF.

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.

G-E Campus News



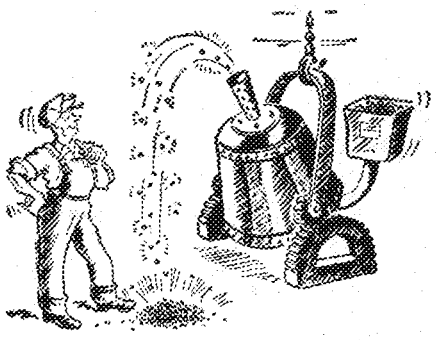
THE HOME GUARD

A DEVICE which can be installed in the home to give both audible and visible warning of air raids has been developed by J. L. Woodworth (U. of Idaho, '24) in the G-E Carrier Current Laboratory.

Designed to operate on carrier current systems, the new gadget makes it possible to contact air raid wardens and civilian defense workers without increasing the load on telephone lines.

When the air raid signal is sent from the transmitter at the power station, the home warning device (which resembles an ordinary house meter) begins to buzz.

After it has thus called attention to itself, the device lights up, and on its dial will appear a colored signal—yellow for preliminary caution, blue for advance caution, red for air raid, or white for all clear—that corresponds to the signal sent from headquarters.



"VEE" JEWELS

THE General Electric Company has developed a method of fusing a special type of glass and forming a miniature jewel. How it's done is a military secret, but the jewels are made on a mass-production basis.

The jewels, called "Vee" jewels (not V for Victory, but "Vee" for the V-shaped depression in which a cone-shaped steel pivot rotates), are in great demand for use in the indicating instruments that measure the flow of electricity in wartime fighting and industrial control equipment. The moving parts of these instruments are of watch size and delicacy, each requiring two Vee-shaped jewels about the size of the head of a pin.

The G-E "gem" has been developed as a substitute for the "Vee" jewels made from sapphires formerly supplied by Swiss craftsmen.

YOUR SMOKE IS SHOWING

A TRAIL of smoke often leads enemy submarines to their intended victims, but an electronic tube might help to give the subs the slip by instantly warning the ship's fireman when smoke is coming from the vessel's stack.

General Electric has already put the phototube, most versatile of the electronic tubes, to work in industrial plants to warn of smoking stacks and to save fuel. W. C. White (Columbia, '12), director of the G-E electronics laboratory, thinks a similar arrangement might be used in ship stacks.

A beam of light, thrown across the smoke column in the chimney, shines on the tube. When the smoke gets too thick, the light is blocked and the phototube works a relay which sounds a warning for the fireman.

GENERAL ELECTRIC

958-80-213

MINNESOTA TECHNIC

IN THIS ISSUE

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PLUGGY IN HELL
ENGINEERS' DAY
PLASTICS ARE HERE
MACHINE GUNS

JANUARY • 1943

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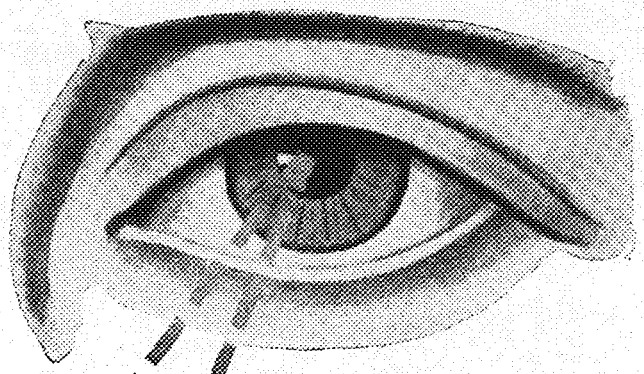
INSTITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA



LEARN TO KNOW YOUR BEARINGS NOW

YOU'LL BE GLAD IN THE YEARS TO COME

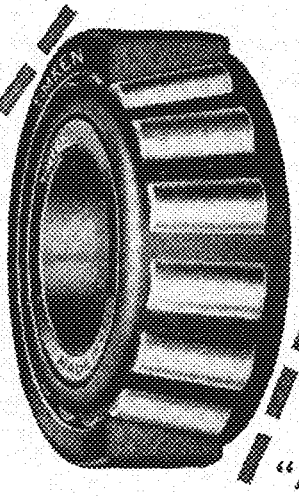
There is no one other feature common to machines of all kinds that has such an important influence on performance and endurance as bearings.

The greater the progress in machine design, the more important bearings become—and especially Timken Tapered Roller Bearings, for they meet every bearing situation in every machine.

They help to step up speeds by eliminating friction; they help to increase precision by holding shafts and gears in correct and constant alignment; they promote endurance by their ability to carry radial, thrust and combined loads in any combination.

By acquiring a thorough knowledge of Timken Bearing design and application now you will have the solution of any bearing problem at your finger tips when the time comes for you to put your engineering education to practical use.

So begin now to make a systematic study of Timken Roller Bearings and their possibilities. Timken Roller Bearing Company engineers will be glad to help you.



THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

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.

"All There Is In Bearings"

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

99.98% pure

isn't pure enough!

APPROXIMATELY 90 billion kilowatt-hours of electricity will be consumed to produce all of the aluminum and magnesium we shall need for warplanes and other uses during 1943.

And every kilowatt of this vast amount of power must be *converted from A.C. to D.C.* before it can be used in the production of these metals.

Most of this conversion will be done by the Ignitron . . . *a new and more efficient mercury rectifier* that is a direct result of Westinghouse "know how" in electronics research.

The vital factor in the efficiency of the Westinghouse Ignitron is the *extreme purity* of its electrodes. The graphite anode must be 99.99% free of certain impurities . . . the mercury cathode, 99.999% free of other impurities!

If certain impurities in the mercury increase 1/1000th of one per cent . . . or in the graphite, 1/100th of one per cent . . . the proper operation of Ignitron will be affected.

Few chemists have the skill, knowledge, and special equipment to solve such a problem of almost absolute chemical purity. For this reason, Dr. E. Bruce Asheraft . . . micro-chemistry expert of the Westinghouse Research Laboratories . . . was assigned to the job.

Dr. Asheraft lives in a Lilliputian world of chemical analysis. Tiny test tubes, doll's-size beakers and retorts, polarizing microscopes, spectrographs, a balance that measures the weight of a *millionth of a gram* . . . these are the keys he employs to unlock the invisible world of matter.

With the help of micro-chemistry, Dr. Asheraft has made possible the control of the extraordinary purity of all graphite and mercury used as electrodes in Ignitrons.

And now, *electronics at work* are bringing victory closer every day . . . for Ignitrons with a rated capacity of more than 3,000,000 kw are turning out the thousands of tons of aluminum and magnesium upon which our Arsenal of Democracy depends!

* * *

WE SALUTE DR. ASHCRAFT and the other thousands of scientists who are working for victory in research laboratories all over America.

We also salute the scientists of tomorrow . . . the engineering students now in college who will be called upon to rebuild a war-torn world.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

TOM THUMB CHEMISTRY . . . Dr. E. Bruce Asheraft examines a specimen weighing less than a microgram . . . approximately 1/50th the size of a grain of ordinary table salt. Dr. Asheraft received his B.S. at Texas A&M. and his Ph.D. at Cornell University in 1937.

Westinghouse

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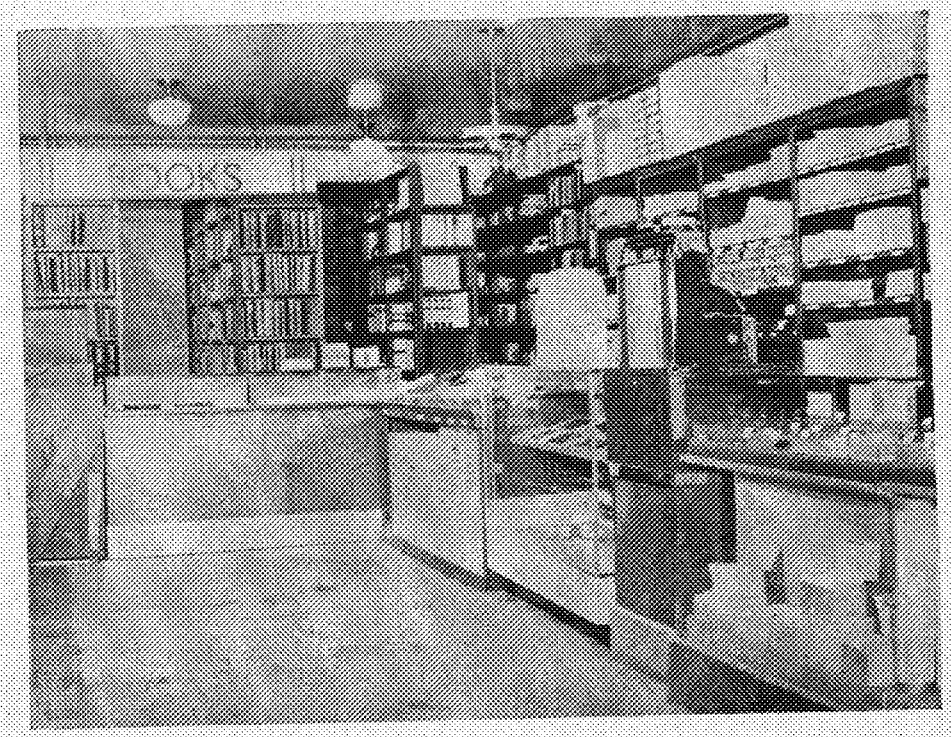

Serves the Students in the Following Colleges:—

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and

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Harold D. Smith
Manager

Main Engineering
Building

This Month . . .

BY RONALD HOAGBERG, E.E. '46

Author of the article on plastics is **Fulton Holtby**. Mr. Holtby is Assistant Professor in the Mechanical Engineering Department and is in charge of the foundry. He has been an instructor of foundry practice at the University of Minnesota since 1935. He but then we have always maintained that he was a bonehead. in 1934 and received his master's degree in 1939 while at Minnesota. In the past five years he has developed the foundry course from a single manual training course to five technical courses, two of which carry graduate credit toward advanced degrees.

FOUNDRY'S FOUNDATION

He has had considerable experience as an engineer in commercial foundries, and has written several articles on foundry practice.

Outside of his work on the campus his interests include music, woodworking, and model railroad construction.

He is a member of the American Foundrymen's Association, American Society of Mechanical Engineers, American Society for the Promotion of Engineering Education, Cupola Research Committee of the American Foundrymen's Association, Twin City Foundrymen's Association, Sigma Xi Honorary Society for Research.

• • •

"Exhibit A" was born in St. Paul and attended Linwood grade school following in his brother's footsteps as captain of the school police. Then on to Central High where he graduated eventually with three letters in tennis, as treasurer of the senior class, and second in scholastic honors. At Central he also won the Sophomore Honor Medal and captained two tennis teams to conference honors. The following fall he went East to the Coast Guard Academy for two years. He continued his career in tennis there by winning two letters. It took a good case of sea-sickness and a life-long desire to be an engineer to finally make him transfer to Minnesota. Mel likes basketball, swimming, and of course, tennis. He also spends a good deal of his time hunting, but he would not tell us what. This Christmas vacation found him working in the Geology Department assisting Professor Grout. It was there he found his head was not made of rock, but of bone—but then we have always maintained that he was a bonehead. He is a member of the Phi Epsilon Pi fraternity and the American Society of Mechanical Engineers. For more information see your latest "Who's Who."

MEL MARK "EXHIBIT A"

Oh yes, need we add that he has a column (?) in this magazine.

NAVY'S GAIN

While working on a paper for the senior mechanical engineering seminar, **J. William Chandler** became interested in the development of the machine gun. This month, William, or Bill, gives us the story behind this most important firing arm of modern war.

Bill graduated as a first lieutenant from Cretin Academy, St. Paul, in 1939. In the summer of 1939 and 1940 he did blueprinting and tracing work in the office of the Standard Conveyor Company. In the summer of 1941 he decided to have some fun while he worked so he got a job as a busboy at Yellowstone Park. Last summer he accelerated his program by going to school through the summer quarter.

A few years ago Bill enjoyed making and flying model airplanes. He also likes tennis and photography. He plays the trumpet, but mainly for his own enjoyment.

Bill is in V-7 and after graduation in July he expects to be called to training to become an engineering officer.

• • •

"Airplanes Fit to Fight" originally given as a paper before this year's A.S.M.E. convention in New York was condensed for the TECHNOLOG by **James Maltby**. Jim, who was an editorial assistant in his sophomore year, is now the feature editor of the Minnesota TECHNOLOG. He is an aeronautical engineering junior and is enrolled in the Navy's V-7 program. He became interested in airplanes while he was in high school at Mahtomedi. Jim was editor of the school annual and he wrote editorials for the school paper.

FRESH AIR TYPE

At the present time he is recovering from an operation he had during Christmas vacation, but when he is in top shape, swimming, tennis, and skiing head his list of favorite sports.

During the summer of '41, Jim worked as a rodman with the field engineers at the New Brighton Ordnance Plant. This last year he accelerated his program and went to school during the summer quarter.

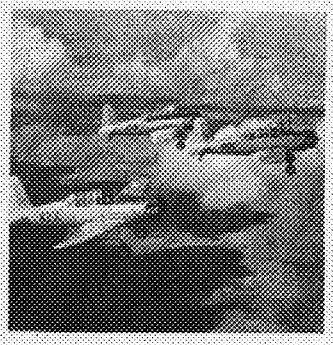
He is treasurer of the Triangle fraternity.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

MINNESOTA TECHNOLOG



THE COVER picture is of three new Vultee training planes at the Enid Army Flying School.

THE FRONTISPIECE shows some of the different types of gears used to translate the high rpm speed of a turbine into slower, efficient propellor speeds.

STAFF

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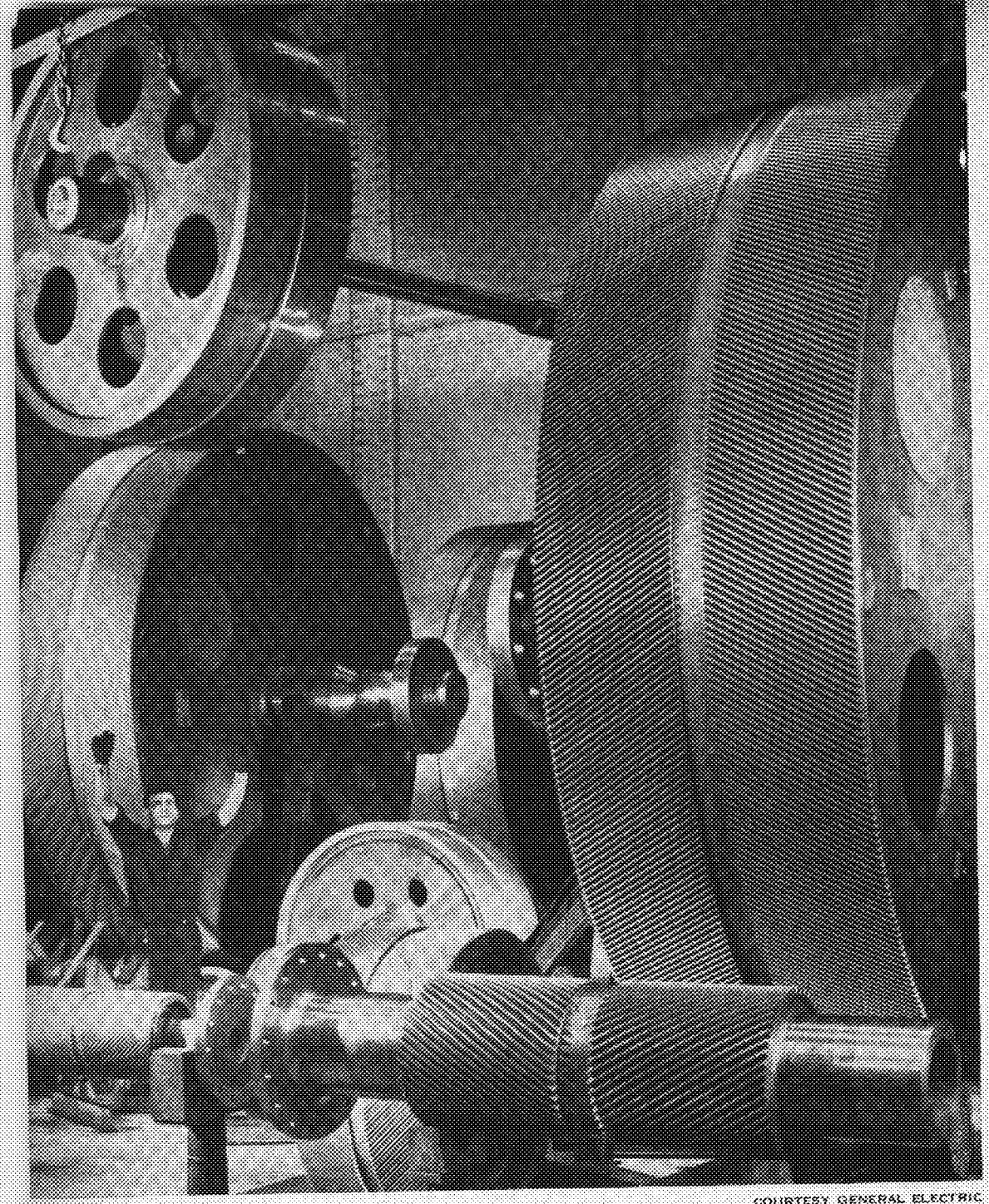


COURTESY GENERAL ELECTRIC

GEARS FOR THE U. S. NAVY

Here are some of the different types of gears and pinions used to translate the high rpm speed of the propulsion turbine into slower, efficient propeller speed. Workman is directing overhead crane removal of a high-speed gear blank to a hobbing machine that will cut teeth into its circumference. Larger gears shown are low-speed, or "bull" gears.

Hobbing machines cut teeth in bull gears of 35 tons and 280-inch diameter to a tolerance of 0.0003 of an inch. Rough and finish-cutting these gears requires 285 hours. Finish cuts must be made without interruption, and an auxiliary power supply as well as a duplicate lubricating system is always ready for emergency use.

The temperature in the gear shop is always kept within a few degrees of 72 F. and gears are "temperature-conditioned" before they are taken into the shop.

Airplanes FIT TO FIGHT

NATHANIEL F. SILSBEE
MAJOR U. S. ARMY AIR CORPS

REPRINTED FROM
MECHANICAL ENGINEERING

THE exact role of air power in this war may still be a favorite subject for argument but an impressive array of facts indicates its decisive importance in the final victory. Even in 1940 Secretary Stimson said: "Air Power has decided the fate of nations. Germany with her powerful air armada has vanquished one people after another. On the ground large armies have been mobilized to resist her but each time it was that additional power in the air that decided the fate of each individual nation."

In defense as well as attack, air power has proved of priceless value. Over Dunquerque and during the air battle of Britain, the Royal Air Force gained local air superiority and stopped the Luftwaffe cold. Last winter the Soviet air force, underrated by the Nazi high command, was a major factor in holding off the enemy. The air blitz on supply lines has seen remarkable examples in the North African campaign and in stopping the ambitious Nipponese in the Solomons and New Guinea.

To gain the air superiority we need, if our side is to win the war, America must have a properly balanced air force. This includes a sufficient quantity of high-quality airplanes—bombers, fighters, reconnaissance, transport. We must have hundreds of thousands of well-trained airmen; and that means not only the air crews, such as bombardiers, navigators, pilots, and gunners, but also the ground crews whose important job is to "keep 'em flying." We must have air bases at strategic points, including landing fields, storage and maintenance facilities, housing and technical installations, and all that must be provided to enable a modern air force to carry on. To maintain American air-force offensive actions at the far-flung battle fronts, an air-supply system must be in operation.

On this four-square basis, America's striking power in the air is being built—airplanes, airmen, air bases, air supply.

Providing the Ingredients

Is this stuff at last really rolling? Our phenomenally expanding aircraft and engine industry, now the biggest industry in the country, is beginning to take care of the airplanes, having already exceeded the rate of 50,000 planes per year, with the quality, as we shall see presently, topnotch. Already, on a dozen fronts, the box score demonstrates that our planes are beginning to show their ability to outfly, outbomb, and outshoot the best the enemy has to offer. We have under the test more than a score of new fighters, bombers, and transports. Many of these have already flown but are still on the secret list and are enough to "make the angels gasp." Speeds, fire power, bomb loads, range, ceiling, safety features—all are there. But to keep this edge in quality, the aeronautical-research facilities of the country must be kept in top gear. The enemy is working on this day and night. Our setup includes the aircraft industry, Wright Field, Eglin Field proving ground, Naval Aircraft Factory, and National Advisory Committee for Aeronautics, with its establishments at Langley Field, Va., Moffett Field, Calif., and new engine-research laboratory near Cleveland. During August and September, American air power began to play a really important part on several fronts; beginning to roll back the Japs in the south Pacific and the Aleutians, helping stall Rommel in Africa, and commencing the eye-opening daylight raids over Europe with our *Fortresses* and *Liberators*. For these 2 months, the ratio had increased to 8 to 1. The Navy and Marine figures are no less remarkable. The principal reason for this change in the situation is the fact that by that time balanced air forces in these areas were being built up. Newer models were available, such as the Boeing B-17E *Fortress*, with stinger tail guns, and the Curtiss P-40F *Warhawk* with higher ceiling than earlier models. Newer types, such as the speedy Lockheed P-38 *Lightning* Intercep-

(Continued on Page 110)

Don't Let This . . .

PLUGGY GOES TO HELL

. . . Happen To You

BY GORDON DICKSON

ILLUSTRATED BY BOB PLATT

IT WAS in the winter quarter of his sophomore year that Pluggy Snurt received the pink slip edged in black. He was an average engineer—young, bottlenecked and likeable. He had been getting pink slips on and off for a year now, but since he could not read and was too bashful to ask a senior mechanical to read them for him, he had just taken them home and pasted them on the wall around his bed. He thought they looked pretty on the purple wallpaper. This pink slip edged in black was something different, however, and he felt he had to know what it meant. So he hunted up a prof whose class he had been in for four quarters and who knew him by sight.

"Huh?" asked Pluggy, shoving the slip under the prof's nose.

"Quiet!" roared the prof, hitting him with a large club, having a spike in the end. Pluggy pulled the spike out of his head and waited patiently.

"Xcess times a over + to the minus nineteenth," mumbled the prof, his slide-rule smoking with the constant motion.

"z minus damn cosine alpha b divided by 3tx," muttered the prof. . . .

"Aha!" yelled the prof in triumph, "z = z."

"Now, what is it?" he asked, taking his club away from Pluggy. Pluggy flourished the slip under his nose. He looked at it. He patted Pluggy on the head kindly.

"I'm going to miss you, Pluggy," he said. "It's the office at the end of the hall." Pluggy smiled and trotted out.

He went in the door at the end of the hall and found himself in a large room completely empty. Suddenly he heard the roar of a French 75, and two medics came out of a smaller room that opened onto the office. They were carrying a dead engineer, and talking to each other.

"No," said the taller one, "I prefer a buzz-saw."

"It saves work, yes," the other conceded, "but the neatest incisions are made with meat cleavers, you can't deny that." He caught sight of Pluggy standing by the door.

"Hey, you," he said, "do you want your grade changed?" Pluggy smiled, shook his head, and showed them the slip.

"No use waiting for this guy, Mike," said the taller one. "Heave ho!" They slung the body onto their shoulders and went out the door. Pluggy walked into the little room they had just come from.

A huge man of Satanic aspect was seated behind an enormous desk, cleaning a cannon with his pocket-handkerchief. He chuckled evilly as Pluggy came shyly forward and laid the slip on his desk. Then he leaned back in his chair and brought his bushy eyebrows close together.

"Snurt," he thundered, "You are a disgrace to this institution. Look at the pictures on the wall around you. J. Flurg, M.E. '39, graduated with a D plus average. Uri—straight D's all the way through college. P. Mjjjjilf, the same. But these glorious examples have not stirred you. In vain we have tried to help such as you by giving ten honor points for every condition

(Continued on Page 112)

ENGINEERS' DAY FOR 1943 will be held February 19 and 20. Above is a picture of part of the festivities during the knighting ceremonies which were part of last year's Engineers' Day. Each senior engineer was made a knight of Saint Patrick and claimed a kiss from the queen.

The Coming Thing

"E" DAY — 1943

Engineers, arise and look forward to your day of gala celebration. This year, Engineers' Day is going to be held during winter quarter so that the accelerated seniors will not miss out on the festivities held in their honor. Due to the change in date many changes have been made in the program with more activities added to make this year's Engineers' Day the biggest of them all. Of course, as all good engineers know, all books are ruled closed for the day by the high and mighty order of Saint Pat.

Who will be our queen? How is she to be selected? Will she be blonde, brunette, or redhead? These are the questions which are on the minds of all the engineers. Although the engineer is known as a "wolf" to the rest of the campus, he really has a good taste for beauty, therefore, the queen of Engineers' Day may well be called "the queen of the campus." The queen is crowned during the knighting ceremonies and reigns supreme along with Saint Pat over the remaining festivities. The name of the queen will be kept a deeply shrouded secret until it is revealed at the annual sunlight dance.

There will be a limited supply of buttons so be sure to get yours early and get in on all the fun. Your Engineers' Day button is going to be your admission to many of the featured events which include athletics, the skating party, and the sunlight. To be in style, wear your button daily.

This year's program will get off to a hilarious start with a snake dance through the campus led by a university band. The snake dance will end up at the Union for the sunlight at which an outstanding campus band will play. Be sure to come early and meet all of your friends. Everybody will be there.

For the knighting ceremony the engineer puts on his cleanest "T" shirt. The queen and Saint Pat are crowned and proclaimed the rulers of the day. The seniors are honored and presented awards for high scholarship and participation in activities.

Sports events in which everybody can participate will be held this year. A new feature of Engineers' Day will be a basketball tournament with many teams expected to participate. The annual bowling tournament which has proven itself very popular in the past will again be held this year. Individual medals will be awarded to members of the winning teams. Get your teams organized at once and register them at the Engineers' Day office in the Union.

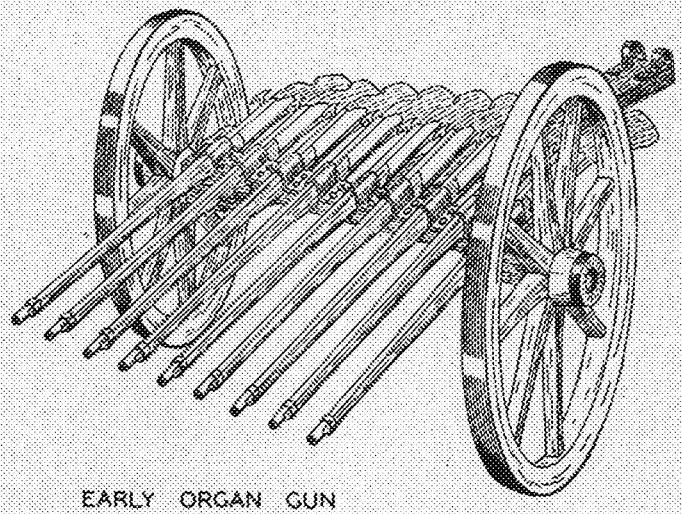
Another new event for the Engineers' Day of 1943 will be a skating party to be held on the skating rink on Northrup Field. There will be skating set to music in which the engineer can relax from his daily routine.

The finale to the celebration will be the Engineers' Brawl to be held at the Radisson Hotel. The music will be furnished by one of the Twin Cities' well-known dance bands.

Early Automatic Arms Were

GREAT

ILLUSTRATED BY KEN COLES

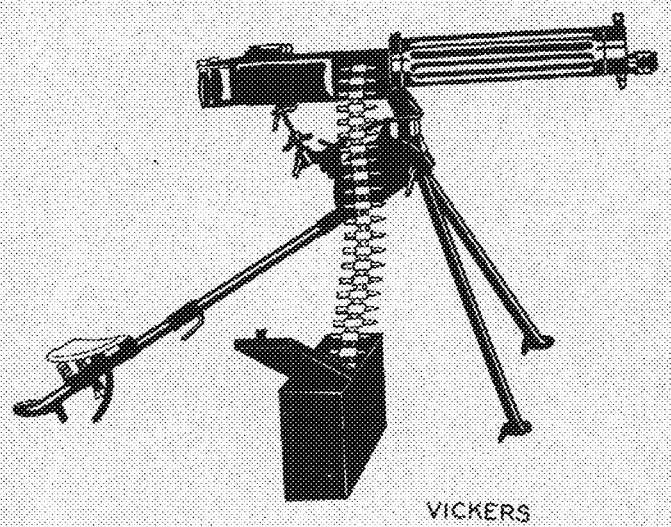


EARLY ORGAN GUN

SINCE the time when firearms first came into existence some six or seven hundred years ago, there have been three main problems to be overcome by those who designed and used them. The first is the arrangement of a chamber and barrel through which a projectile can be driven by a charge of explosive. The second is that of providing an ignition system to fire the charge, and eventually a container to hold the charge as a separate unit in the form of a cartridge. The third is that of providing ways and means to repeat the discharge and fire successive shots as rapidly as possible.

It may be seen that the third problem was almost entirely dependent on the second. For many years the principles behind most of the modern repeating systems were understood and applied as nearly as possible to the arms at hand. But their practical application awaited an ignition system that could be adapted to making the charge of a firearm a self-contained and self-igniting unit.

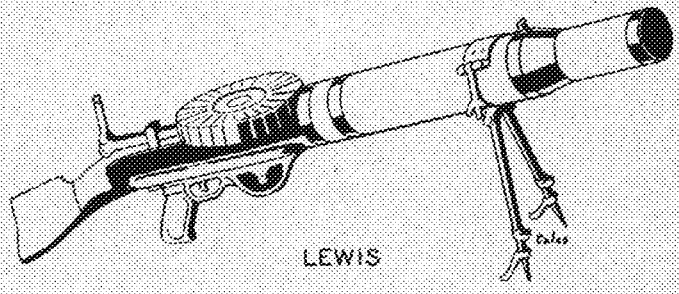
The early gunsmiths found the simplest way to increase firepower was merely to add more guns to a unit. Three or four guns mounted on a rack were first tired and later attempts were made with over one hundred guns mounted on a cart. It is interesting to note that the users of these guns must not have been overly confident of the destructive power of their weapons for lances were usually affixed between every third or fourth gun. At any rate these organ guns, as they were called, must certainly have presented a formidable appearance.



VICKERS

A particular gun used by the French army had 144 barrels arranged 12 in a row in such a way that one fire or train of powder would fire each row. In the records of Conrad Keyser taken from 1390 to 1405 are shown illustrations of guns with several barrels arranged parallel to each other. These guns were called organ guns because of their similarity in appearance to a pipe organ. It is not surprising that the great military engineer, Leonardo da Vinci, turned his hand towards designing a rapid firing gun. One of his novel arrangements consisted of an organ gun with its barrel pointing in a fanwise direction so as to cover the entire field.

Besides the organ gun, the inventors turned to another idea for success. A series of guns was arranged around a revolving block or disc. With this arrangement only the barrels revolved while the breech remained stationery. As this disc was rotated each barrel came in line with the breech and the charge was ignited. Da Vinci designed a revolving gun which consisted of a series of 72 guns arranged around a horizontal axis with 8 and 9 guns to a set. "Each set pointed at a tangent from the circumference of the drum and was supposed to be discharged when a revolution of the wheel brought them on top and they pointed towards the enemy." According to Fleurange's memoirs, an engineer, Pedro Navarro, made 200 organ guns for Louis XII of France. The barrels were two feet long and were supposed to fire 50 rounds. It is not known whether these guns were ever actually used in service or not. Maximilian the I had several guns designed for him but they were not different from those already noted.



LEWIS

All of these guns mentioned were not practical for many reasons. The main difficulty was the fact that the enemy could make considerable advances during the interval required to go through the complicated loading and priming operations necessary between each discharge. Then, too, there was little field strategy employed when the weapons were used in battle. It must be remembered that in those early times artillery was as yet scarce and only a small proportion of the infantry had guns at all.

The match lock made its appearance about 1300 and the wheel lock came into use in 1517, but in battle the soldier carried lighted pieces of tape to make ignition certain. About the middle of the

GUNS

BY J. W. CHANDLER, M.E., '44

sixteenth century, an important step in rapid firing was accomplished. The soldiers began to wrap powder in cartons and carry these into battle with them. In this way, the speed of loading could be greatly increased. This idea was used on the organ and revolving guns of the time and materially increased their efficiency. Later, the ball was bound into the neck of the carton and thus the first cartridges were produced.

In the second half of the sixteenth century, a number of arquebuses were set on a cart with a shield in front. This gave a fairly concentrated fire plus a degree of mobility and protection. Mention is made of repeating guns about 1577, but this is probably merely a different name for the revolving-barrel gun. At this time, however, there were several methods of breech loading which also increased the practicality of the early multiple barrel guns. A Chinese gun is reported to have been used in 1590 which had a revolving breech and only one fixed barrel. This development constituted a great improvement over the revolving-barrel guns but there were still the usual priming difficulties. The invention of the flint lock in 1635 was another big step in eliminating these difficulties.

Not a Bawble

In 1640 and 1641, England and France both produced guns firing from six to eight shots a round, but they were kept very secret. This secrecy was probably an indication that the use of the multiple firing gun was at last coming into favor. Strong testimony to accomplishment of rapid firing guns is given by Pepys in his diary in 1663: "After dinner, was brought to Sir W. Compton, a gun to discharge seven times, the best of all devices I ever saw, and very serviceable and not a bawble; for it is much approved of, and many thereof made."

Most of these early forms were slow loading and dangerous, and it was not until the invention of the percussion cap by Alexander Forsythe in 1805, that any truly practical rapid firing gun could be developed. This invention eventually made possible the Gatling gun of 1865.

It is interesting to note that the first practical machine gun was invented by an American, Mr. R. J. Gatling. This machine gun was the first to be officially adopted by the United States and Great Britain. The Gatling gun was used for about 25 years with only slight modifications and was then rendered obsolete by the development of the recoil operated gun.

"The Gatling gun consisted of eleven barrels; usually ten, in common with a grooved carrier and lock cylinder, the whole rigidly secured about a main shaft." The gun was operated by turning a crank, which in turn, rotated the barrels. As each barrel came in line with the breech, it automatically locked while the round was fired. Since each barrel fired only one out of every ten shots there appeared little tendency of the gun to over-heat. These constantly rotating barrels tended to make the gun unsteady and consequently rather inaccurate.

Though it had ten barrels, the Gatling gun had only one breech. This breech was so arranged that there was a cartridge always ready to be fired whenever a barrel came into position. Although the breech was mechanically safe, it was subject to frequent jammings and cartridge stoppages. These difficulties were not caused by any defect of breech and bolt action, but were the result of an inefficient gravity feed system.

In 1889, Sir Hiram Maxim announced the development of a new type of machine gun. Maxim had disregarded the principles of the Gatling gun and turned to a new principle of operation. He utilized the energy from the recoil of the gun to supply the force for automatic firing. His gun also introduced two more important developments, the belt cartridge feed, and the water-cooled barrel.

When the cartridge was exploded, the barrel recoiled against an antagonistic spring, which in turn, was made to do the work of loading, firing, and ejecting. In other words, the only necessary operation required when operating the Maxim gun was to fire the initial cartridge. It is interesting to note that this system of recoil operation worked perfectly on Maxim's first model. Inasmuch as the recoil of the barrel must be provided for, it may be seen that it is doubly effective if it can be made to do work at the same time.

The belt cartridge was almost as significant an improvement as was the principle of recoil operation. If the difficulties in perfecting a positive feed for the Gatling gun are recalled, it can be seen what a big step forward the belt feed became. The web belt was a simple, rapid and positive method of feeding the guns. The belt itself consisted of two pieces of flex webbing connected by brass strips with eyelets between adjacent cartridges. There was a handle secured to each end of the belt to facilitate loading. One belt usually held about 250 cartridges and was carried in a box for convenience during transportation.

World War "Vickers"

The Maxim gun was soon adopted or copied by many nations. The English made a few changes and called their gun the Vickers. The Maxim gun was used extensively by Germany during the first World War. The principle of recoil operation led to the development of machine guns operated by the recoil of the gases and the recoil of the cartridges.

Though the heavy Maxim gun was highly efficient and effective, it had its disadvantages in actual combat. The demand arose for a light gun which could be easily moved into position and handled by one man if necessary. The new science of air fighting was also calling for a new type of gun which could be used on the airplane.

To meet the demands for a light, simple, automatic weapon, the Lewis machine gun was developed. The Lewis was a gas-operated gun with a positive air cooling system. Instead of the heavy belt feed, a rotating drum holding 47 cartridges was supplied. The complete gun weighed only thirty pounds as compared with the 75 to 80 pounds of the Maxim gun. The heavy cumbersome tripod used on the large gun was replaced with a light pivot mount.

Early Aircraft Guns

When the airplane came into use as a fighting machine, it was equipped with machine guns. The first guns used were merely regular infantry models mounted on the airplane, but as time went on, the machine gun for use on aircraft was developed. Aircraft machine guns were divided into two classes, those fired independently and those fired through the propeller.

The synchronized machine gun was geared with the motor of the airplane, so as to fire between the blades of the propeller. The belt-fed type of gun, such as Vickers, was used because the light machine gun did not carry sufficient ammunition. There was no trouble keeping the gun cool in the air, so usually the water jacket and other unessential parts of the gun were removed. The synchronized guns were usually mounted in pairs on the fuselage and were aimed by pointing the entire plane at the objective.

When the plane carried more than one person a pair of Lewis guns, mounted on a swinging rack, was also carried. These guns could not be belt fed because the belt interfered with their mobility. The Lewis gun was used in this capacity without any major modification, the only substitution being that of replacing the regular rifle stock with a spade grip.

The synchronized gun is not used on modern planes because of the slow rate of fire necessary when firing between the propeller blades. Instead, the guns are mounted in groups of four or more on each wing and arranged to fire outside the arc of the propeller. The very latest in aircraft armaments exclude machine guns entirely and uses four 20 mm. shell guns instead.

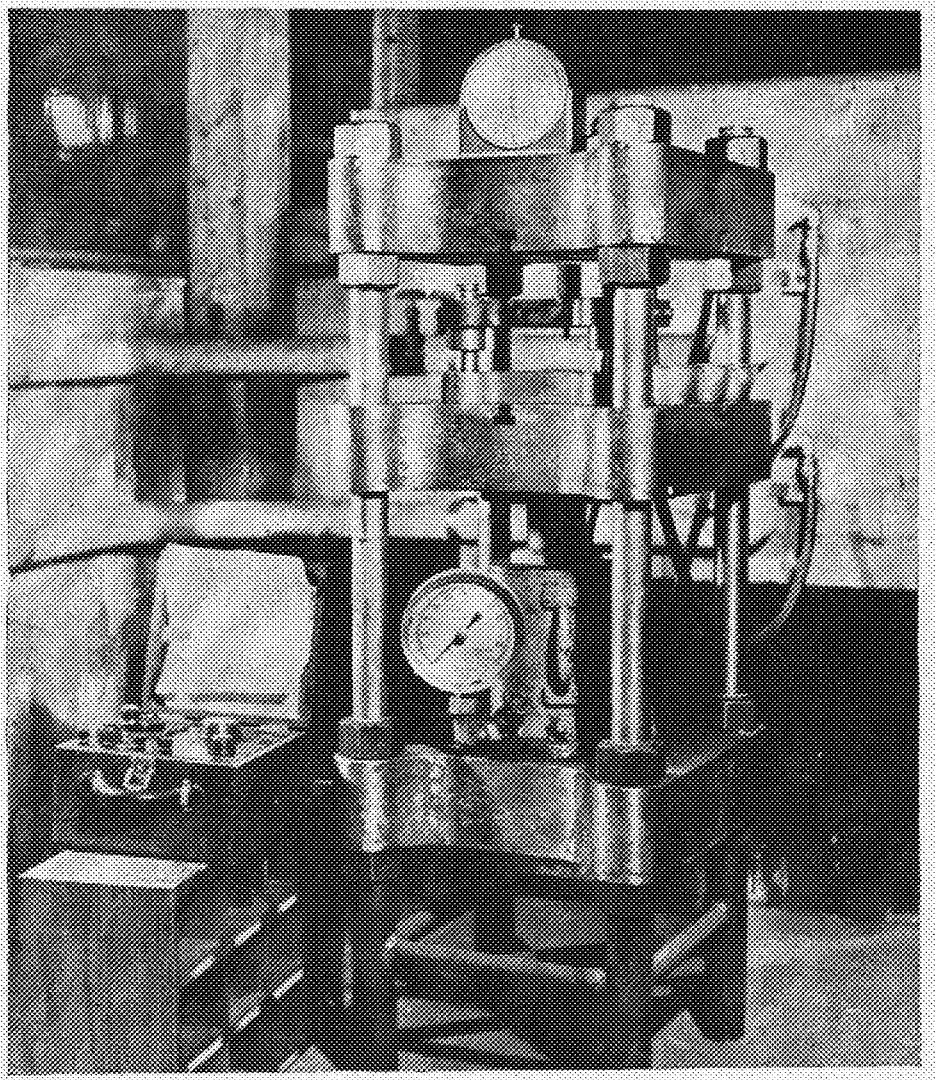
There have been few improvements over the machine gun of the first World War. Most of the changes have been developed along such lines as sights, mounts, etc. The rate of fire of the modern gun is about twice that of the World War model because of advances in manufacture and design of the moving parts.

The Battle of France showed that the answer to the machine-gun held line was the armored *panzer* unit. For this reason, the trend has been toward heavier guns, such as the anti-tank gun, the 50-caliber machine gun, and the automatic cannon. However, all these heavy rapid fire weapons operate on the recoil principle first proposed by Sir Hiram Maxim. The machine gun by itself is no longer the main weapon of the infantry.

An Easier life with

PLASTICS

BY FULTON HOLTBY
ASS'T PROF. MECHANICAL ENGINEERING



PLASTICS PRESS designed and built by the mechanical engineering department. Pressure is supplied to the press by a hydraulic jack with a rated capacity of fifty tons.

THIS morning you might have awakened to a plastic alarm clock, pressed a plastic light switch, and observed the first signs of a winter dawn through plastic venetian blinds. You shaved with a plastic razor and used a plastic toothbrush. You put on a plastic belt or suspenders and clothes having plastic buttons. You made toast in a plastic handled toaster and ate breakfast with plastic-handled tableware. You listened to a plastic-cased radio, spoke in a plastic telephone, and checked the weather on a plastic thermometer.

You rode to school on a car having plastic safety glass and many plastic parts, smoked a cigarette taken from a plastic case, and used a plastic ash tray. The day is young but before you reset the plastic alarm clock you will use a plastic fountain pen, take a picture on plastic film with a plastic camera and use many articles made of plastics.

Easily Shaped

The word plastic means capable of being shaped or molded. The term plastics, as we think of it today, refers to those materials which are easily shaped or molded. Many plastics are cast and machined, some are used as adhesives for plywood, and many others are laminated and rolled. The largest single use of plastic materials is in molded products.

Plastics in the original form before molding are powdered. The powder is put into molds, sometimes called dies, and heat and pressure are applied simultaneously to form a finished product. The process of molding plastics is sometimes referred to as casting. Powdered plastic materials are all specially compounded chemically to meet specifications as to their physical and chemical properties when finished. There is on the market a plastic for practically every purpose and need. The presses used in molding are usually operated hydraulically with the molds being heated by steam or electricity.

Two Kinds of Plastics

All the varieties of plastics may be placed in two categories: thermosetting and thermoplastic. Thermosetting molding materials are those which can be softened to the consistency of glazing putty by heating. By applying heat and pressure as prescribed the plastic material is forced into contact with the mold to form the desired shape determined by the inside contour of the mold. The pressure holds the material against the mold while additional heat brings about a final chemical change which results in permanent hardening of the material. Thermoplastic molding materials differ from thermosetting ones in that there is no chemical change involved so that after heat and pressure have been applied to force the material into contact with the die, the plastic remains soft until hardened by cooling. The product can be softened and hardened over and over by repeated heating and cooling.

A printer, John Hyatt, in 1870 discovered the first important plastic material, celluloid. While experimenting to find a substitute for ivory used in billiard balls, he found that cellulose pulp treated with camphor and nitric acid formed a material which when hot could be formed into any desired shape. His discovery made possible celluloid photographic film and resulted in the craze on celluloid collars, cuffs, combs, and novelties.

Celluloid is a thermoplastic material being dense and hard at room temperature, but soft and pliable when heated. When the thermoplastic is cooled it becomes dense and hard again and retains any new shape

to which it may have been formed. Since there is no chemical change in a thermoplastic material it will not withstand either heat or any chemical which would attack it before molding. Shellac and bituminous compounds are thermoplastic.

Beginning of Bakelite

Dr. Leo Baekeland discovered, in 1909, that a reaction of phenol and formaldehyde with a suitable catalyst could be formed into an insoluble mass by application of heat and pressure. This plastic was named Bakelite and because of its good insulating and mechanical properties found immediate use in the young and rapidly developing electrical industry.

Bakelite is a thermosetting compound made up of a binder and a filler. These compounds can be compared with concrete which is a mixture of cement and sand, and which has been hardened by a chemical reaction in the presence of water. The cement is the binder and the sand is used as a filler to decrease cost and provide resistance to changes in shape. The binder in the thermosetting Bakelite is the phenol-formaldehyde resin, which is mixed with a suitable filler such as powdered wood, asbestos fiber, or even cloth. When this mixture of binder and filler is heated and pressed in a mold, a chemical reaction takes place resulting in a bonded mass which cannot be softened by heat, and which will resist chemicals which would attack the binder before the chemical change took place.

Since the discovery of celluloid and Bakelite, many new plastic materials have been developed. These new materials with properties not available in older engineering materials have entered many fields of application. The growth of the plastic industry has been rapid; so rapid that many engineers are still thinking of plastics in terms of ornamental radio cases, steering-wheels, telephones, and fountain pens instead of plastics as modern engineering materials. These same engineers are surprised to learn that the first car with an all-plastic body, so tough and strong that it will not chip or dent, has been completed, that weather and oil-resistant plastic-bonded plywood is now available for building and housing construction. They will soon see plastic-bonded plywood aircraft and boats which are stronger than models now made, and in addition are fireproof. They will see many of our war plants converted for the production of plastic products such as bathtubs, automobile bodies, airplanes, furniture and machine parts.

Infinite Uses

The present war has created new uses for plastics as substitutes for scarce materials. Many uses of plastics are now military secrets. We do know that water cooled and lubricated plastic bearings are now replacing bronze for large steel mill roll bearings, rayon and nylon are replacing silk in textiles, waterproof plastic glues are used for Navy boats, and synthetic rubber is just around the corner. Just as the great American chemical industry developed from the First World War, the use of plastics will create a great new industry after this present war.

Young engineers will design, process, sell, service, and manufacture products made from these materials. They will have to understand the fabrication of the materials by the molding, laminating, forming, coating, casting, and extrusion and drawing processes. Fortunately, engineering graduates today have had foundry, forge, pattern, and machine shop. The fabrication of plastics is similar to many processes studied in these shops. The casting process is nearly identical to permanent mold foundry practice. The forming process is similar to sheet metal work. The laminating process and the coating process involve respectively the use of wood-working and paint-spraying equipment. Since the plastic product does not require much, if any, finishing, the high cost of such work which is so often present in fabrication of steel, wood or other engineering materials, is eliminated. This lack of finishing costs and the presence of pleasing color and surface appearance of plastic products has been one of the main reasons for its wide substitution in the place of other materials.

Plastic's Properties

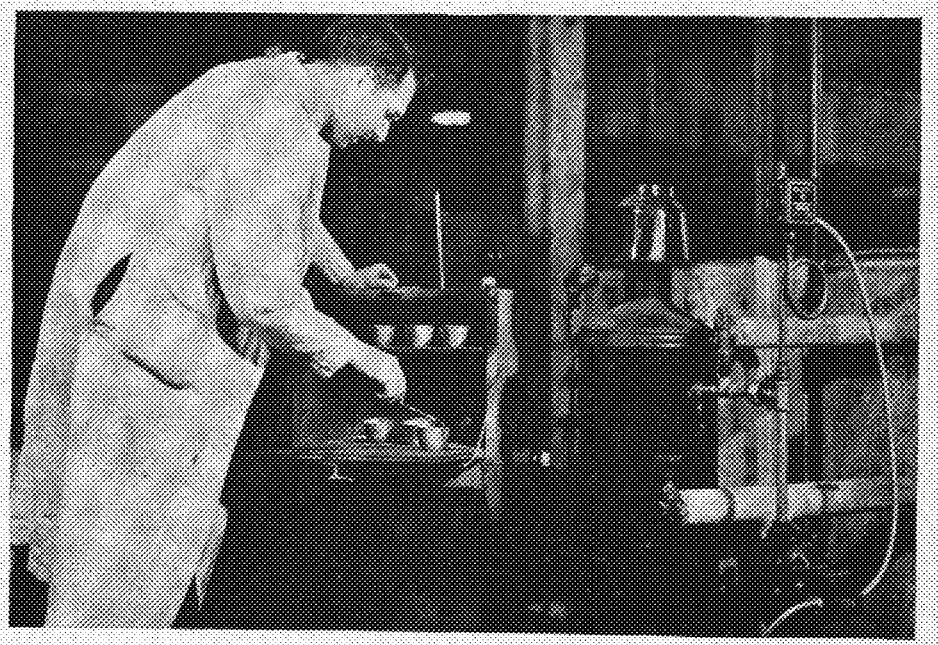
Young engineers will have to know the properties and application of the many plastic materials. Some have good tensile strengths, comparable with bronze and steel when drawn or stretched; some resist all acids; some are soft and some are hard; some transmit light better than glass and soon will be used for camera lenses and glasses. Some have the appearance of the choicest grained walnut or mahogany; some can have any color from the purest white to a brilliant red or purple. Some resist oils; and some have properties of the finest silk and woolen threads.

In keeping with new developments in engineering, the Mechanical Engineering Department of the University of Minnesota has recently designed and made the plastics press illustrated in this article. The press is to be used for instruction in a course now being offered in plastics, and also will be used for problems in research. Pressure is supplied to the press by a hydraulic jack with a rated capacity of fifty tons.

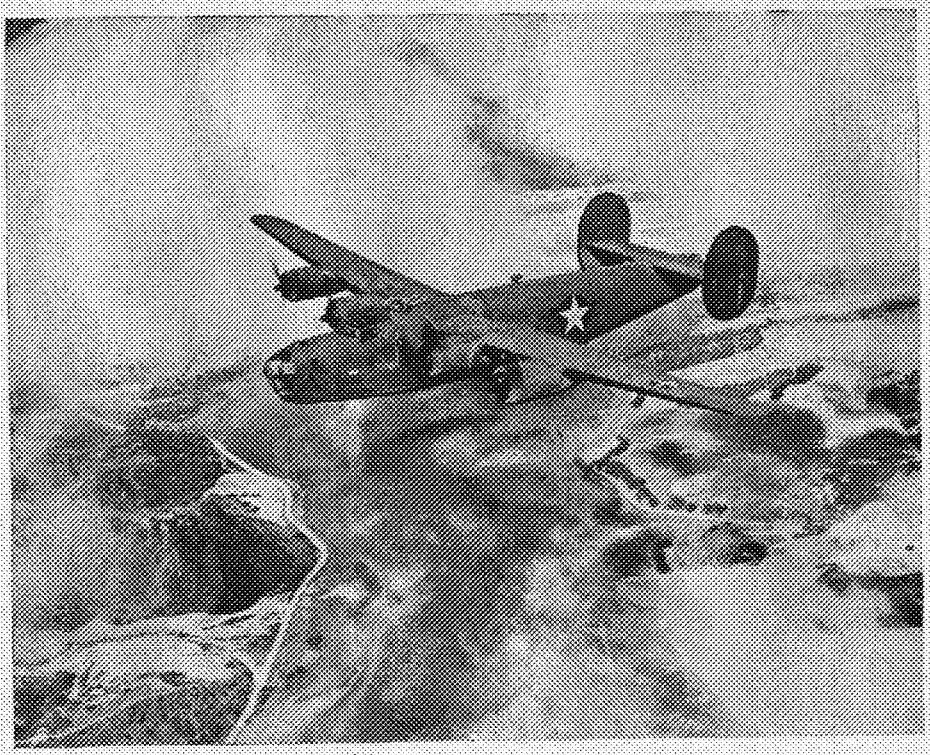
Steam on the Beam

Steam is circulated from the small boiler standing near the press, through the molds, to heat them and condensate passes back into the boiler. A small electric oven is used to preheat the molding materials before subjecting them to the pressure and heat of the press. Work is to be carried on using all types of plastics, and we hope that the engineers of Minnesota may have a hand in the advancement of plastics in the even more modern world of tomorrow.

The field of plastics is very broad, and rivals many of the fields of engineering. Fortunately a college graduate engineer has studied in chemistry, physics, design, thermodynamics, and processing. He can readily understand the processes used in the plastic industry. Plastics have now been accepted as one of the most outstanding modern engineering materials and the undergraduate engineering student should consider it as a possible field of specialization. Being synthetic and chemically compounded by man, plastics are subject to man's will—to be constantly changed, advanced, and broadened in their scope. The past of plastics is a record of successes, and the future is one about which there have been made many interesting and promising predictions.



THIS SMALL ELECTRIC OVEN is used to preheat the molding material before subjecting it to the heat and pressure of the press.



CONSOLIDATED AIRCRAFT CORPORATION

GIANT, FOUR-MOTORED BOMBER is the Consolidated-built B-24 Liberator shown in the above photo. They are said to have a range in excess of 3,000 miles. The wing span is over 100 feet and length more than 60 feet.

PLANES FIT TO FIGHT

(Continued from Page 105)

tor Fighter, with its fast climb, high ceiling, and long range were thrown into action. Balance was rounded out by the appearance in these areas of models already highly successful elsewhere, such as the fast, powerful bomber-fighter Douglas *A-20 Havoc*, hard-hitting medium bombers, including Martin *Marauders* (B-26) and North American *Mitchells* (B-25), and long-range 4-engine Consolidated *Liberators* (B-24). A great proportion of these new planes were flown to the theaters of action, and Air Transport Command's increasing flow of cargo planes kept the supply of spare engines and parts coming along. The establishment of the Overseas Division of the Air Service Command completed the picture with its ground technicians and facilities to keep an ever larger proportion of our planes actually in the air. Other factors include combat experience of our pilots and crews and increased skill in handling our deadly .50 caliber guns, both hand-turned and power-turret types.

Time-Tested Designs—New Models

It is not generally realized that most of the first-line military airplanes in the forefront of today's aerial combat are the result of tried and proved designs first brought out six or more years ago, vastly improved as to speed, ceiling, and especially fire power, but still essentially the same airplanes.

In the fighter class are four single-seater low-winged monoplanes which were designed in 1934-1935, flown in 1936, and put into limited production in 1937-1938 (the *Messerschmitt* was in full quantity production). These are the British *Spitfire* and *Hurricane*, the German *Messerschmitt* Me-109 and the American Curtiss *Hawk* P-36, stalwart fighters all, the 8-gunned British jobs having the edge in fire power, the Me-109 in ceiling, and the P-36 in maneuverability. Originally designed for engines of 640 to 850 hp, their successors (*Hurricane II, Spitfire V*, Me-109F, and P-40F, *Warhawk*) are now powered by V-type liquid-cooled engines averaging around 1200 hp (Merlin XX and Daimler-Benz 601N). Original speeds averaged 325 mph; now they are between 360-390 mph top speed.

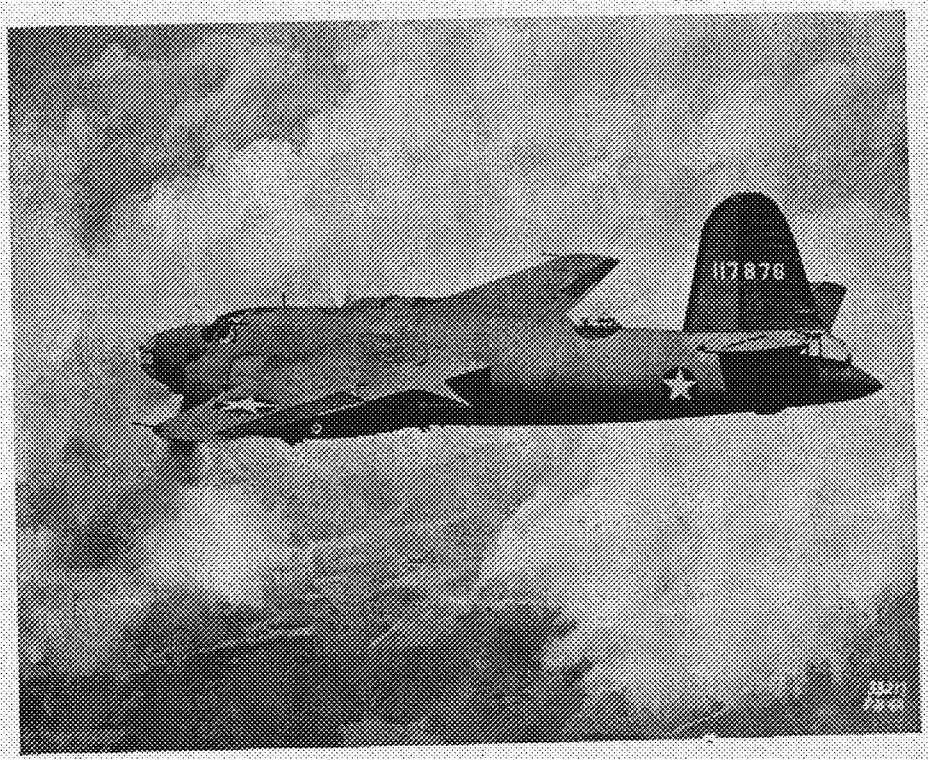
The same story more or less holds for bombers, including the British *Wellington*, German *Heinkel* 111K and the American *Fortress*, all developed in 1934-1935, test-flown in 1936, and still going strong in stepped-up versions, which fly faster and farther with heavier loads of bombs.

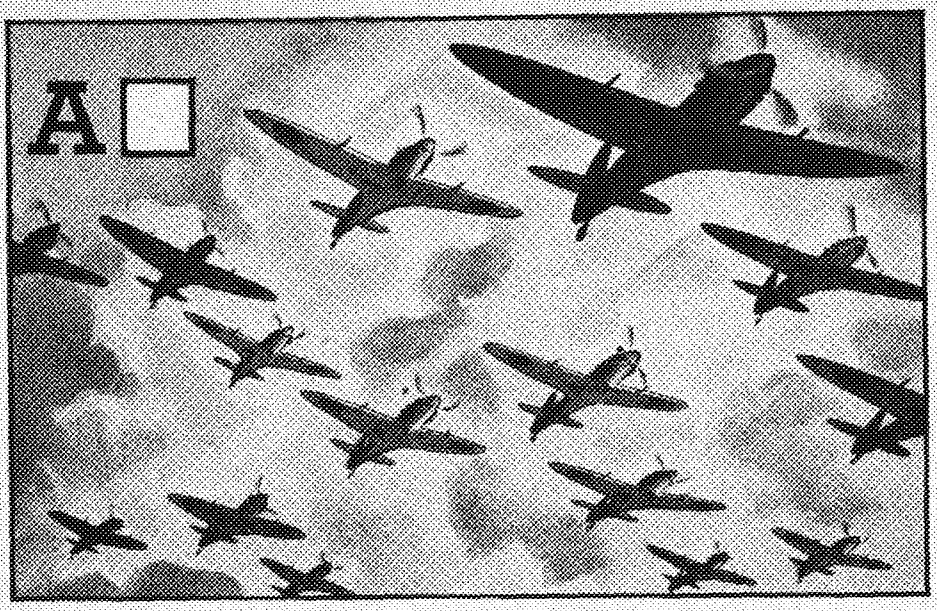
In addition to these developments it should be noted that even in the case of planes designed since the beginning of the international crisis, there is often a considerable time lag before a new military airplane can be successfully thrown into battle. For example, the powerfully armed Bell P-39 *Airacobra* was designed in 1937-1938, the prototype was test-flown in the spring of 1940, in good production about a year later, and in action on several fronts from early 1942. The fast-climbing Lockheed P-38 *Lightning*, twin-engine interceptor-fighter, was tested in a flight across the country in February, 1939, in about seven hours and a half, including stops for fuel, at about two-thirds throttle, hitting over 400 miles per hour while crossing the Alleghenies. A large number of changes in the prototype delayed quantity production on the P-38E (the model tentatively selected for combat operation) until the summer of 1941. Operational tests revealed the necessity of eliminating tail flutter at high speeds, other changes in the interests of increased safety were made, and an improved turbosupercharger installed, all of which added up to the P-38G, the model reported in successful action in various fronts during the past few months.

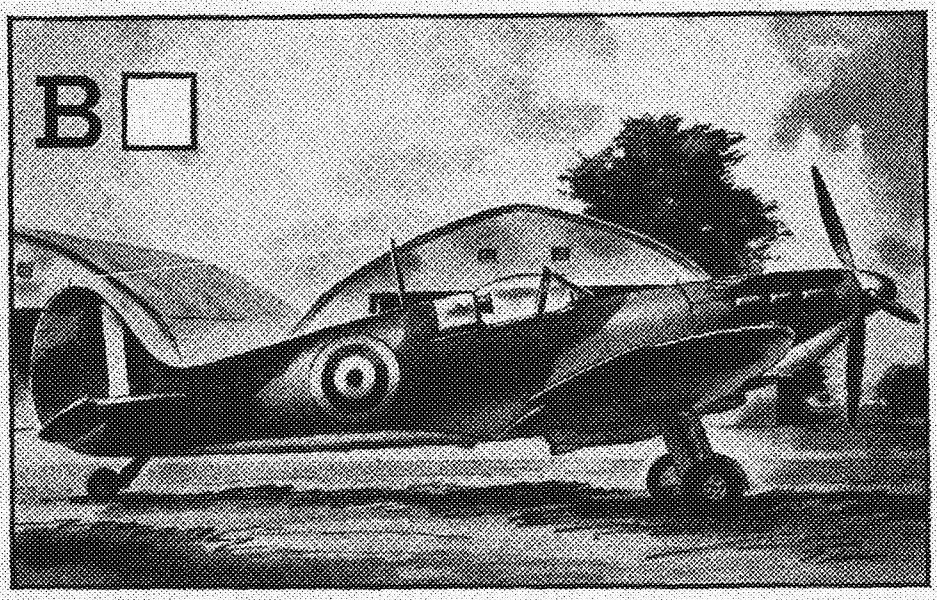
(Continued on Page 114)

THE MARTIN MARAUDER outspeeds many pursuit ships. Its rumored top speed is 350 miles per hour. This ship has been used in the Solomon Islands combat zone.

GLENN MARTIN COMPANY







WHICH would you vote "most likely to succeed?"

"The Aircraft Warning System gives a single plane on ground alert the equivalent striking power of 16 planes on air patrol." This startling statement comes from England.

Our country's Aircraft Warning Service—quite similar to England's—keeps a constant check on the flight of all aircraft. Should the need arise, it is prepared to send fighter planes aloft, to mobilize and direct ground defense forces, to warn endangered areas. Every step in its operation requires the fast, accurate communication of the telephone.

This is just one of the many wartime jobs that are keeping telephone lines busier than ever before. To help us keep lines clear for vital military and industrial calls, please avoid using Long Distance to war activity centers unless the call is urgent. And please keep all your telephone calls as brief as you can. Thank you.

WAR CALLS COME FIRST!

PLUGGY

(Continued from Page 104)

credit. But no! You have been a waster, squandering your days and nights at Joe's Hogpen, swilling down cheap shellac. If you had even the slightest suspicion of a flunk plus average, I could relent. But no! Every test you have taken, final or otherwise, has given you a zero average. You are still taking your fall quarter freshman courses. Snurt, I am forced to an irrevocable decision. You can no longer be an inmate of this institution!!"

"But—" gulped Pluggy, "engineers are shot on sight if they leave the campus."

"*That* has been taken care of," rumbled the huge man. "Go over and stand on that trap door." Pluggy did.

"Good luck, Snurt!" boomed the huge man, and pulled a lever. The trap door opened and Pluggy fell.

He fell for hours. Pluggy counted all his fingers and toes and then, having nothing else to do, tucked his slipstick into his belt and went to sleep. He was awakened by hitting something spiky, and looked around to find himself lying on the floor of a large cavern, around the walls of which fires were burning. A tall man with horns and hairy tail and dressed in red was standing over him.

"The Devil damn thee black, thou whey-faced loon," snorted the man, "Look what that alligator hide of yours did to my pitchfork." He held the pitchfork up—the tines looked like a mass of well-cooked spaghetti suddenly seized with a cramp.

"You talk just like an arts student."

"I *am* an arts student. All the devils in the engineers section of hell are arts students. In the arts students section of hell, all the devils are engineers."

"Oh!" said Pluggy.

"That's right. Come on, oh tortured soul."

"Whad'ya mean 'oh tortured soul'?" asked Pluggy, trotting to keep up with the long-legged devil.

"That's what we're supposed to call you down here." They stopped before a long counter set against the side of the cavern. A demon was there picking his teeth.

"A suit of clothes for this tortured soul, oh Demon," said Pluggy's companion.

"Coming up, oh Devil," said the demon diving under the counter and handing up articles of clothing. First they made Pluggy put on a suit of long woolen underwear (F.O.B. north Brimstone pits, "guaranteed to scratch") that was too small for him. Then they made him put on a pair of stiff pants with knife-edge creases that were too big for him, a shirt with a collar that was too tight and starched as stiff as a board, a tie tied so tight it choked him, and an ROTC blouse (basic).

"Now follow me, oh tortured soul," said the devil. "Your first class is Shakespeare." Pluggy waddled off behind him, the knife-edge creases biting into his legs at every step.

They entered a large cave filled with hard, straight-backed chairs which sloped down towards a lecture platform on which a ghoul was standing. Whips, racks, thumbscrews, hoists, rubber truncheons, wheels on which to break people, spikes, staves, pinchers, hot pokers, hot branding irons, and radios that played nothing but soapbox operas tastefully decorated the walls of the cave. The ghoul was asking questions as Pluggy and his guide entered.

"You!" he snapped, pointing at an engineer in the first row. "Who was Juliet?"

The engineer turned pale, looked at his sliderule, gulped and mumbled, "Idono."

"To the rack with him!" A couple of demons dragged him away. A hand went hesitantly into the air in the back of the room.

"Well," snapped the ghoul, "stand up! Who was Juliet?" A little engineer with a pink face stood up shyly.

"Romeo's mother," he mumbled.

"Rubber truncheons!" screamed the ghoul. As a couple of demons leaped to obey the order, he noticed Pluggy and his devil.

"Wasis?" he barked.

"A new student MacGhoul," said the devil respectfully. Pluggy tugged at the devil's sleeve.

"Why do you call him MacGhoul?" he whispered.

"Because he's very Scotch," answered the devil, "and he's afraid of being taken for an Irishman if they call him oh Ghoul."

"Ah," said the ghoul, "a new student. I'll ask him an easy question to start with. Who wrote the plays that Shakespeare wrote? Hmm?"

"Idono," said Pluggy, turning to the devil beside him. "Did you?"

"Certainly not," said the devil. "Bacon wrote the plays of Shakespeare." The ghoul pricked up his ears.

"Did I understand you to say, oh Devil, that Bacon wrote the plays of Shakespeare?" he inquired with heavy politeness.

"You did, MacGhoul," retorted the devil stiffly.

"Allow me to say that you're an ignorant young fool, oh Devil."

"Permit me to say that you're an old dutto . . . oh Ghoul."

"Oh Ghoul!" screamed the ghoul. "Get him demons!" The demons of the ghoul leaped up the slope toward the devil, who fell back a step and blew hard on a silver whistle that had magically appeared in his hand. Then, turning on his hoof, he dashed out of the cave and into the central cavern just as his demons came up and joined battle, with the ghoul's demons whom they outnumbered, and might have finished off quickly, if other ghouls of the English Department, attracted by the noise, had not come piling out of their cave-classrooms and reinforced MacGhoul's demons. The battle spread, Romance Languages and Latin joining in with the English Department while German and Mathematics took the side of the devil. Other departments scattered themselves around indiscriminately. The uproar was at its height when a sudden sound like a mighty gong rang through the cavern and His Satanic Majesty, *the* Devil Himself, appeared at the far end of the cavern on a dais seventy feet high. His Satanic Majesty was slightly over twenty feet himself and stunningly dressed in a tight suit of red and a scarlet cloak. Instantly everything was silent.

"Now," said His Satanic Majesty, "What is the cause of all this row?" A confused babble rose, everybody pointing at everybody else.

"Silence," said His Satanic Majesty. "I will use my insight." He closed his eyes, waved his hand and Pluggy, the devil, and the ghoul appeared at the foot of the dais.

"You?" said Satan, looking down at the devil and the ghoul with some surprise. "Now, who started this?"

"He did, sir," they chorused, pointing at Pluggy.

"Hmmm," said his Satanic Majesty. "An engineer, hmmm?"

"Yes, sir," said Pluggy.

"What was your average, Pluggy?"

"Zero point zero, sir."

"Hmmm," said *the* Devil Himself, "This requires thought, hmmm!"

Two hours later, as Professor French was sitting in his little office off the big office at the end of the hall, complacently polishing his French 75 with his pocket-handkerchief, Pluggy appeared before him surrounded by a faint odor of brimstone. In Pluggy's hand was a note which he handed to Professor Stroik. It read as follows:

P. Snurt has taken the following course and received in it a grade which I feel sure will, when averaged with his present record, render him eligible for reinstatement in the College of Engineering, University of Minnesota.

Signed: His Satanic Majesty,
The Devil Himself.

And pinned to the note was a shiny new blueprint on which was written:

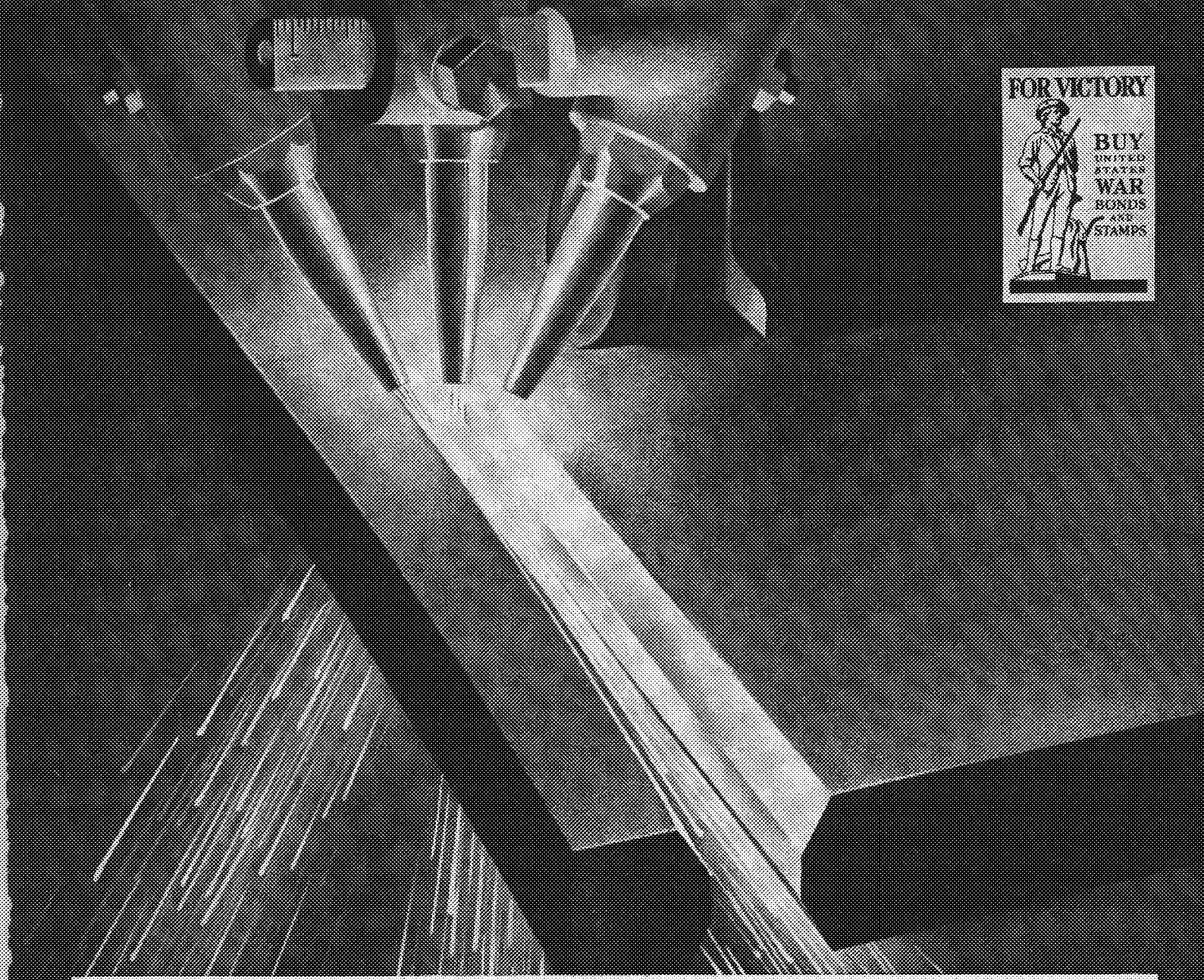
No. of Credits	Name of Course	Grade
250	The Tactics of Playing Hell with Things	A

What's in a Plane?

Look into the laboratories and see a few of the tests to which a bomber's 20,000 to 25,000 parts are subjected

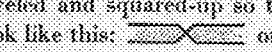
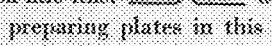
1. A GNAT'S HAIR. Accuracy is the thing in all airplane laboratory functions. Balances, for example, weigh tiny particles of aluminum alloy and other aircraft materials to within one-twentieth of a milligram! Samples of every lot of material must go through the big chemical laboratory before the lot is approved.

2. ICE CREAM AND PICKLES. Some materials are just as incompatible as that, so scientists must try to reconcile them, or at least learn what effect they have on each other. That is what this chemical process is for, and it is surprising how many old enemies are brought into friendly contact in airplanes as a result.



FLAMES THAT CUT TIME!

TODAY, ships are needed as never before. And today, ships are being built as never before . . . and built faster, stronger, and with less steel . . . thanks to welding!

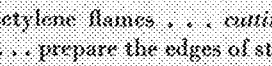
But before welding can take place, steel plates have to have their edges beveled and squared-up so that, when butted together, they look like this:  or like this: 

In the past, preparing plates in this manner was done by heavy machine tools. Cutting was slow and costly. Each plate had to be handled many times. Plate cutting on this basis could hardly keep pace with welding today.

Now, oxy-acetylene flames . . . *cutting in different planes simultaneously* . . . prepare the edges of steel plates of any commercial thickness *at one pass* . . . in a fraction of the time required by mechanical methods!

This Linde flame-planing method is as simple as ABC. It is economical . . . and easy to use. It cuts plates so smoothly and accurately that *no machining is necessary!* And it uses materials which can be produced in abundance.

On-the-job power requirements for flame-shaping are negligible . . . for the reaction of the cutting oxygen jet with the hot steel does all the work . . . and only fractional horsepower is required to move the cutting nozzles along the line of cut.

In conjunction with "Unionmelt" Welding . . . an amazing electrical welding process that unites plates of any commercial thickness faster than any similarly applicable method . . . like this  . . . the Linde method of plate-edge preparation is working miracles in speeding up shipbuilding.

These two methods are also helping to break production records in other fields. Great pressure vessels . . . locomotive boilers . . . huge pipes . . . heavy chemical tanks . . . combat tanks . . . artillery mounts . . . and other vital equipment are being turned out faster because of them.

Linde research, intensified today, is constantly solving new problems in flame-cutting, flame-fabricating, and flame-conditioning of metals for war production.

The important developments in flame-cutting—and other processes and methods used in the production, fabrication and treating of metals—which have been made by The Linde Air Products Company were facilitated by collaboration with Union Carbide and Carbon Research Laboratories, Inc., and by the metallurgical experience of Electro Metallurgical Company and Haynes Stellite Company—all Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

UCC

General Offices: New York, N. Y. Offices in Principal Cities

PLANES FIT TO FIGHT

(Continued from Page 110)

The *Airacobra* and the *Lightning* had design features which have rightly been termed "unorthodox" (one way in which major improvements can be achieved). This is ample justification of a four- to five-year board-to-battle record. Another new fighter is the Republic P-47 *Thunderbolt*, which is a more conventional design, though with plenty of distinctive features of its own. Its family tree goes back to the P-35, of which the P-43 was a stepped-up version with a 1200-hp engine and turbosupercharger for high-altitude operation. The P-44 was an improved P-43, with six heavy machine guns, a 1350-hp engine and the latest gadgets available in 1940. The fighter-plane experts at Wright Field passed on to Republic's engineers certain things they wanted in a powerful slugger that would dominate the upper air, and the expensive XP-44 mockup, good as it was, had to be scrapped. In September, 1940, the XP-47 was designed, and by May, 1941, the prototype was test-flown. Improvements were made, and while production on the P-43 was tapering off, the factory began tooling up for what became the P-47B, with 2000-hp double *Wasp* engine. Speed has been announced as better than 400 mph, ceiling up to 40,000 feet, with six or eight of the same .50-caliber high-velocity machine guns which have proved so devastating in the *Fortress* and *Liberator* heavy bombers. Further testing brought other important improvements, and by spring, 1942, the advanced model P-47D was in limited production. Six months later good production was achieved at the parent factory and begun at a Midwestern branch; it has also been announced that another major aircraft producer is rapidly tooling up one factory to turn out this formidable fighter.

Plastic Production

Military airplanes are not only tailor-made as to types, but during war a feverish struggle is constantly going on to obtain superiority over the enemy. Each change for the better which one side makes, each improvement in speed, ceiling, or armament must be followed as fast as possible by more effective changes in the other's planes. This prevents airplanes from being built on strictly mass-production methods, freezing designs. This is why the aircraft industry has had to maintain the highest possible degree of flexibility in its production, even though it means a somewhat slower production rate. As a matter of fact, the present large-scale orders for planes in 1000 and even 5000 lots, with pooled production and a high degree of subcontracting, has more nearly made this possible than at any time hitherto. Nazi Germany made the mistake of freezing designs on the Me-109 single-seater fighter, the Ju-87 *Stuka*, and other planes to insure overwhelming quantitative superiority. The battle of Britain taught them the lesson, and they are now coming through with the required changes more quickly. One of the factors which has enabled American flyers to overcome terrific odds so far in practically every combat area is the fact that American factories are to a large extent keeping pace with battle-front developments and putting into our warplanes the required changes with a minimum of delay, and yet not interrupting the flow of fighters and bombers to the front. It so happened that the day the first B-17F came off the line the last of the B-17E's was being delivered and the total for that month instead of dropping off was slightly increased.

Here is the kind of change that must be provided for. For example word comes back from Egypt that the landing gear on a certain bomber is causing too many crack-ups, or maybe two of the .30-caliber guns should be replaced by .50's, and certain changes are suggested. Many of our large aircraft and engine companies such as Douglas, Lockheed, and Wright Aeronautical have expert trouble-shooters in the important theaters of action, and in coördination with Army Air Force officers on the spot the word gets back quickly. Until the change can be made in the production line proper, which may take several weeks, each airplane is flown to a modification center where the change is made before the plane is flown to the front. There are several dozen of these modification centers located in various parts of the country. Some of these are operated by our principal aircraft producers, some by skilled crews of our nation's domestic air lines, and a few by air force personnell at the various air depots.

BOEING AIRCRAFT COMPANY

DEADLY PAIR . . . A brace of the latest model Boeing Flying Fortresses cruise over the Cascade foothills near Seattle while on a test flight.

Life or Death Chances

The philosophy of the modification center is simple. As one officer puts it: "Suppose you make kitchen stoves. Your factory is all tooled up for one model on a quantity basis and you're turning out thousands of them. Then your head salesman tells you that *you've* got to add another gadget or your competitors will run you out of business. Which is easier—retooling your whole plant or adding another shop where the gadget can be installed on the stoves before they meet their competition?"

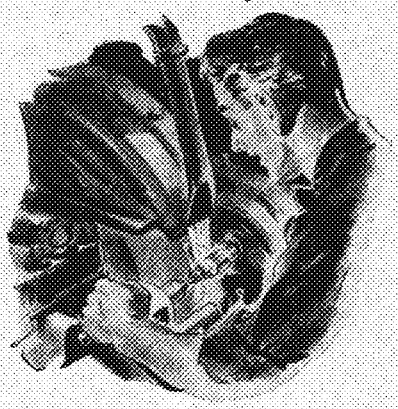
Another function of the modification center is that of adapting our planes for special jobs, such as the Doolittle raid, or for certain combat areas where special conditions are encountered. For example, North American B-25 *Mitchells* are painted a dusty pink for service on desert fighting fronts, and this hard-hitting medium bomber as well as other planes for this front are fitted with extra fine filters to keep out as much of the sand as possible. Other types of ships have to be adapted for operation under Arctic conditions. One of the outstanding examples occurred before the modification centers were developed, but it illustrates the urgent necessity of "must" alterations being worked into our combat aircraft. It is well known that the Japs found no tail guns in the *Fortress* B-17's they met over the Philippines, mostly B-17C's and D's. Even though the Jap guns downed very few of these big craft in flight, owing to their speed and amazingly rugged construction, our combat crews out there clamored for tail guns—and they got them in record time. The Nip pilots didn't know what struck them, and it is reported that nearly a hundred of them were downed before a single ship was able to get back and tell the others what was happening. From the battle of Midway on they have kept a healthy distance from our *Fortress*, and history is repeating itself on the western front with Goering's picked aces in Focke-Wulf 190's.

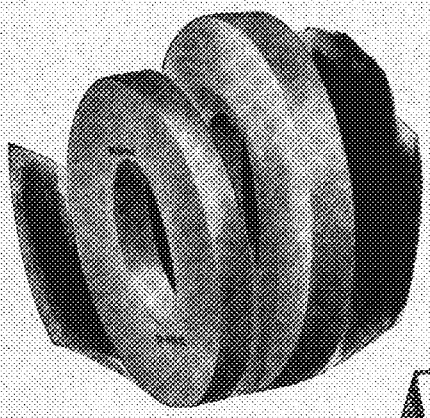
Reports of a new German high-altitude bomber and at least one fighter plane, with pressurized cabin, provide sharp reminders that no country has a corner on aeronautical research. We have to keep on our toes, and boldness and imagination are required to meet possible threats by air. When air supremacy is achieved, ultimate victory is assured, and with it the hope of a more stabilized and coöperative world order.

Now they fly ten times as long without overhauling!

The flimsy crates of World War 1 needed overhauling after as little as 24 flying hours. But today's planes fly hundreds of hours at much higher speeds before a major overhaul. The reason? New materials, new designs and new methods of finishing metal surfaces. Finishes so nearly perfect that bearings, cylinders, pistons and cams are made practically wear-proof! It's a process in which Carborundum has played an important part...by supplying the finishing wheels and stones required.

Formerly ultra-finishing was a long tedious task. But thanks to the new process, finishes accurate to a few millionths of an inch can now be produced on ground surfaces on a production basis. Application of these finishes to wartime engine production has improved the fighting efficiency not only of planes, but of tanks and other motorized equipment. Fewer men are needed for maintenance and repair.





Ultra-finishing-is only one of many ways in which Carborundum may be able to help save precious time. When you get out in the field and encounter a production problem that abrasives might solve, write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

They tell us in hydraulics that the jet always has a higher velocity than the vane. Maybe, but I know of many a case where a vet was too slow for the jane.

* * *

She: Some moon, isn't it?
Bob Zesbaugh: Some dew, too.
She: Well, I don't!

* * *

Question and Answer Dept.:
Q.: I have been going steady with Jerry Busch for over six months. What shall I do?
A: If you haven't done anything yet, it's too late.

* * *

Attention, Professor Wilcox:
According to Mae West, a curve is the loveliest line between two points.

* * *

All exams here are conducted on the honor system. You take seats three chairs apart in alternate rows.

* * *

Following the line of least resistance is the thing that makes men and rivers crooked.

* * *

I feel awfully poetic this month:

There's the wonderful love of a beautiful maid,
And the love of a staunch, true man.
And the love of a baby that's unafraid—
All have existed since time began.
But the most wonderful love, the love of loves,
Even greater than that of a mother,
Is the tenderest, infinite, passionate love
Of one dead drunk for another.

* * *

Her lips quivered as they approached mine. My whole frame trembled as I looked in her eyes. Her body shook with intensity as her lips met mine, and I could feel my chest heaving, my chin vibrating, and my body shuddering as I held her to me.

No, I should never have kissed her in a Ford with the motor running.

* * *

A psychologist claims that woman wears better than man. She may wear better, but not nearly so much.

* * *

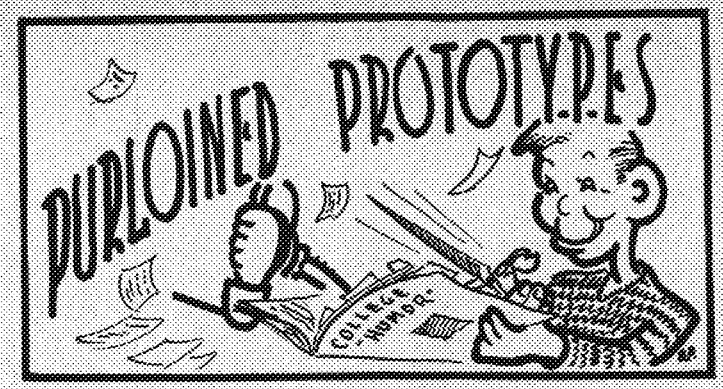
A bit of advice for the coming quarter:
Absence makes the marks grow rounder.

* * *

She was only a janitor's daughter, but she knew how to turn on the heat.

* * *

Attention to all frosh Chem. E's.:
Cyanide solutions should always be measured out in graduates, never in pipettes. If pipettes are used, there won't be any graduates.



BY JOHN UPPGREN, M.E., '43 AND WILEY SOUBA, M.E., '43

LOST:

Several engineers during winter quarter registration. Please return bodies to the lower basement of the M. E. building.

• • •

"Your girl is spoiled, isn't she?"

"No, it's just the perfume she's wearing."

• • •

"Ah wins."
"What yo got?"
"Three aces."
"No yuh don't, Ah wins."
"What yo got?"
"Two eights and a razor."
"Yuh sho do. How cum yuh so lucky?"

• • •

Mr. Brown—"I had a queer dream last night, my dear. I thought I saw another man running off with you."

Mrs. Brown—"And what did you say to him?"

Mr. Brown—"I asked him what he was running for."

• • •

POHM

Blessings on thee, little dame—
Bareback girl with knees the same,
With thy rolled down silken hose
And thy short transparent clothes;
With thy red lips, reddened more,
Smeared with lipstick from the store;
With thy make-up on thy face,
And thy long hair's jaunty grace,
From my heart I give thee joy—
Glad that I was born a boy.

• • •

PARTS OF OLE

A witness in a railroad case at Fort Worth, asked to tell in his own way how the accident happened, said:

"Well, Ole and I was walking down the track, and I heard a whistle, and I got off the track, and the train went by, and I got back on the track, and I didn't see Ole; but I walked along, and pretty soon I seen Ole's hat, and I walked on, and seen one of Ole's legs, and then I seen one of Ole's arms, and then another leg, and then over on one side Ole's head, and I says, 'My Gawd! Something muster happen to Ole.'"

• • •

"Who's the stranger, mother dear?
Look! he knows us—ain't he queer?"
"Hush, my own, don't talk so wild;
He's your father, dearest child."
"He's my father? No such thing!
Father died away last spring."
"Father didn't die, you dub!
Father joined a golfing club.
But they've closed the club, so he
Has no place to go, you see—
No place left for him to roam—
That is why he's coming home.
Kiss him; he won't bite you, child;
All them golfing guys look wild."

• • •

The latest craze is to be found in the insane asylum.

Doctors get by. They have inside information.

* * *

The dictionary says that "taut" means "tight." That's why many can say "Yes" to the question "Were you taut much in college?"

* * *

Does the couple with one set of triplets and one set of twins have a full house?

* * *

Among the makers of one-piece bathing suits, the thigh's the limit.

* * *

The pretty girl of the party was bantering the genial bachelor on his reasons for remaining single.

"No-oo, I never was exactly disappointed in love," he meditated. "I was more what you might call discouraged. You see, when I was very young I became very much enamoured of a young lady of my acquaintance; I was mortally afraid to tell her my feelings, but at last I screwed up my courage to the proposing limit. I said, 'Let's get married.'"

"And she said, 'Good Lord! Who'd have us?'"

* * *

A justice of the peace in a small Maine town was called upon to perform his first marriage ceremony. After he had the knot safely tied, the young couple continued to stand before him as if expecting some further rite.

Whereupon the justice stammered out, in a desperate attempt to round off the ceremony with something of a religious turn, "There, there, it's all over! Go and sin no more!"

* * *

"Where is the car?" demanded Mrs. Diggs.

"Dear me!" ejaculated Professor Diggs. "Did I take the car out?"

"You most certainly did. You drove it to town."

"How odd! I remember now that after I got out I turned around to thank the gentleman who gave me the lift and wondered where he had gone."

* * *

A.S.M.E. member: "Think of those Spaniards going 3,000 miles on a galleon!"

I.Ae.S. member: "Aw, forget it. Yuh can't believe all yuh hear about them foreign cars."

* * *

"It's so simple," modestly exclaims Bruce Birchard, "to hook up electric power circuits. I merely fasten leads on terminals and pull the switch. If the motor runs, we take our readings. If it smokes, we sneak it back and get another one!"

* * *

"Let's get married or something."
"We'll get married or nothing!"

* * *

Ike: "Do you know where they get virgin wool?"
Mike: "Sure, from sheep that can run the fastest."

* * *

Sandra: "I am perfect."
George: "Good, I am practice."

* * *

Sally: "Do you know what the tailor said to the nudist?"
Helen: "No, what did the tailor say to the nudist?"
Sally: "So what."

* * *

Voice from passing car: "Engine trouble?"
Voice from parked car: "Nope."
Voice from passing car: "Tire down?"
Voice from parked car: "Didn't have to."

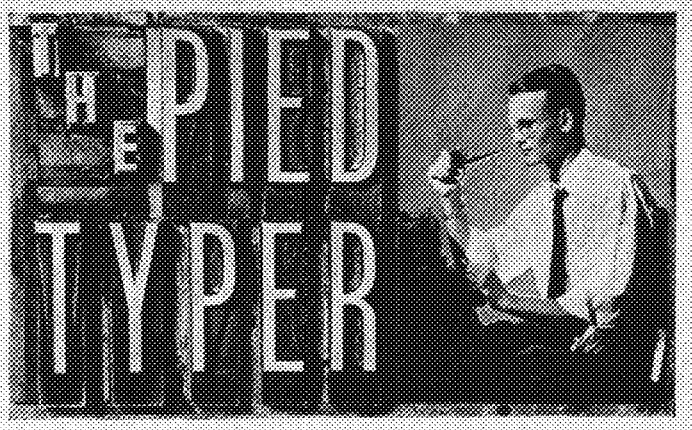
* * *

"Sir, I am told that you have a barrel of beer in your room which is contrary to all orders."

"That's true, sir," replied the student, "but the doctors told me if I drank this beer I should get stronger."

"And are you stronger?"

"Yes, sir, indeed I am. When the barrel came in I could scarcely move it and now I can easily pick it up and carry it about the room."



We have always contended that one's education does not cease as soon as he has graduated from college. We now have definite proof of this from a former editor of the Loc who visited us while on a short vacation from his duties at the National Research Council in Ottawa, Canada. It seems that since he has been away from these halls of higher education he has, through diligent study, learned the gentle art of playing "Admiral Puff Puff." The only equipment necessary for playing said game is one glass per player, and an unlimited supply of that foamy stuff that made Milwaukee famous. The procedure consists of going through a complicated series of maneuvers and phrases. Every time a player misses he must "bottoms up" his glass and start over again. Last player remaining perpendicular wins. For further details see me.

• • •

Health service has not as yet released statistics on the number of killed, wounded, and injured resulting from registration, but we are quite sure that if they are released they will be astounding. Perhaps the present system of registration, which consists of packing about three hundred students in a room which normally holds about forty along with twenty or thirty large drawing tables, is part of the university's compulsory physical education training. It would seem that anyone who could go through registration and live would certainly qualify as a commando. We would suggest that with the present shortage of engineers it might be better to conserve those we have by providing more space and more faculty men to aid in registration.

• • •

In an article in our October issue, Dean Lind made the statement that there is a definite shortage of instructors in engineering just as there is a shortage of coffee, sugar, and other commodities. This statement moved us deeply at the time, and since then we have been utilizing our idle moments thinking up ways in which we can help our poor, overworked profs. We have finally arrived at a three-point program which we believe will do much to relieve the stress and strain of teaching:

1. Always come to class ten minutes late. The prof will finally catch on and not come until ten minutes late, thus decreasing the time he spends in class by twenty percent.
2. Never hand in the problems or reports assigned. This will save the prof much valuable time that he would otherwise spend in correcting them.
3. When you are in class, go to sleep immediately so that you won't be prompted to ask foolish questions which will disturb his equanimity.

• • •

Yes, it's almost here. "It" being Engineers' Day, and "almost" being February 19 and 20. This is the day when all engineers throw down their slide rules, don their "T" shirts, and roam the campus in search of fun. According to reports from Miles Olson, general chairman for the day, this year's Engineers' Day promises to uphold all of the good old tradition that has made past Engineers' Days so popular. Perhaps the most important part of said tradition is that of providing a beauteous and rugged queen to kiss the line of some four hundred senior engineers who are eagerly waiting to exercise their osculatory prowess. Guess that's all for this month. Be seein' ya in the line.

J. R.

It's Just Around the Corner ---

Saturday ☆ Feb. 20, 1943

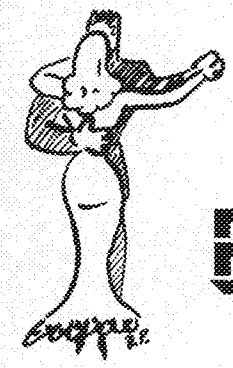
The One and Only

ENGINEER'S BRAWL

● ● ●

Line up your date now
for this "MUST" on every
Engineer's Social Calendar

● ● ●



And Don't Forget the

E-DAY SUNLITE

Friday ☆ Feb. 19, 1943

IT WON'T BE LONG NOW!

★ ★ ★

The **1943 GOPHER** *Out Soon*

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OUR PRINTING ORDER HAS BEEN PLACED AND
AFTER WE HAVE SOLD THOSE ORDERED
THERE WILL BE NO MORE AVAILABLE.

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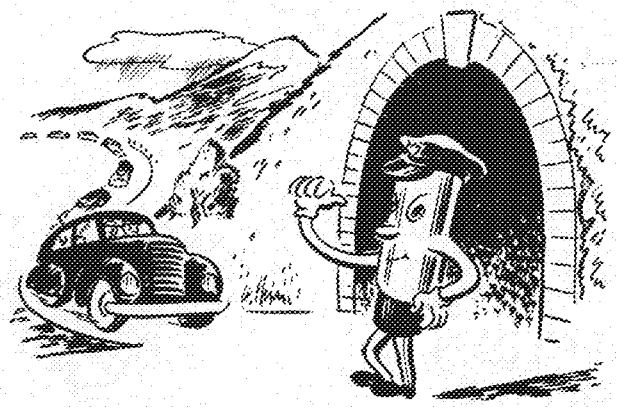
G-E Campus News



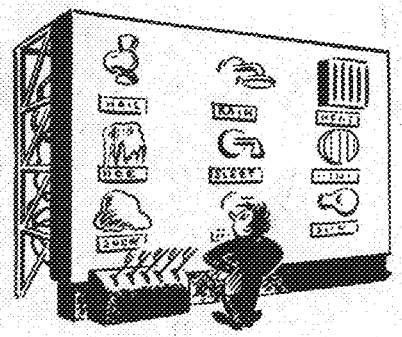
COAST IS CLEAR

FOR three years an automatic traffic control (essentially an electronic device) has been directing motorists through a one-way tunnel that serves as a direct route through a mountain on a Salt Lake County highway in Utah.

The traffic control counts vehicles as they enter and leave the tunnel. If the outgoing count is less than the ingoing, a bell warns a patrolman to go in after the missing car. Thus traffic is kept moving through the tunnel—in one direction at a time.

When the carbon-monoxide content of the air in the tunnel reaches a critical point, another electronic watchman stops traffic and turns on a ventilating fan.

Approximately 600 cars go through the tunnel every 24 hours, but the electronic cop isn't tired yet.



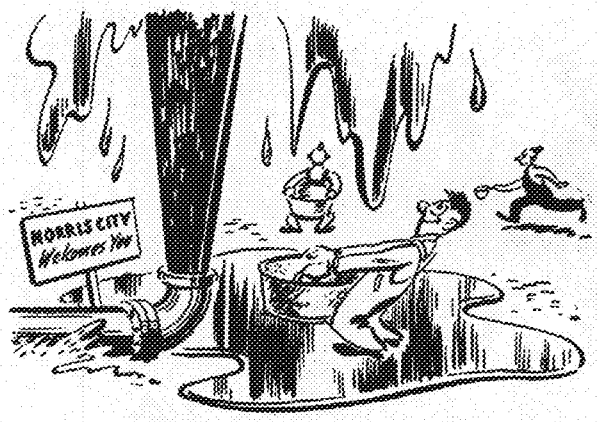
TAKE YOUR CHOICE

THE U.S. Army Air Force can test airplane engines at altitudes of 40,000 feet, where it's 67 below, or at low altitudes over deserts where the temperature soars to 120 F—without taking the ships from the ground.

Testing is done in a laboratory where refrigeration equipment, electric heaters, and air evacuating equipment take over for the elements.

One such lab, for which G.E. is building electrical equipment, will house several test chambers, in each of which engines will be tested under different conditions.

To accomplish this, air will be partly conditioned and then delivered to the various test chambers. At each test chamber the air will be further conditioned to obtain the exact humidity, temperature, and pressure for the particular condition desired. Then the air will be delivered to the engine carburetors.



PIPE DREAM

THE War Emergency Pipeline, largest oil trunk of its kind in the world, will go into operation in January. Extending 531 miles from Longview, Texas to Norris City, Illinois, the "Big-Inch" pipeline (so called because it is 24 inches in diameter) will help alleviate the oil shortage in the East.

G.E. recently shipped, five weeks ahead of schedule, the first two of fifteen 1500-hp motors it is building for the line.

Built of cast iron to conserve steel plate, the motors will be used to drive centrifugal pumps in booster stations along the line. These pumps will keep 1,330,000 barrels of oil flowing at a rate of 4 miles per hour—a delivery rate of 300,000 barrels a day at Norris City.

By June it is expected that the remaining section of the line, 857 miles long, will connect Norris City and the Atlantic seaboard.

MINNESOTA TECHNIC

IN THIS ISSUE

MARY SAVES THE DAY
WELDED BLISS
SAME OLD STORY
SHOT AT SUNRISE
'E' DAY PROGRAM

FEBRUARY • 1943

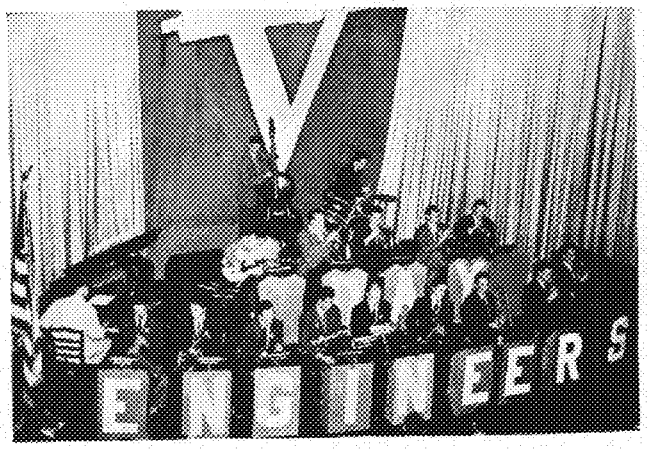
Engineers' Day Issue

15c

INSTITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA

Star These Dates—

★ Friday, February 19

ALL-STAR 

SWING BAND

It's the

"E" DAY SUNLITE

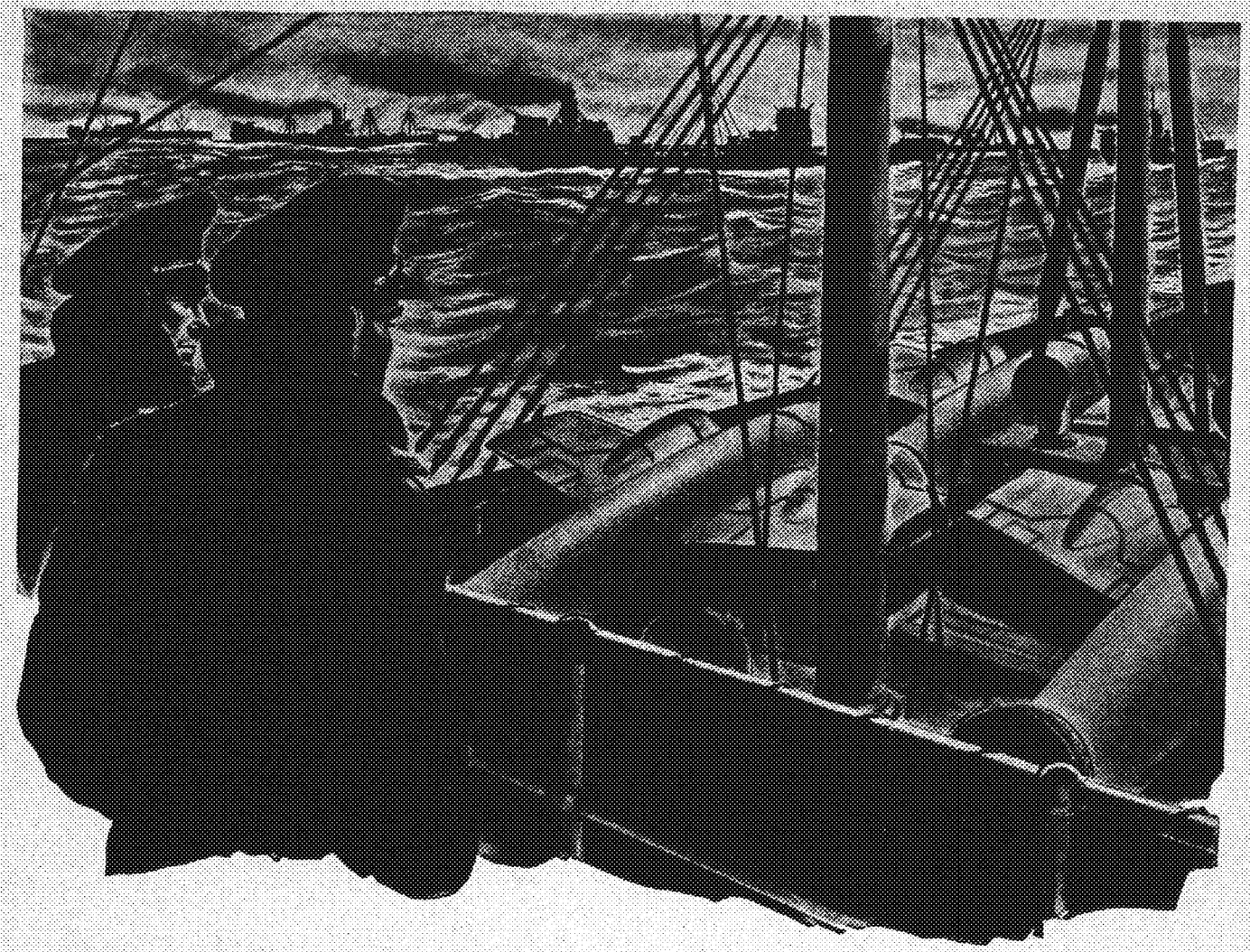
★ Saturday, February 20

The Annual

ENGINEERS' BRAWL

HOTEL RADISSON

$1.50 INCLUDING TAX



This is the way to win a battle in the desert

Libya and North Africa made it clearer than ever: THIS IS A WAR OF SUPPLY.

In 1918, an American soldier could be equipped and maintained on 5 tons of supplies each year.

But today, for every soldier sent abroad, *10½ tons* of shipping space must be provided for *equipment alone*. And it takes an additional *18 tons of shipping to supply a single soldier for a year!*

Supply is a matter of *ships*.

And ships need electricity.

Vast quantities of electric power, for a thousand vital tasks that must be done to take a convoy safely across the seas...

Electricity to steer the vessels and operate the radios and signal lights.

Electricity to detect the approach of enemy subs and planes, to sound the alarm, to organize the defense.

Electricity to power great cargo winches, and delicate navigating instruments.

Electricity to make magnetic mines harmless, to provide invisible "black light" for reading charts at night. Electricity to keep food fresh, to cook it, to ventilate the ships, to provide comfort for the crews.

Electricity in every freighter, every tanker, every Navy escort vessel—to help win the war of supply!

We of Westinghouse take tremendous pride in building so much of the electrical equipment, so many of the great turbines and gears and electric drives, for the ships of America's Navy and Merchant Marine.

Into every piece of that equipment go all our "know-how," all our skill, all our determination to *do our share* in this war—and if possible, a little more.

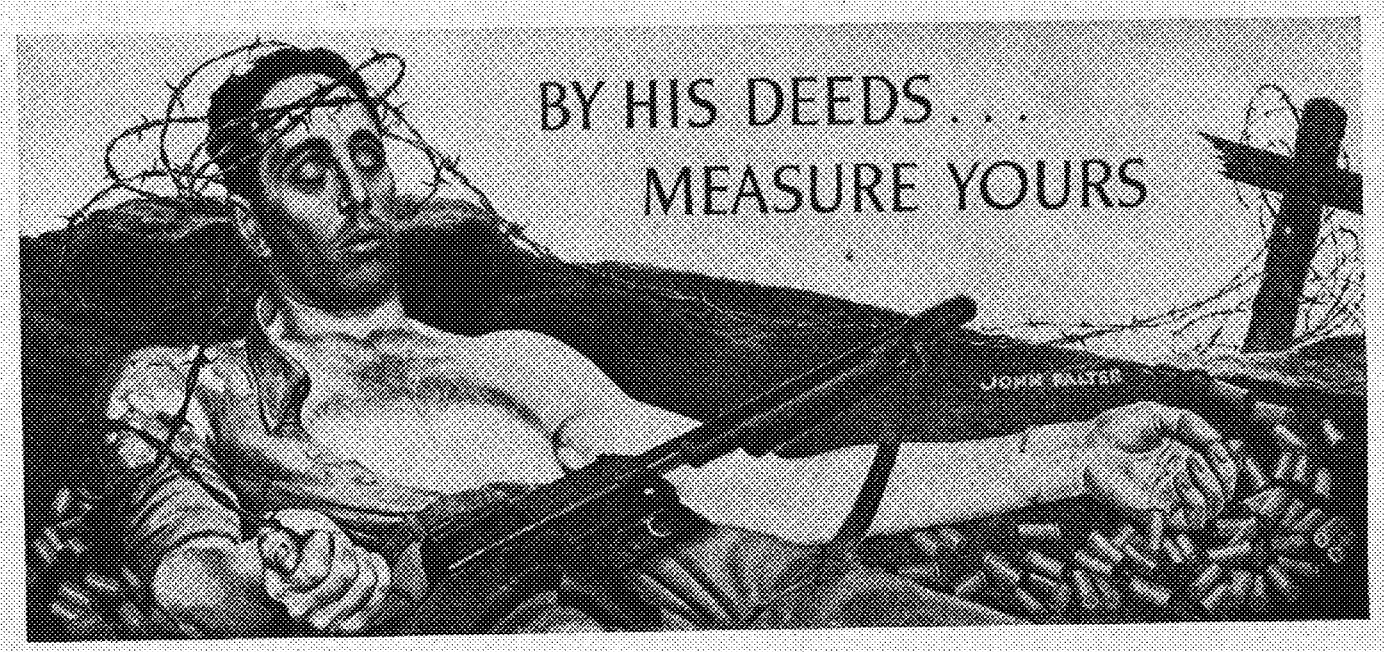
Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

Tune in the Westinghouse Program starring John Charles Thomas — NBC Network, Sunday, 2:30 P. M., Eastern War Time.

Westinghouse

PLANTS IN 25 CITIES — OFFICES EVERYWHERE

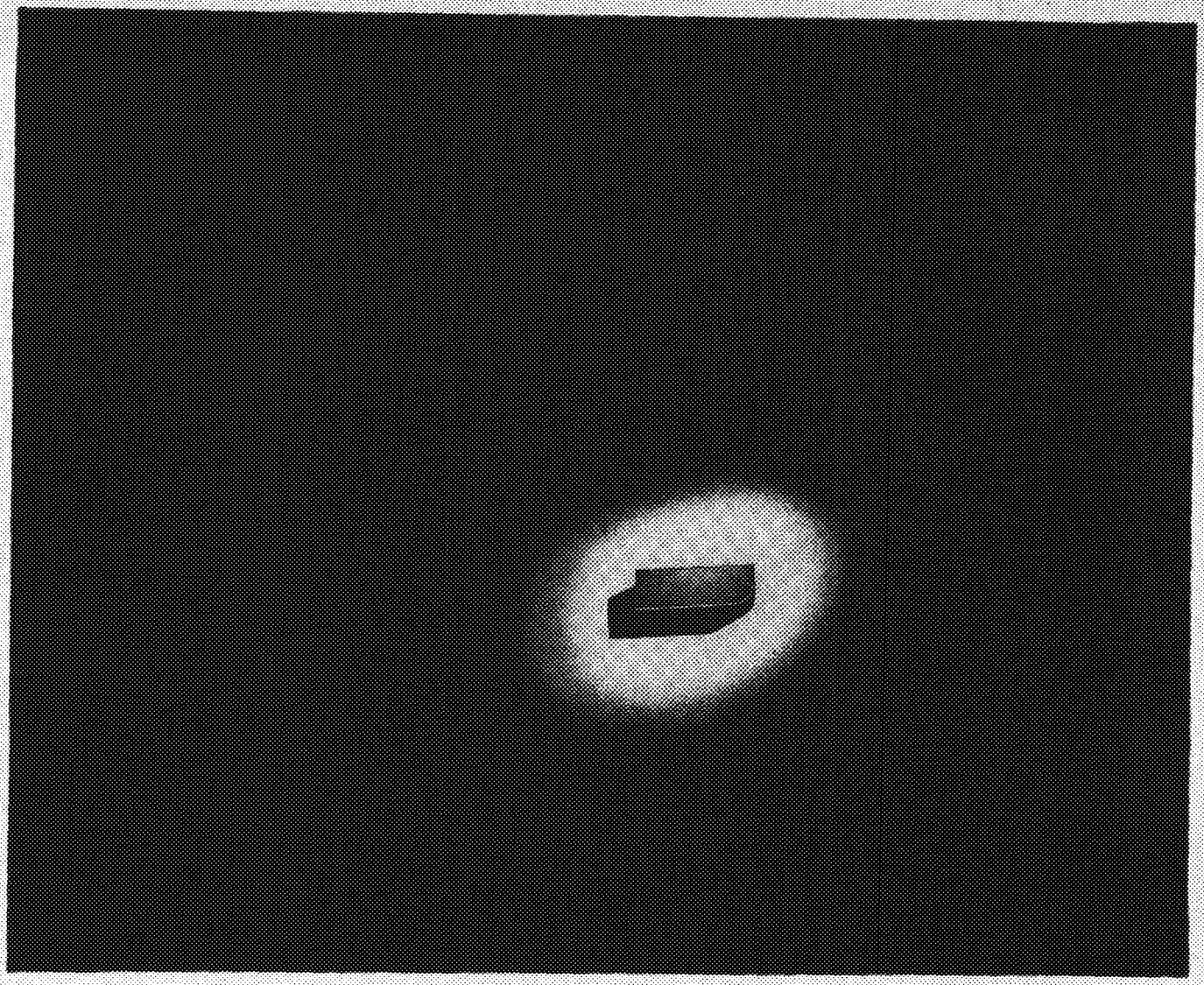
IT is not pleasant to have your peaceful life upset by wartime needs and restrictions and activities. . . . It is not pleasant to die, either. . . . Between you who live at home and the men who die at the front there is a direct connection. . . . By your actions, definitely, a certain number of these men will die or they will come through alive. If you do everything you can to hasten victory and do every bit of it as fast as you can . . . then, sure as fate you will save the lives of some men who will otherwise die because you let the war last too long. . . . Think it over. Till the war is won you cannot, in fairness to them, complain or waste or shirk. Instead, you will apply every last ounce of your effort to getting this thing done. . . . In the name of God and your fellow man, that is your job.



The civilian war organization needs your help. The Government has formed Citizens Service Corps as part of local Defense Councils. If such a group is at work in your community, cooperate with it to the limit of your ability. If none exists, help to organize one. A free booklet telling you what to do and how to do it will be sent to you at no charge if you will write to this magazine. This is your war. Help win it. Choose what you will do—now!

EVERY CIVILIAN A FIGHTER

CONTRIBUTED BY THE MAGAZINE PUBLISHERS OF AMERICA



"METALLIC VITAMINS" FOR INDUSTRY

So effective are relatively minute quantities of cemented carbides in stepping up—pepping up—production that they are often called the "metallic vitamins" of industry.

Because only small quantities are required per tool, Carboloy cemented carbides are measured in grams. A gram is 1/453rd part of a pound. A Carboloy tool tip weighing only 25 grams or slightly less than one *ounce* is a good size tip—enough to last for days, weeks—often months of cutting at speeds often higher than 4 to 5 times that possible with ordinary steel tools.

In terms of production, an ounce of cemented carbide can turn the turrets of dozens of tanks, or drill hundreds of guns, or turn as many as several hundred shell, or bore the cylinders of hundreds of "Jeep" cars. One ounce of carbide can do these and countless other crucial machining jobs faster and better than any other tool material.

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The myriad of present uses for Carboloy—the "metallic vitamin" of industry—now helping to speed the day of victory, forecast the steadily increasing diversity of benefits for the years of peace to come. ★ ★ Carboloy Company, Inc., Detroit, Mich. District Offices: Birmingham, Ala. • Chicago • Cleveland • Los Angeles • Newark • Philadelphia • Pittsburgh • Seattle.

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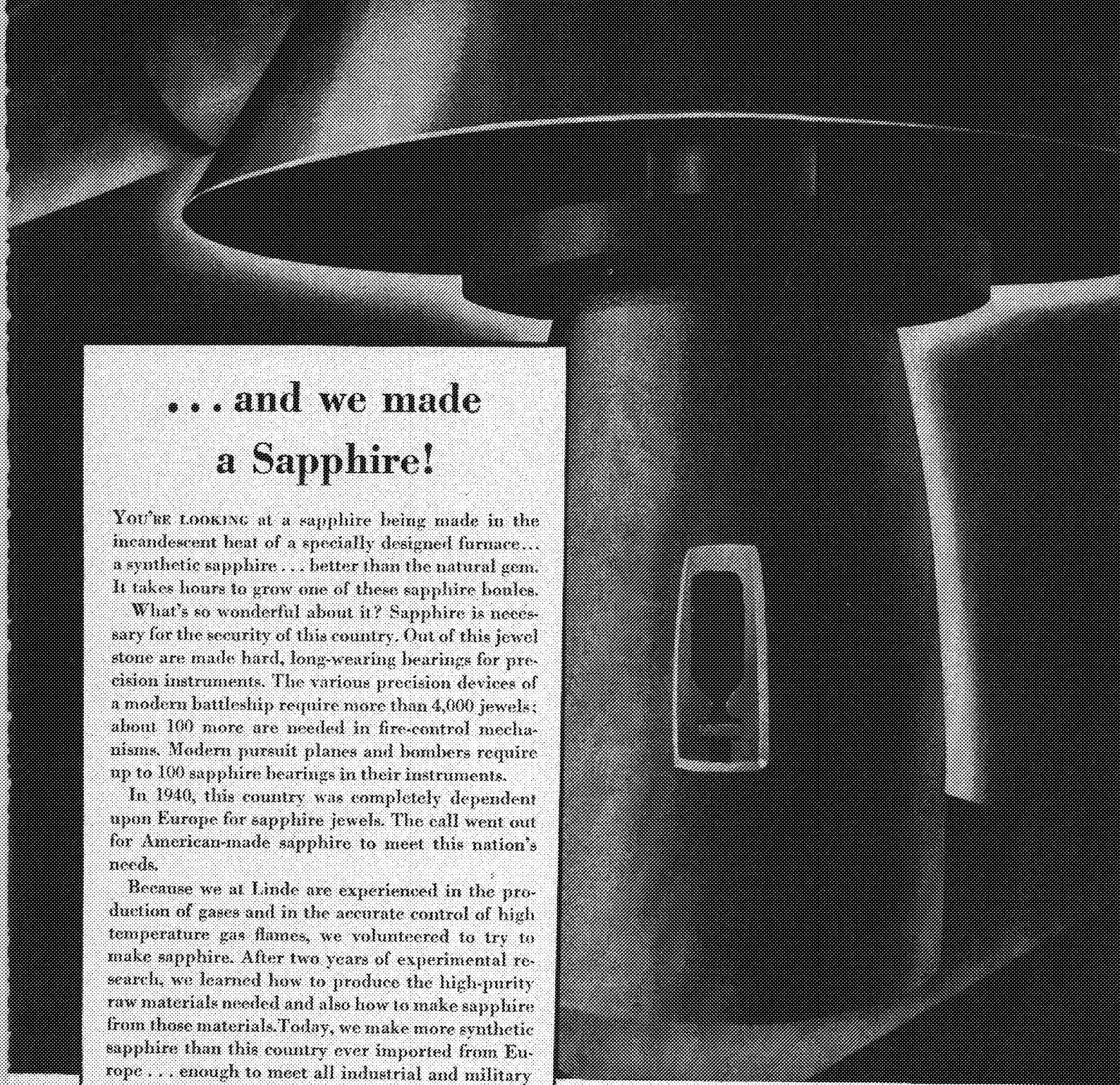
A series of six Carboloy Training Films now available covering detailed, step-by-step procedure on the design, brazing, grinding, use and manufacture of cemented carbide tools. 35 mm silent slide films. (Not motion pictures.) Available for permanent use at approximate print cost of $20 per set. Educational institutions may also secure sets on loan for single showings through selected college film loan libraries. Catalog and loan library listing on request. Write Carboloy Company Inc., Detroit, for Booklet "A".

CARBOLOY
TRADE MARK

CEMENTED CARBIDE
TOOLS • DIES • DRESSERS
MASONRY DRILLS • WEAR PARTS



. . . and we made a Sapphire!

YOU'RE LOOKING at a sapphire being made in the incandescent heat of a specially designed furnace... a synthetic sapphire . . . better than the natural gem. It takes hours to grow one of these sapphire boules.

What's so wonderful about it? Sapphire is necessary for the security of this country. Out of this jewel stone are made hard, long-wearing bearings for precision instruments. The various precision devices of a modern battleship require more than 4,000 jewels; about 100 more are needed in fire-control mechanisms. Modern pursuit planes and bombers require up to 100 sapphire bearings in their instruments.

In 1940, this country was completely dependent upon Europe for sapphire jewels. The call went out for American-made sapphire to meet this nation's needs.

Because we at Linde are experienced in the production of gases and in the accurate control of high temperature gas flames, we volunteered to try to make sapphire. After two years of experimental research, we learned how to produce the high-purity raw materials needed and also how to make sapphire from those materials. Today, we make more synthetic sapphire than this country ever imported from Europe . . . enough to meet all industrial and military needs. Thus America need never again be dependent upon an outside source.

Right now, we make colorless sapphire because colorless jewels make harder bearings. No sapphire is available for anything but war production. In the future we stand ready to make ruby and other gem stone materials for the jewelry trade . . . and for you.

This research development by The Linde Air Products Company is paralleled by other recent achievements of Electro Metallurgical Company, Carbide and Carbon Chemicals Corporation, and National Carbon Company, Inc.—all of which are Units of Union Carbide and Carbon Corporation.

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation

GENERAL OFFICES: NEW YORK, N. Y.
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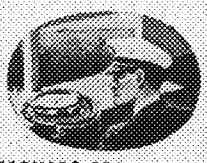
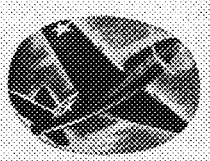
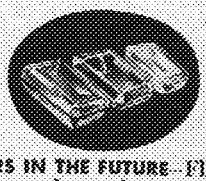


HIS BEARINGS ARE RIGHT—Chronometers, compasses, and other navigational aids must be rugged as well as precise. Sapphire bearings can "take it."



FLYING JEWELS—Pilots' lives and the success of their missions depend upon accurate instruments. Sapphire bearings assure continued accuracy.

LABORATORY WARRIORS—Delicate balances, time instruments, and other important precision equipment of the research worker need sapphire jewels, too.



YOURS IN THE FUTURE—Flawless gems...such as rubies, sapphires, and spinel . . . made by this same Linde process . . . will be available for jewelry in the future.

BUY UNITED STATES WAR BONDS AND STAMPS

This Month . . .

BY ROLAND HOAGBERG, E.E. '46

● **STAN GENDLER**, M.E. '43, is one of the regular staff members to be introduced this month. Stan began working for the Log last year as a news reporter and later he became a regular columnist. This year he is assistant editor in charge of departments (Alum Notes and author sketches).

SHUTTER-SNAPPER

Stan's home town is Albert Lea, Minnesota. He graduated from high school in 1939 and in the fall of the same year he entered Albert Lea Junior College. After one year of pre-engineering at junior college, he transferred to the University of Minnesota. Stan accelerated his course and went to school last summer so he could graduate as a mechanical engineer this June.

His hobbies include photography, stamp collecting, and golf. He is a member of the Sigma Alpha Mu fraternity and the American Society of Mechanical Engineers.

JIVE HOUND

● **BOB WASLEY**, senior electrical engineer, is the publicity manager of the Minnesota TECHNOLOG. He has been assisting on the Log since his freshman year when he was circulation manager. A short, well-built, genial fellow, Bob is well liked by his co-workers and friends. He was publicity chairman for the 1942 Engineers' Day but this year, being a senior, he intends to enter into the festivities.

Bob's favorite hobby is music. Besides being an ardent record collector he plays a mean sax and clarinet. In his freshman year he played with the University Band. In addition to his music, he spends much of his spare time experimenting with photography and playing tennis.

Bob is a member of the American Society of Electrical Engineers.

● **DONALD BAER**, Aero '44, hopes to graduate in '43. Preceded around the campus by a generous sized nose, he may readily be identified. An all-around sportsman, his athletic career has been marked by frequent great attempts and their resultant dismal failures. D. Baer is a member of Alpha Tau Omega fraternity. When asked what other people thought of him he said, "They can't make up their minds." He has been known as a friend to the masses and to the underdog, counselor to the freshman and critic of the senior, cracker-barrel philosopher and man-about-town. He has been called radical, conservative, venturous, cautious, brilliant, dull, fascinating, and repulsive. He says he is always in favor of whatever will ultimately benefit mankind and against whatever will damage mankind.

PHILOSOPHER

As layout editor of the TECHNOLOG he makes it a policy to have every issue better than the last, and usually succeeds. He manages to hold down two jobs on the campus, enjoy life, work on the TECHNOLOG, and still get some grades. Any of his many other activities may be classified under the head "enjoys life" and interested parties may secure additional information from the author.

Although generally of a serious nature, he turns his hand in this issue to a more facetious brand of fiction.

● **ROLAND HOAGBERG**, staff writer for the Minnesota TECHNOLOG, is a freshman in the electrical engineering school. This is Rolly's first year of writing for the Log. After graduating from Roosevelt High School, he worked for two years at the Midland National Bank of Minneapolis before coming to the University. He is a member of the committee on costumes and awards and the committee on the Brawl for the 1943 Engineers' Day.

HUMORIST

Horseback riding, bowling, tennis, and cribbage top his list of extracurricular activities. When asked what his ambition is, he replied, "Don't let this get around but I would like to write a humor column for the TECHNOLOG." Rolly is a member of the Army Enlisted Reserve and the Army R.O.T.C.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

MINNESOTA TECHNOLOG

VOLUME XXIII NUMBER 5

FEBRUARY, 1943

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THE COVER picture is of the 1943 Engineers' Day queen, sparkling Laurel Anne Lein. Laurel is a sophomore in the arts college. The photograph is by Jim Rustad.

STAFF

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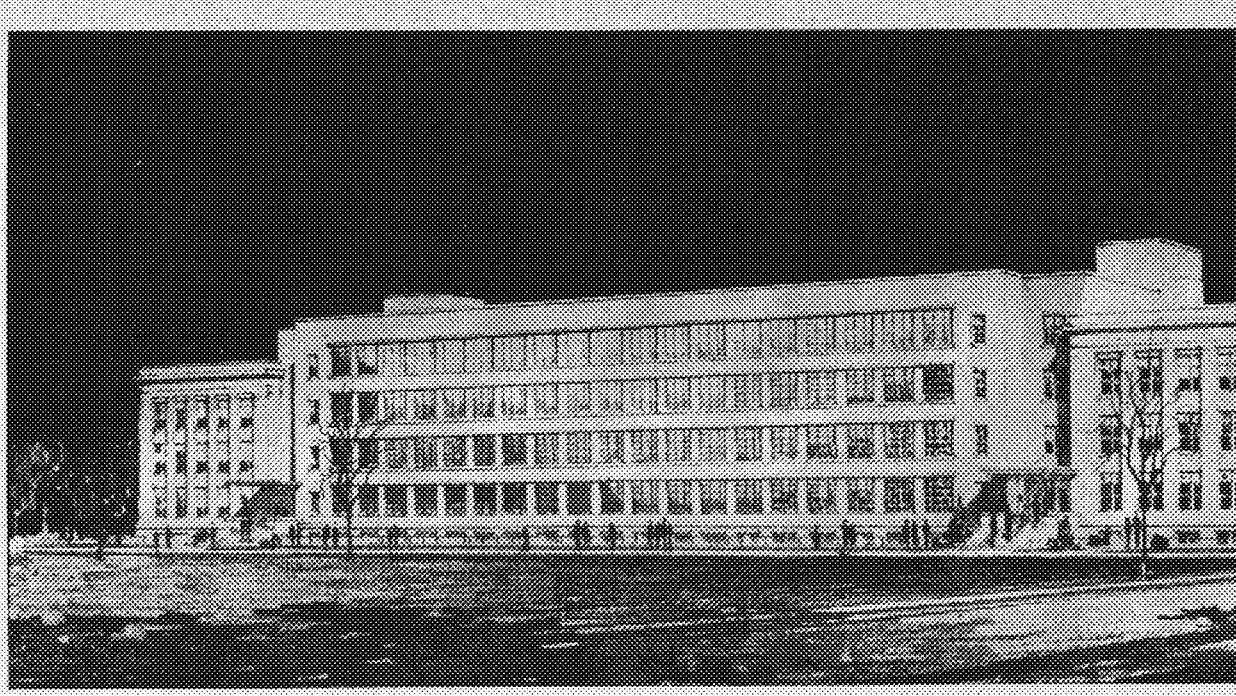
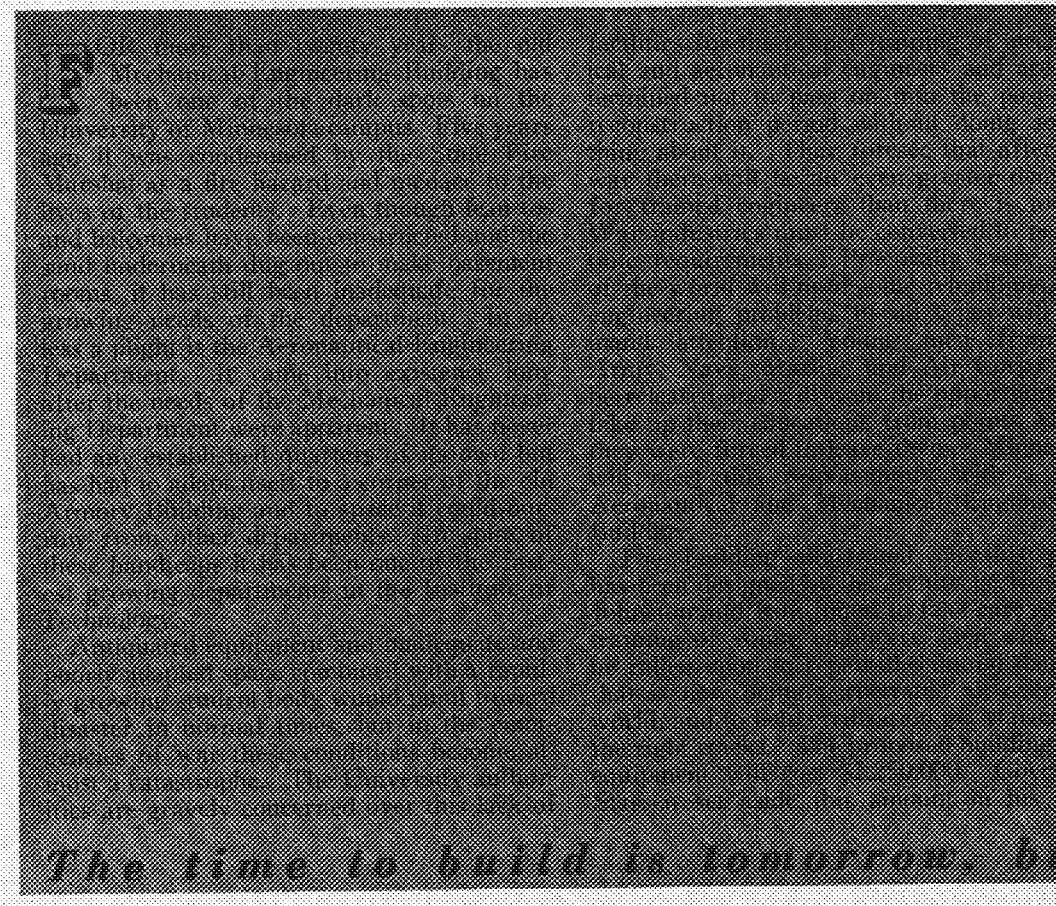
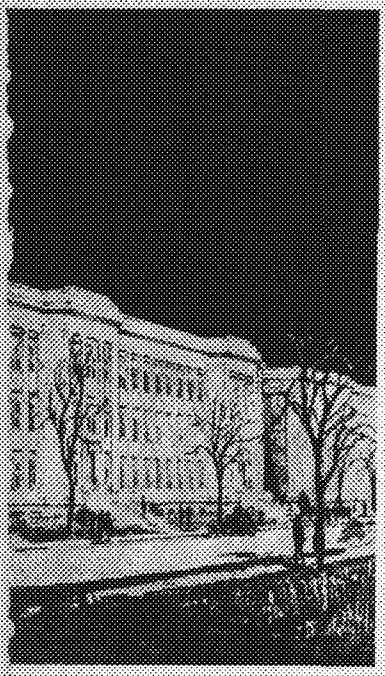


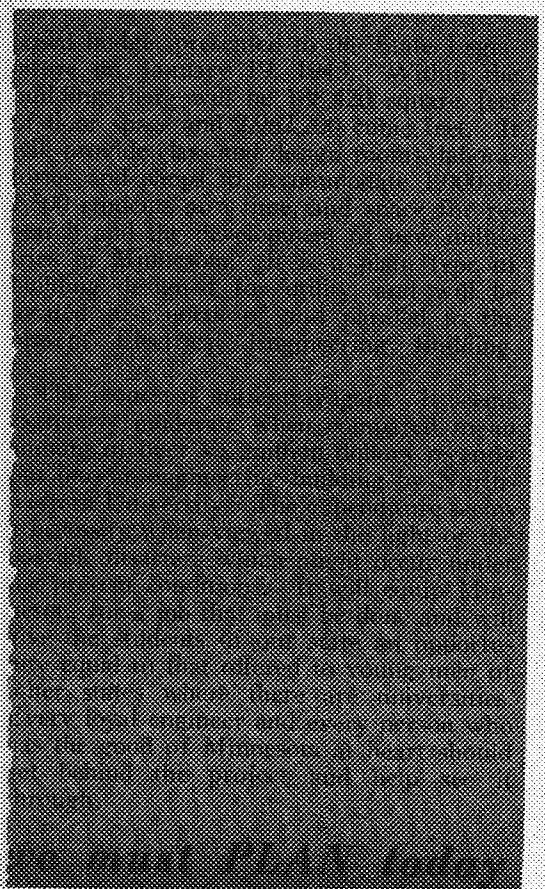
WE MUST NO



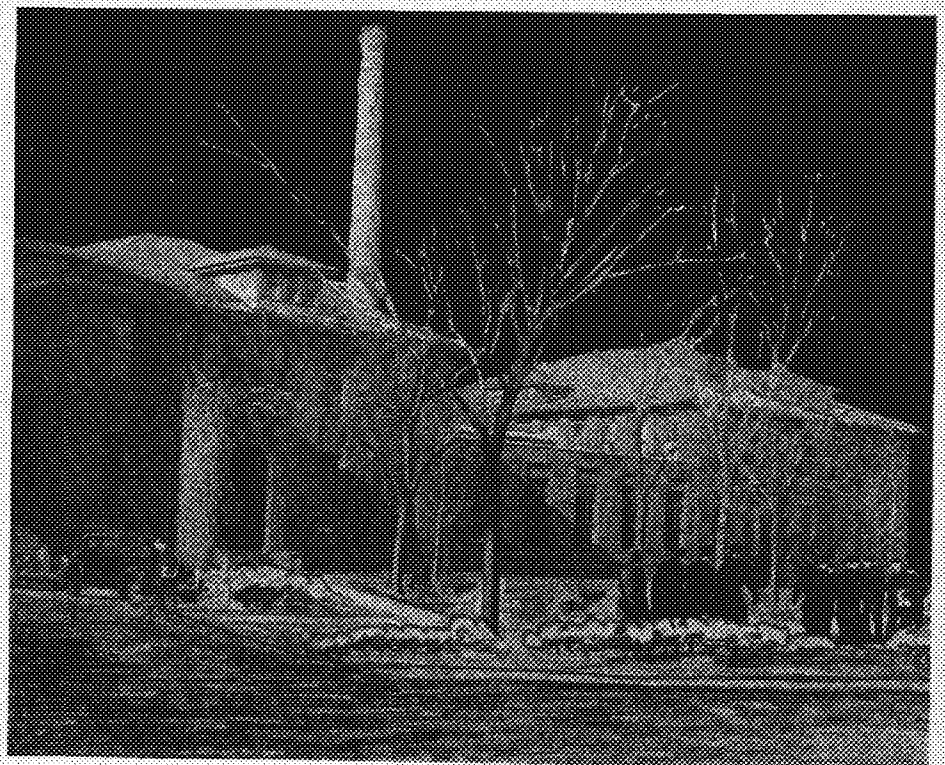


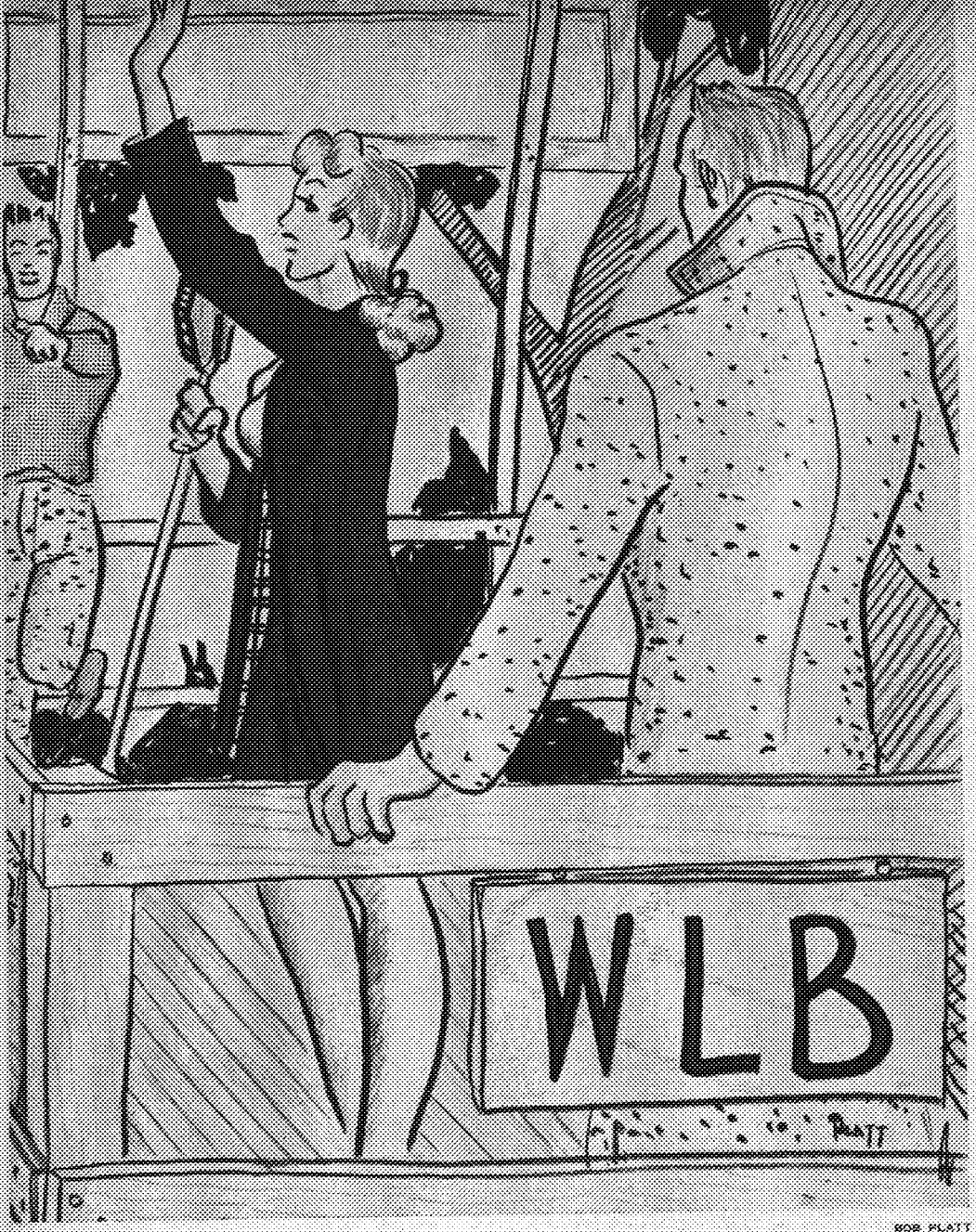
This is how the new Aeronautical-Mechanical Engineering Building will look. Its more than 188,000 square feet of floor space will provide adequate room to accommodate 1,000 to 1,500 students at a time.

DELAY ANY LONGER



Below is the present Mechanical Engineering Building that was condemned as a fire hazard and menace to the lives of the students five years ago by the State Fire Marshal.





BOB PLATT

Ron waits before a microphone ready to broadcast the E Day parade while Mary discovers the foresters' sinister plot, and . . .

MARY SAVES THE DAY

By Gordon Dickson

THERE are a lot of old engineers in the city and around in the state, who make a practice of listening in to the announcer who reviews the Engineers' Day parade when it passes in front of EE each year. Incidentally, there are also a lot of other people—non-engineers—who also listen. Together they add up to a rather fair-sized listening audience. It is a point of honor not to disappoint them, and they never have been, although it was a close call last year.

It was 11:45 in the morning of a warm summer day last spring quarter and the floats were lining up on the parade grounds ready for the Engineers' Day parade, which was scheduled to start at twelve o'clock. Up until then only two had appeared. Sleek, low-slung convertibles shuttled back and forth between the TECHNOLOG office and the parade grounds moving staff and committee members from place to place with inconceivable speed. Things were happening. The queen had been kidnapped by the *Daily* and returned. Dean Lind had run out of aspirin. There was a report that a dozen foresters had been lynched and stuffed into the chimneys of Folwell Hall, and that the business was being investigated as a matter of routine. On the parade ground Jerry Julius looked at his watch and perspired. At 11:53 there was a deafening roar of sirens, whistles, and horns, and hundreds of floats converged upon the parade ground. J. Julius dodged in and out among them risking life, limb, and slide rule; and by 11:58 had them roughly segregated as to class and size. At 11:59 he jumped into the lead convertible, waved his arm, and yelled, "Follow me!" There was a thundering sound, a cloud of dust, the noise of a passing tornado, and at 12:00 the parade was on its way down University Avenue towards the loop, leaving on the parade grounds the wrecked remains of only ten floats and the silent bodies of an equal number of contestants. At 12:05, Jerry pulled out his map of the parade route, studied it carefully, noticed that the way led out Hennepin to Lake street, and put it back in his pocket.

In front of EE, Mary LaPetre swung her slim legs back and forth in the air as she sat on the edge of the temporary platform and watched as Schmidt, Kuhlmann, Becker, and a flock of other EE's got things ready for the broadcast of the parade, which was scheduled for 1:00. It was 12:06 and Mary was conducting a slight argument with Ron Warner, sophomore EE, who was to do the actual broadcasting.

"Now look here, Mary—"

"Damn this wire," said Becker. "It's caught in a crack under the platform."

"I suppose you think you can run my life for me," said Mary. "I don't care if he is a forester, I made that date a week and a half ago and I'm not going to break it."

"Well, pull it," said Kuhlmann, "it won't break."

"After all, Mary, we're supposed to be going steady."

"I guess I know the stress a wire like that can stand!"

"Supposed to be, is right. What were you doing with that blonde Saturday afternoon?"

"Now don't bring that up again." The point is, you're in engineering, Mary, and Stiber's a forester."

"I suppose being a forester makes Petey a criminal?"

"Oh, 'Petey', huh? You aren't by any chance going steady with him, too?"

"Get out of the way and let me do it, Becker."

Mary hopped off the platform and tilted her brown head up in an insulted fashion.

"I am not!" she said coldly, "But now that you mention it, Warner, it isn't such a bad idea. You can consider yourself entirely unhampered as far as that blonde is concerned, as of now!"

"Mary!"

"And what's more, I think I'll drop over to the Ag campus right now!"

"Mary!"

Snap!

"All right, Kuhlmann, *now* let's see you fix it!"

THE TIME WAS 12:17.

"Mmmmm. What time is it, Petey?"

"Just 12:30. Say, Warner's doing that broadcasting, isn't he?"

"Uh-huh. What's so funny about that, Petey?"

"Oh, I was just thinking of the look on

his face when that parade doesn't show up."

In the back seat of the leading car Jerry Julius looked at his watch. He looked hard at his map of the parade route. He looked at Cedar Lake around which the parade was buzzing merrily for the third time. Finally he shrugged his shoulders.

"Keep going," he said.

THE TIME WAS 12:30.

"Oh, Petey. Why?"

"Well, you see, we made two copies of a fake parade route. Then we palmed one off on Julius and stuck the other down the barrel of that cannon we stole from the engineers yesterday and hid behind the Union here. We can find the parade any time we want to, but the engineers couldn't in a million years. Only about five of us foresters know where it is."

"Oh!"

"What's the matter, Mary?"

"I just remembered. I forgot all about Annabell. I was supposed to meet her at the Bridge at 1:00."

"Who's Annabell?"

"Just a friend of mine, Petey. I'll phone her right away, before she leaves the house, and tell her I'm not coming. You stay here, Petey. I'll just make the phone call and then I can spend the rest of the afternoon here with you!"

THE TIME WAS 12:40.

A window of the TECHNOLOG office shot open and Bob Giantvalley stuck his head out.

"Hey, Warner!" he yelled. "LaPetre's on the phone." Ron dropped off the platform, ran across the street, shoved through the crowd, and climbed down into the office.

"Hullo, Mary," he said contritely. "Huh? . . . in three minutes. By." He hung up.

"Listen G-valley. . . ." he said, relayed Mary's information, and suggested a plan of attack.

"You'll have to stay here, though," said G. V.

"I'll be up on that platform, waiting," said Ron.

SEVEN minutes later, four engineers strolled into the Ag Union and ordered cokes. They toyed with them for about three minutes.

"Awful stuff," said one, finally.

"I could stand some fresh air," said a second.

A third one gagged. All four got up and walked out to a large car that stood waiting. It was a large, green car; a car that looked as if it could stand a lot of rough treatment. The four engineers got in.

"Just drive around to the back," said the tallest one.

They rolled around to the back of the Ag Union and stopped. They got out. Down in a little grassy hollow, some fifty engineers could be seen mixing it up with about an equal number of foresters. Occasionally a large black object would appear swaying about in the middle of the struggling mass and would be visible for only a few seconds before being covered again with struggling bodies. The roar of battle rose in the air. They got back in the car.

"The responsibility is all mine," said the tall one sourly. "Get going."

The car left the pavement and swooped down into the hollow, driving into the very center of the packed mass. The four engineers jumped out and at the cannon, which wavered a few feet from the open car doors. They grabbed it after knocking off a few foresters who had a strong grip on the barrel. The cannon was rushed toward the car, but three feet from the back seat it was grabbed by a tremendous forester who set his heels in the ground and brought the rush to a stop. Out of nowhere came flying a short, squat engineer who crashed against the huge forester, knocking him into the cannon. He disappeared, head first, down the barrel. There was a sudden cessation of hostilities as engineers and foresters teamed up on the wildly waving legs and pulled him out. There was a popping noise and he rolled away and disappeared under the feet of the crowd. The short engineer bounced to his feet, shook himself, and with one terrific effort, seized the cannon and sent it shooting into the back seat of the car. The four engineers leaped in, the doors slammed, the car spun about and went driving up the slope like a rocket.

THEY roared back to the campus. The tall engineer, who had been groping in the cannon for some time, drew out a crumpled sheet of paper and studied it intently.

"Ten blocks to the Lake Street bridge on the River Road," he announced, "going in the wrong direction."

They roared up the River Road, but had hardly passed the Franklin Avenue bridge, when one of the foresters in the back seat, that had been dressing rather badly during the fight, fell off with a loud clang. Cursing at the delay as only engineers can, they backed up and rammed the dented piece of steel into the back seat beside the cannon. The car ground into motion again. Time passed. . . .

"There it is!" yelped one of the engineers suddenly. They were just below Lake Street bridge on the St. Paul side of the river and there, to be sure, was the parade on the opposite side bowling merrily along in a parallel direction.

"Stop the car," said the tall engineer. They halted at a spot that gave a clear view across the water. He got out rather stiffly—the door had been on the fritz ever since they put it in the back of the car—and walked to the side of the road. The parade, which had fallen a bit behind, came around a bend and began to pass in review on the other side.

"Stop! Go BACK!" screamed the tall engineer frantically waving his arms wildly in the air. Jerry Julius, standing tall and stern in the back seat of the leading car, his arms folded like a cigar store Indian, passed majestically in front of them. A chorus of cheers and horn-honkings welled up from the passing parade behind him. They kept right on going.

"Maybe they don't know we're engineers?" said a voice from the doorless car. Wordlessly, the tall engineer produced his slipstick and waved it passionately over his head. The cheers from the parade redoubled, a veritable forest of slipsticks went into the air, and a powerful bellow of "St. Patrick was an engineer!" came drifting faintly across the bosom of Mother Mississippi. The tall engineer waved his arms vainly for silence and howled in agony. The parade, however, had picked up the catchword and was half chanting, half singing.

"St. Patrick was an ENGINEER, an ENGINEER, an ENGINEER!"

"Gork!" said the tall engineer, suddenly. His voice was gone from the shouting.

"I guess that slipstick idea wasn't so good after all," said the same voice sadly from the car.

"—an ENGINEER, an ENGINEER!" came faintly to their ears as the last float disappeared around the far bend on the opposite side of the river.

"Get goin'," whispered the tall engineer hoarsely, "and we'll cross the Lake Street bridge and catch them on the other side."

TEN minutes later traffic was blocked on Lake Street as the engineers in the doorless car finally caught up with the parade. Floats and convertibles clustered around the leading car.

"—I got a map—" said Jerry Julius.

"Sigh!" said the tall engineer fiercely. He could not even whisper now.

"Hey!" bellowed a motorcycle cop skidding up on the outskirts of the traffic jam, "What the hell goes on here?"

"St. Patrick was an engineer," sang the parade gaily, "an ENGINEER, an ENGINEER. RAH! RAH! RAH!"

"A riot?" said the policeman quizzically to himself. He looked at the size of the engineers. "Definitely a case for the State Guard. I'll tell the chief. Nothing I can do about it." He wrote something down in his traffic book and rode off humming "I Don't Want to Set the World on Fire."

U. PRAISES WIDESPREAD STUDENT REVOLT said the Axis papers a few days later.

In the middle of the turmoil, Jerry Julius was finally being convinced. He issued a few orders and three minutes later the parade was tearing down the River Road to the U.

"Merrily we roll along—" sang the parade.

"How much time we got left?" asked Jerry Julius, who was now at the wheel of the doorless car, well in front of the parade.

"One-ish!" said the voice from the rear. "It's just one o'clock now."

RON Warner looked at his watch and mopped his brow.

"Go ahead," said WLB. Ron gulped, made a rattling sound in his throat, and opened his dry mouth.

"Ladies and gentlemen—" he croaked.

. . . . . .

"We couldn't possibly make it," said Jerry Julius. Deep gloom pervaded the interior of the doorless car.

"Good night, ladies—" sang the parade behind them.

"Oh well," said Jerry despondently as he switched on the radio, "might as well

(Continued on Page 152)

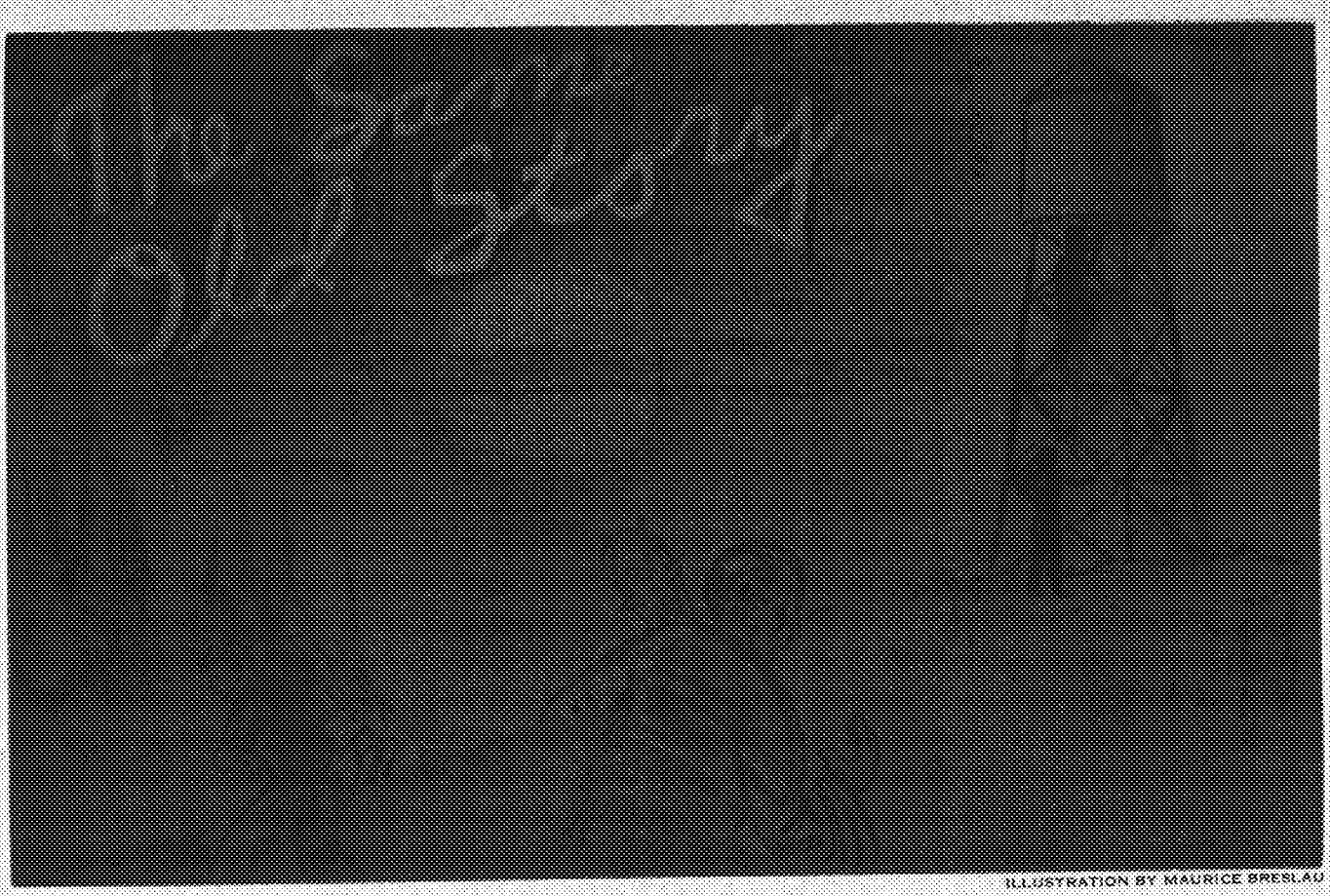


ILLUSTRATION BY MAURICE BRESLAU

Colorful parades, mild riots with miners and foresters, big celebrations, and the Blarney Stone have marked E Day history.

By Bob Wasley, E.E., '43

THE tall fellow with the maroon and gold sweater who was sitting in the booth next to ours closed his book, deftly sheathed his slide rule and pushed an empty malted milk glass aside. "Why don't you call it E Day?" he said as he stood up and put on his coat. "Then you could use as your slogan, E Day the V way!"

We all laughed, but nobody said anything as we watched him walk slowly over to the cashier—we were thinking.

The Engineers' Day committee had an unusual job on their hands this year and it was no wonder they had asked a couple of old-timers from last year's committee to discuss a few angles of the 1943 E Day over a malted at a campus haunt. That remark from the fellow in the next booth who had overheard our conversation somehow seemed to crystallize the whole problem beautifully and we were all aware of it. Then one of the fellows said, "You know I'm really convinced now that we're justified in having an E Day this year. All we've got to do is to plan the celebration so that it falls into perfect harmony with our victory effort—make it a day to renew our pledge to do all in our power to use our skill and training to win this war and create a better world through engineering in the peace that will follow."

"That's all very well and good," said another committeeman as he swallowed noisily and wiped his chin with a paper napkin, "but have you considered the student's angle? It's got to be fun for him. He should be allowed to relax a little, dance, and go through the customary ritual of kissing the queen."

"Oh, I don't think anyone will begrudge us a little fun," answered the first. "After all, the army has dances and parties for its personnel and we're not above having our morale boosted occasionally."

The new publicity chairman, who had been dividing his attention between his malted milk and the blonde in the pink sweater who had been playing the juke box, suddenly became wistful as he said, "Gee! I wish we could put on one of those carefree, razzle-dazzle pre-war celebrations—you know, with the chip-on-the-shoulder attitude." And with that he began to sing, "I'm a Rambling Wreck From Georgia Tech" in an off-key baritone that brought only groans from the rest of us.

Somehow the conversation seemed to stick around the subject of what happened in "the good old days" and somehow after much buck passing it was up to me to play the role of narrator.

"But after all, fellows," I argued, "all I know about past E Days is second hand; just what I picked up last year working on the celebration."

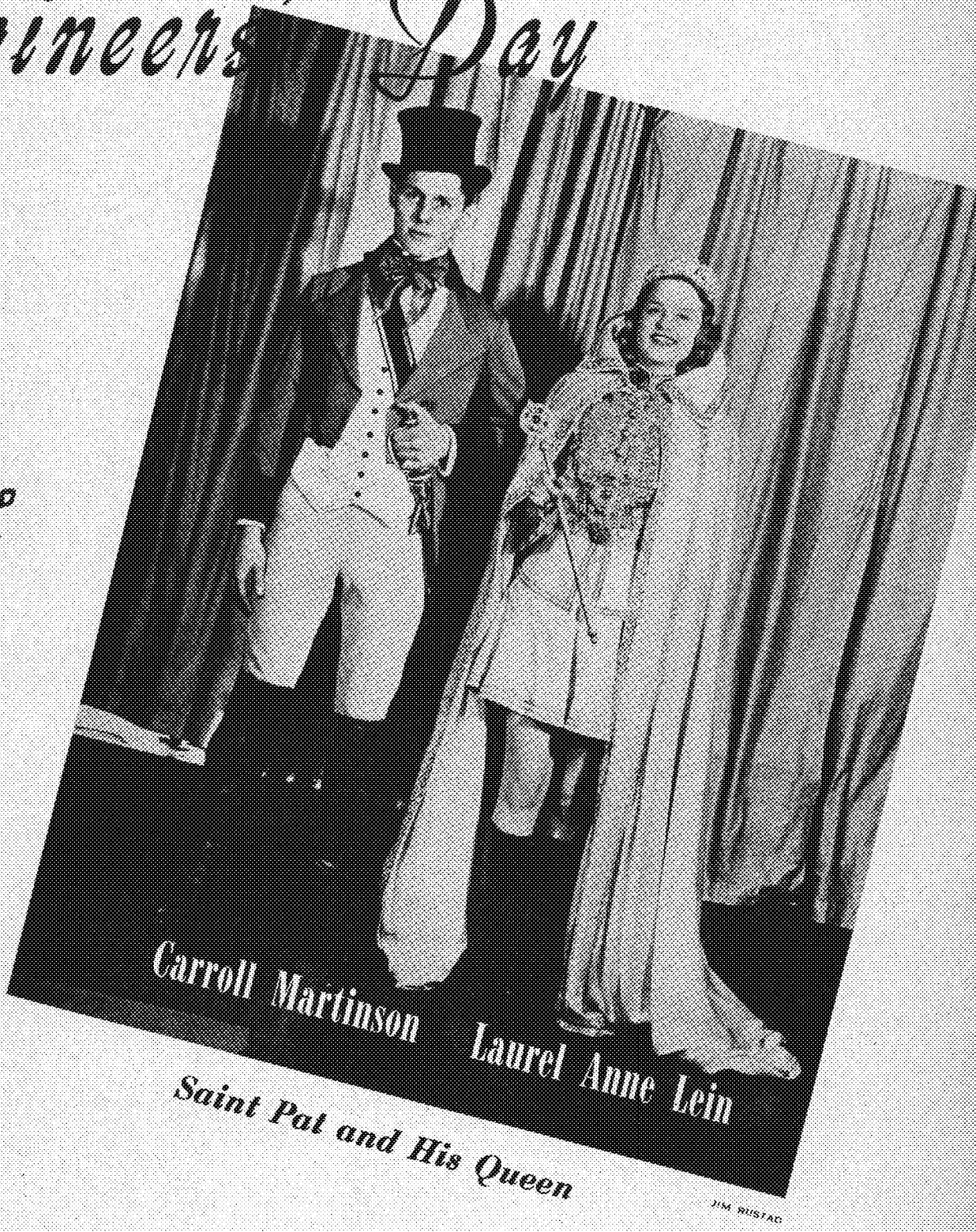
But it was no use, and after reluctantly inhaling one last gulp of my malted (knowing full well that before I had finished, it would have melted into a thin unappetizing gruel), I scratched my head and tried to think.

"The first tales of E Day are, I suspect, more a product of a vivid imagination than of fact, and after being told and retold have undoubtedly gained a lot of color and detail. Back in 1903 on St. Patrick's day a group of workmen were excavating near the Mines Building and a couple of senior engineers, who were eating their lunches near by and watching critically (taking time out only to whistle at coeds who hobbled by in hobble skirts or bustled by in bustles) were surprised to see a large boulder come rolling down the incline toward them. It came to rest on the foot of one of the engineers (who must have had an extremely long reaction time) and they were both astounded to see some queer hieroglyphics inscribed in the stone. Later the foreign language department told them it read "Erin go braugh" which deciphered meant "St. Patrick was an engineer." The excited tech student body considered the whole thing an act of divine providence, and there and then adopted St. Patrick as their patron saint and declared that this day should forever be celebrated as Engineers' Day.

Thus did Engineers' Day begin with the realization that the new and sacred possession must be the Blarney Stone. But this poor old 300 pound rock was destined to

(Continued on Page 152)

41st Annual Engineers' Day



SPECIAL "E" DAY SECTION

FRIDAY

KNIGHTING

Because Engineers' Day has been moved up this year the traditional opening and knighting ceremonies will take place inside. At 1:30 a fanfare will announce the entry of the royal couple who will be accompanied by a band and a guard of Pershing Riflemen. After the party has reached the platform through an aisle formed by senior engineers decked out in their bright green regalia, the National and Engineers' Day flags will be posted as the band plays the National Anthem.

Dean Lind will give a brief talk, and as in the past St. Pat will get in his two cents' worth. Then comes the thing that everybody on campus has been waiting for—the crowning of the Queen. After she has been properly welcomed Dean Leland will present Plumb Bob awards to outstanding seniors.

The holiday will be officially opened when the Queen dubs St. Pat patron of all engineers. Pat then takes over and proceeds to knight all the senior engineers who come forward and kiss the Blarney Stone. Each new knight in the order will receive a certificate signed by St. Pat. When the ceremonies are completed everyone will polish up their Engineers' Day button for the Sunlite.

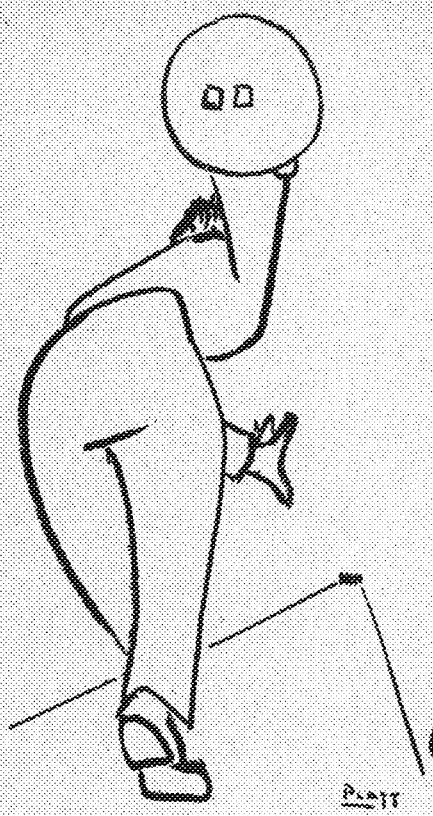
SUNLIGHT

After the knighting ceremonies, engineers and their girls will adjourn to the polished floor of the Union ballroom for the Tech Twilight. Promptly at 3:50 p.m. the all-engineer orchestra will start groovin' it and the festivities will be under way. The orchestra is under the direction of Jim Anderson who composed the "Saint Pat Boogie" in honor of Engineers' Day.

The ballroom will be decorated specially for the occasion in the festive green that is characteristic of Engineers' Day. The soft lights will lend the added touch to make it an occasion to be long remembered by everyone there. For those who become weary after a few hot numbers the exhibit is close by in the ballroom annex.

During intermission Saint Pat and his Queen will be presented to the dancers. Intermission entertainment will also be provided. An Engineers' Day button is the only admission required of men, and girls can get in for free. So polish up your button, grab your gal, and come on.

SATURDAY



FIELD DAY

The cry "play ball" will be heard again this year, but on the hard wood floors of Cooke Hall instead of on the baseball field. The big basketball tournament made up of teams from each Tech department will start off at 7:00 p.m. Friday evening and will dribble down the floor for the finals Saturday morning at 9:00 a.m. Friday afternoon all the sharks of the pool room will match cues in a pocket billiard tournament.

Coming around to Saturday morning again, the finals will be held in the bowling tourney starting at 10 a.m.

To top off the events everyone will meet at 11:00 a.m. for the big obstacle race that promises to have surprises in store for everyone.

EXHIBITS

This year's exhibit is being held in the Ballroom Annex of the Union, Feb. 17-20, from 8:30 to 5:30 daily.

Not only are the different schools represented but also some of the larger war plants in the Twin Cities display their peace and war products.

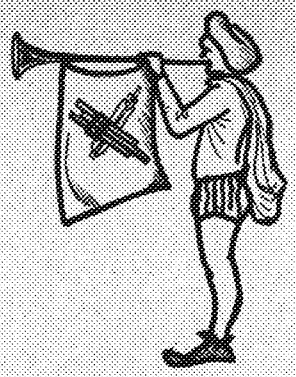
Minneapolis Honeywell has a display showing the development of the thermostat. Twin City Ordnance Plant shows the various steps in the manufacture of a bullet, all the way from a slug of brass to the finished product. Fort Snelling is sponsoring an Army exhibit which includes light and heavy artillery shells, a machine gun, trench helmets, field mortars, rifles, and gas masks.

There are many other exhibits too numerous to mention that make the display a bang-up affair that no one can afford to miss.

BRAWL

At 9:00 p.m. Saturday, February 20, every loyal son of St. Pat will bring his favorite colleen to the big event that every engineer looks forward to throughout the year—the one and only Engineers' Day Brawl.

The Brawl committee has "gone overboard" to make the Brawl a fitting climax for what will probably be the last E Day for the duration. "Red" Melgren has especially enlarged his bang-up band to 13 pieces to give the biggest event on the campus the largest orchestra in town. The beautiful Main Ballroom of the Radisson is being appropriately decorated, and the entertainment committee promises a fine program during the intermission which will follow the all-engineers grand march.



Hear ye one, hear ye all; engineers, this is your day. In the presence of Saint Patrick, the patron saint of all engineers, let it be known that Engineers' Day, 1943, is officially here.

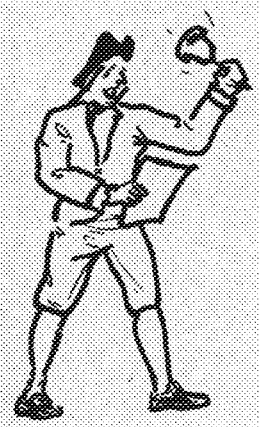
All engineers shall let things slide and shall rule the day. There is the big engineering exhibit being displayed in the Union; there will be the gala knighting ceremonies in the ballroom of the Union, followed by everyone in the swing of things at the Sunlite. Friday evening and Saturday morning will see the engineers matching wits and athletic ability to determine the victors in pocket billiards, bowling, basketball, and obstacle racing.

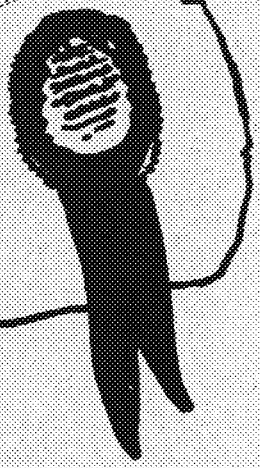
Let us not forget that immortal phrase that will be heard echoing above all festivities, "Erin Go Bragh." This was decryptographed by the engineers in 1903 as meaning, "Saint Patrick was an engineer." The inscription was found on a stone that was dug up while excavating for the Mines Building. Saint Pat was adopted as the patron saint of the engineers and has since been adopted by engineers the country over. From the first celebration of Engineers' Day in 1903 has grown the annual celebration by almost all engineering colleges.

"Saint Patrick Goes to War" is indeed a fitting phrase as we commemorate Engineers' Day this year. Saint Patrick, symbolizing the engineer, has in some cases, already gone, and is still going. He is to be gone for the duration. To the engineers we proudly dedicate this day and him we hail.

Miles Olson

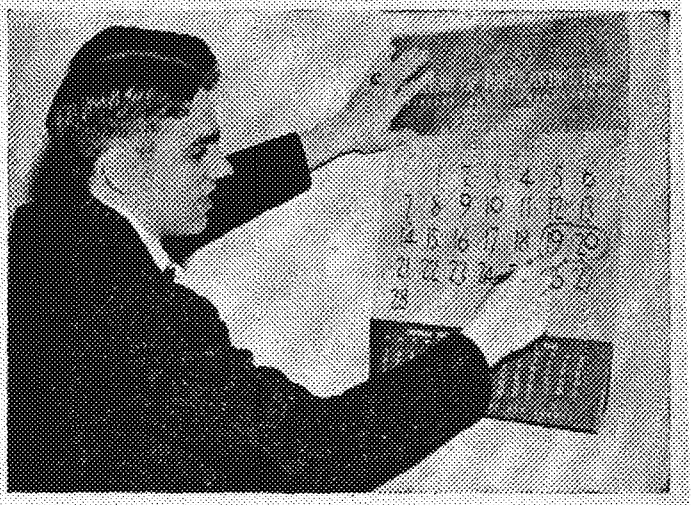
ENGINEERS' DAY CHAIRMAN





General Chairman of the 1943 Engineers' Day is MILES OLSON. Miles, a member of Theta Tau, has a long list of extracurricular activities. He is secretary-treasurer of the American Foundrymen's Association, member of the American Society for Metals, the American Society of Mechanical Engineers, and the Technolog staff. He was recently elected to the Technical Commission and will take office shortly.

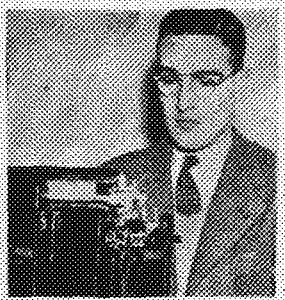
Miles and his able committeemen have been working feverishly for weeks to make this year's E Day one of the biggest and best in history. Judging from advance reports, it will be.



THE "E" MEN

MAKE THIS YEAR'S ENGINEERS' DAY A SUCCESS

Bob Giantvalley is the man in charge of the knighting ceremonies. He is the lucky fellow that is responsible for obtaining the beauteous queen who will reign over the engineers on their day. Assisting Bob are Cal Goodrich, Dick Schmidt, and Roland Hoagberg.



Dan Greenwald is chief arranger for the engineering exhibit in the ballroom annex of the Union. On his committee are Charles Heisig, Jim Doell, Fred Kuhlmann, Al Annard, Harley Thorson, Bill Hoch, and Bob Platt.

Glen Larson is the super-salesman responsible for those persistent fellows who buttonhole you and sneer, "Gotcher E Day button yet, hud?" Assisting Glen are Bill Kurzeka, Chuck Swanson, Bob Bruce, Don Rudd, Clarence Volp, Warren Ernst, Bob Speth, and Dick Wiessner.

Eugene Andrews, publicity chairman, is the fellow who has been flooding the campus with reams of publicity. He had the privilege of publicizing the thirty queen candidates. Also working are Ken Casselman, Dick Leversee, Earl Anderson, Marie Vachon, and Bev Shores.

Al Kraus has the job of keeping both eyes firmly on the finances. As treasurer of Engineers' Day it is Al's duty to make certain that the boys do not spend more than they make. One item on his books reads, "Aspirin for treasurer; 25 cents." Assisting Al is Roger Williams.

Jerry Busch, dance chairman, has spent the last month jitterbugging madly around making all arrangements for the E Day Sunlite and the famous "Brawl" which will climax Engineers' Day. Helping Jerry are Gene Whitacre, Don Cadwell, and Dean Babcock.

Dave McGuire is the big brawny muscle man in charge of the E Day athletic program. His job includes organizing the basketball, bowling, and pool tournaments. Assisting Dave are Tom Brown, Bob Krogh, Joe Hanson, George Swanson, and Verne Peck.

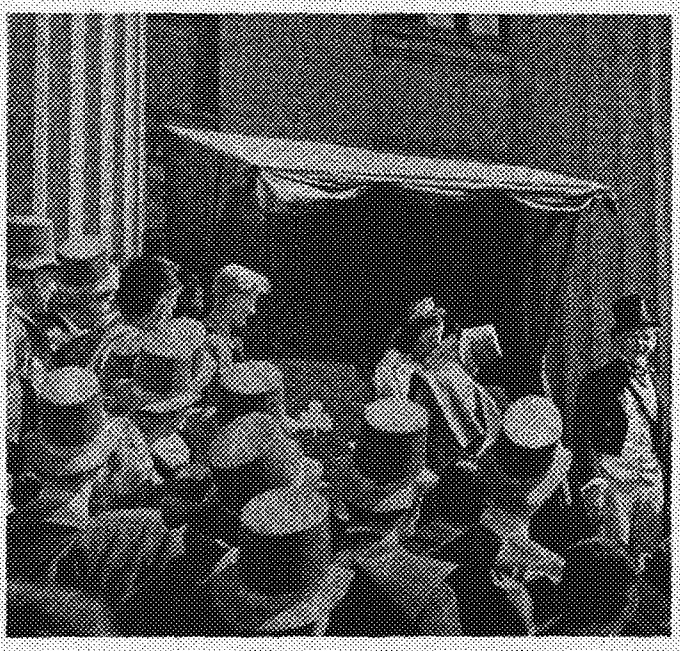
A YEAR AGO

● University of Minnesota prexy, Walter Coffey, was a loyal supporter of Engineers' Day. Here he buys the first Engineers' Day button from a pretty coed.

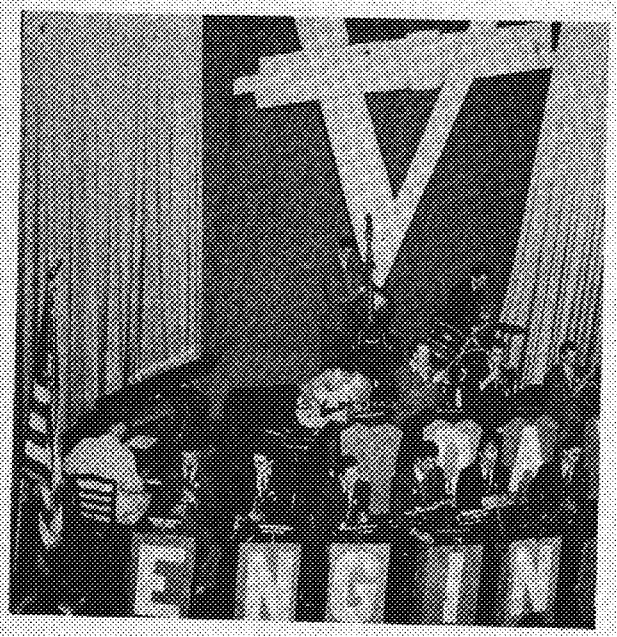
● On their way to open the festivities by breaking a bottle of champagne on the flagpole, Saint Pat and his beautiful Queen march between lines of seniors.

● Being an Engineers' Day queen is no easy job. Like many other worthwhile things in life, it requires a considerable amount of sacrifice and hard study.

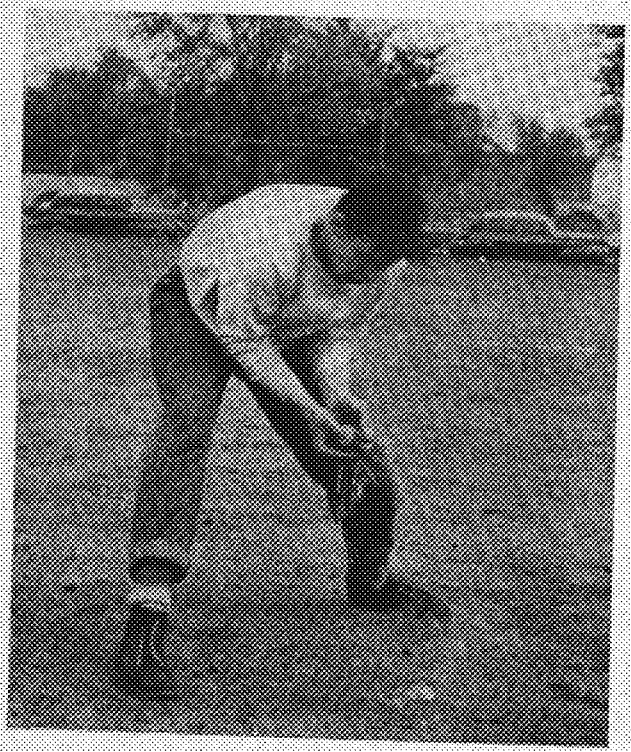
● Seniors come forward to be made "Knights of Saint Patrick." All but the most timid collected a traditional and luscious kiss from Saint Pat's Queen.



TODAY

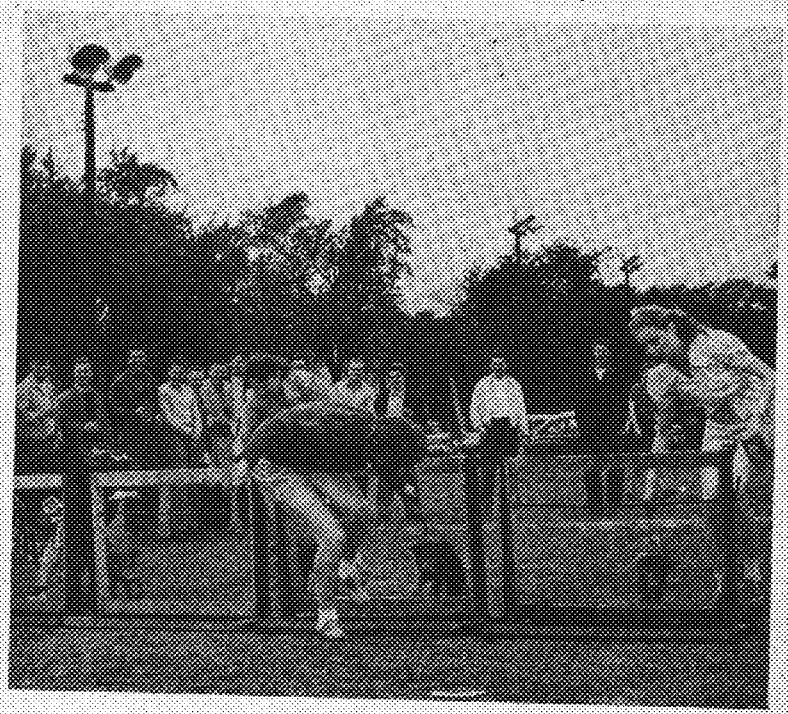


● Fun, but slightly messy, was the egg throwing contest which was one of the many novel features of the field day's interesting program.

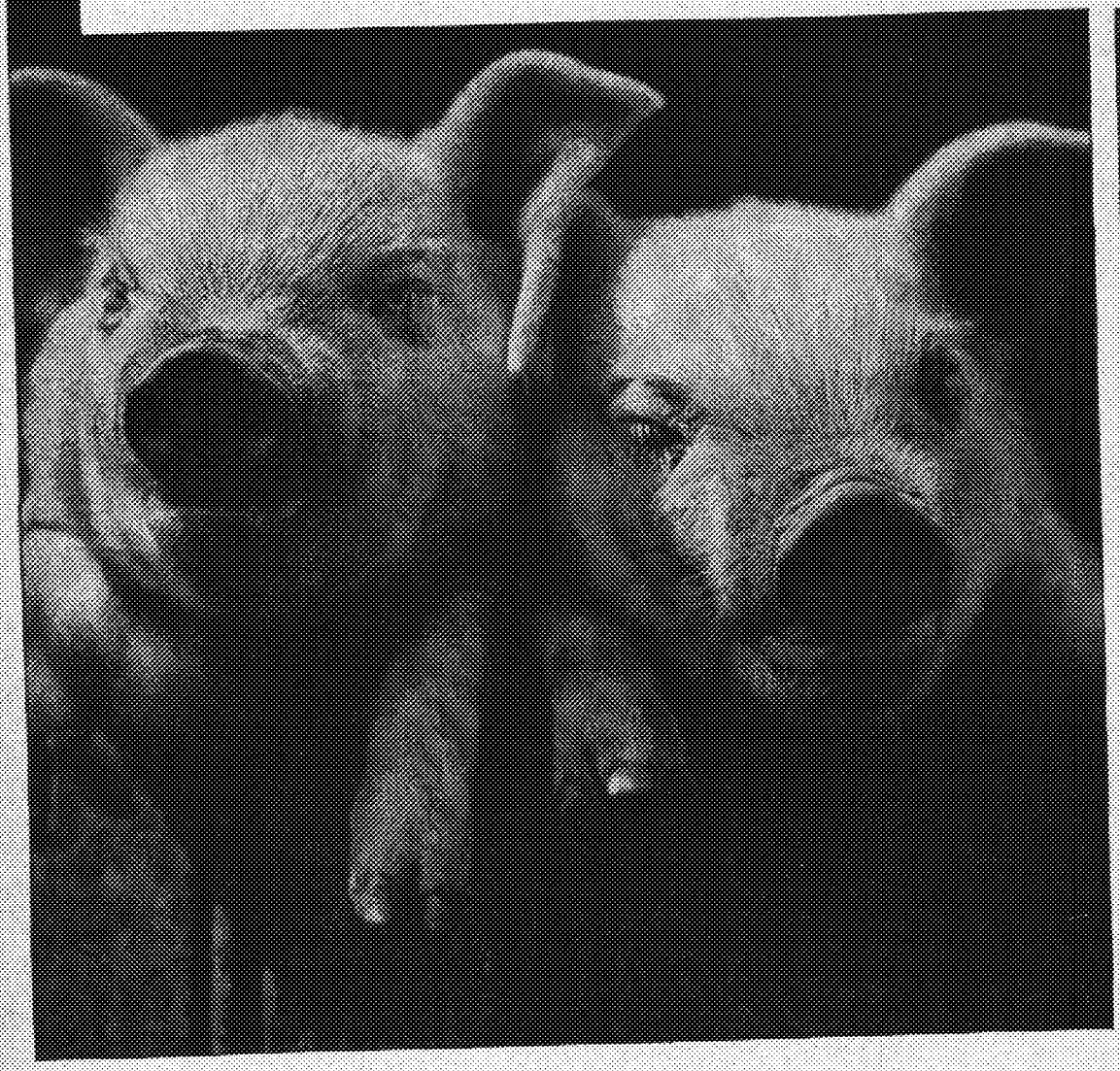


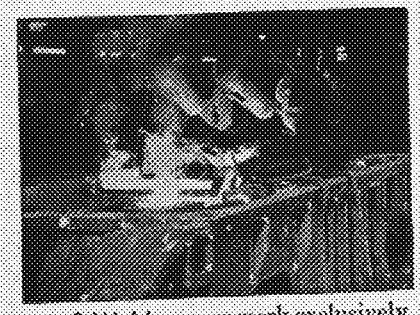
● At the Engineers' Sunlite All-Engineers Band dishes out the jive, hot and solid.

● The pig obstacle race was the hit of the field day program. Glamorous girls carried or dragged baby pigs over, under or around obstacles. Note expressions on bystanders' faces.



Fatter Porkers... Faste





A-C Welders now work exclusively on machinery for the war effort.

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And Allis-Chalmers engineers—cooperating with plant engineers in every part of the country—are helping manufacturers *dwer more*—not just with new machines *with machines now on hand!*

Every Allis-Chalmers man and wo is working *all out* for Victory. Our on right now is winning this war. But from war work we are gaining rich produ experience which will be invaluable t Nation when the war is over. We ready to help build a better peace!

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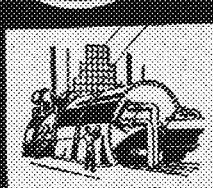
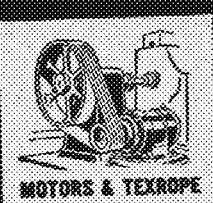
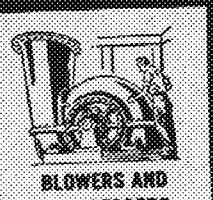


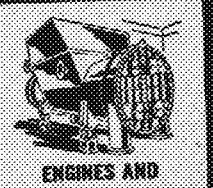
STEAM AND HYDRAULIC TURBINES



MOTORS & TEXROPE V-BELT DRIVES



BLOWERS AND COMPRESSORS

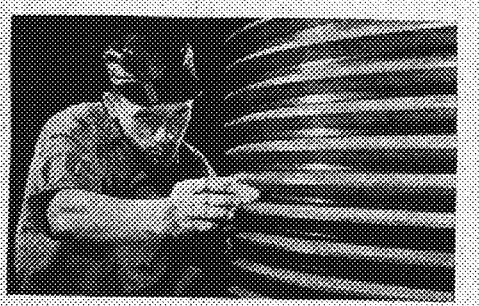


ENGINES AND CONDENSERS

CENTRI PUM

Planes

. . . ALLIS-CHALMERS HELPS MAKE BOTH!



Allis-Chalmers makes the greatest variety of capital goods products in the world.

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VICTORY NEWS

Inland Shipyards: Hundreds of A-C pumps, motors and V-belt drives are at work along the Great Lakes helping in the greatest shipbuilding activity this region has ever known.

Ore carriers, tankers, cargo vessels—even submarines—are being built here.

Tremendous expansion of facilities was required to meet the goals set—and equipment for the yards, as well as for the ships, has left A-C plants in great quantities.

YOU'LL WANT THIS HANDBOOK

New 16-Page Book applies to all makes of V-belts—tells how to conserve rubber through correct V-belt maintenance; how to measure proper tension; what determines "life expectancy"; what to do about worn sheaves; much other useful information. Liberally illustrated. Ideal for training new men. Write for your free copy.

New A-C War Plants: Two big new Allis-Chalmers war plants are now in operation "somewhere in the USA"...the second in a record 90 days after the ground was broken.

To save time and critical materials, wood construction was adopted for the newest plant. Practically the only metal used was in caps for the ends of trusses and columns. These were cast in A-C foundries to save time.

FOR VICTORY
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IN WELDED BLISS

The Story of Winnie the Welder

by Donald F. Baer, Aero. E., '44

THERE was a gal named Winnie welding a bow section of a new cargo ship. When she pushed back her goggles you could see that she was a good-looking girl, but dirty. She wasn't too good a welder, but she tried hard and the foreman endured her because she had pretty eyes.

On her way to check her stuff in at the tool-crib that night she slapped the foreman on the back.

"Well, that's done for today," and she stooped over and helped him up off the ground. He was a 100 pound heavyweight and all of five-feet-two.

"Thanks," he said and smiled up at her toothily.

"Think nothing of it, Doc," she said. "I'll see you tomorrow."

But she saw him sooner than that. She was going to a show that night and had to run to catch her street car. As she leaped onto the back platform she barged into a little fellow who happened to be in her way and knocked him on his face into the car.

"Oh, I'm sorry," she said. When she picked him up to dust him off she recognized him as the foreman. She paid her fare to the conductor while the foreman crawled around the floor picking up pieces of lunch box and thermos bottle which were scattered about under everybody's feet.

Needless to say, one thing followed another and Winnie and the street car conductor, named Jim, were married and lived for a while thereafter.

Five years later we pick up our story of Winnie. Again she had just finished her seam on a bow section with a sigh of relief. She took her lipstick out of her pants pocket, patched up a little, kissed the foreman goodnight and went home.

"Good evening, Jim," she said. "What have we got for supper? Has Archie been a good little boy? Gee, we worked hard today. Finished two whole bow sections."

Jim cautiously cracked another egg on his elbow and dropped it into the frying pan. "Wonder where that kid of ours is," he said to himself. "Hey, Archie, get in here an' bring some more of this hot water to your mother. I won't have her come into my nice clean kitchen unless she cleans off that dirt. Gor, when I married her I didn't ever expect that she could get so dirty."

A few minutes later Winnie breezed into the room all fresh and smelling faintly of toilet soap. "Say, Jim, I think I'll take you out tonight. I feel the urge to tear around again like we used to once in a while. We'll celebrate that raise I got six months ago."

"Uh," said Jim. "Say, Winnie, can't you get me a job over there? It's been so bor-

(Continued on Page 150)

I Was

SHOT AT SUNRISE

A Short, Short Story Complete on This Page

Pfc Wm. Dunsworth

IT was a dark and coldly damp morning, that day when I was marshalled out of my bed to face that which all men must sooner or later face. A chill crept up and around my spine as the realization of my approaching fate flashed in my mind. My left ventricle was beating a mean boogey-woogey against my right, and my blood ran hot and cold, alternately, just like the showers in the latrine.

Outside all was deathly still. Inside all was still and deathly. The stars and a huge pale moon slushed about in the morning fog, and in the distance a lonesome coyote howled among the sage over a dried buffalo's skull.

The air seemed stagnated by the apprehension of approaching disaster.

Suddenly the ghastly silence was cracked by the sharp, thumping footsteps of a burly figure approaching my bunk. The sergeant looked painfully at my tense form, "Get the hell out of that bunk!" he breathed; and to say the least I complied with due dispatch.

They fed me well that morning, gave me butter with my toast, and even let me have some milk with my cereal (although it was very old milk, indeed). It was then that I knew my time was up, but I was brave for I knew it was for a noble cause.

It wasn't long before they had me marching single file to the chamber—no ceremony was noticeable, mainly on account there was no ceremony as this was a very unceremonious occasion indeed. . . . I was to be *shot* . . . at sunrise! The thought of it paralyzed my mind for the moment as I realized the impending doom that awaited me. (I'll admit, however, that many honest citizens often express the belief that my mind is at all times somewhat numb.)

THE eastern horizon was showing grey streaks of dingy light besmearing the deep blue of eventide. With each step I took an added flicker bespeckled the distant sky—yes indeed, there was little doubt but what the sun would rise on schedule—my number (37298276) was up!

The sickly white walls of the chamber stood out against the morning denseness; it looked ghastly. The sight of it caused my lips to freeze together and the clatter of my chattering teeth echoed and reechoed within the hollow chasm of my big mouth—what with my tongue having retracted well down into my esophagus.

A DAMP tear bulged forth as I thought of my past and my dear mother and one thing and another, and all this and that.

My feet dragged heavily now. . . .

We entered the chamber door; my heart churned so agonizingly that my blood fairly coagulated.

The man in charge of the firing squad stepped forward and asked my name—the sergeant had to tell him as my tongue still clung desperately to my adam's apple. Quietly the men assumed their positions and the sergeant prodded me forward . . . the time had come! This was it; shots filled the air!

THEY got me from every side, with merciless p r e c i s i o n; I slumped lifeless to the floor.

In my service record they wrote—"Shot at sunrise, Sept. 30, 1942; typhoid and diphtheria in the right arm, tetanus, smallpox, and yellow fever in the left arm. Signed Howsyer Wasserman, Capt. Med. Dept."

I had but two arms to give to my country—I gave them bravely, for in the Army all men are brave.

The battery, a functional part of certain types of communication systems, might well be called a miniature powerhouse. It supplies the vital electric current. Recently battery builders have found in plastics an admirable material for many component parts as well as the battery case itself. STYRON (Dow Polystyrene) is now being used for these purposes because it provides all the essentials and, in addition, offers definite advantages over the materials that it supplants.

Exceptional electrical properties which make STYRON a remarkably effective insulating medium—extraordinary resistance to chemicals—high impact strength—light weight—these are some of the distinctive characteristics of this crystal-clear molding material that are of great assistance to battery makers. Thus in the field of electricity, as in many others, plastics are making a genuine contribution.

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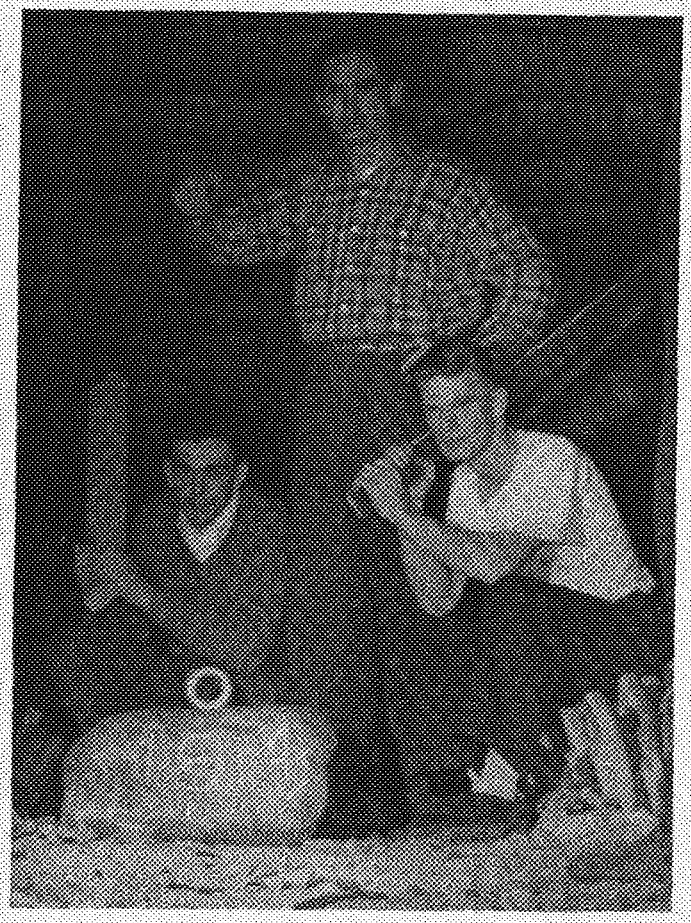
CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

Plumb Bobs Guard Rock



Waiting for any and all onslaughts against the treasured Blarney Stone are Dan Schiavone, Curt Larson, and Don Franke. All are members of Plumb Bob, honorary senior society that is intrusted with guarding the Stone.

Anticipating a raid by their traditional rivals, the foresters, in reprisal for the "visit" to the Ag Campus several weeks ago, these men posted an early guard.

Said one of the guards, "We must not only guard against a raid by the foresters, but also it is necessary to be on the lookout for the few remaining miners who do not know that Mines is a part of the Institute."

It seems that the Miners captured the Blarney Stone in 1906 and 1940, and some of that spirit still persists.

Techs in Politics

"Support your party!" With these words Jerry Busch, Tech party chairman, urges all I.T. students to go to the polls next Friday and vote for the Tech party's candidates.

The Tech party was founded in 1939 and since then has grown until it is now one of the largest and strongest parties on the campus. Naturally, the success of the Tech party during the past three years is probably a result of the excellent support of the technical students, although its platforms usually attract votes from other colleges.

Its continued success or ultimate failure, however, is no doubt dependent on the support we engineers give the Tech party next Friday, February 26.

TECH NEWS

EDITED BY DON FRANKE, E.E. '43

Ag Campus Coup

Tech News reporter has ringside seat as engineers raid Ag Campus—Braves 25 below cold to bring you this exclusive story

The moon shone down on the Ag Campus.

"Just let 'em try anything," snorted Anthony Q. Whittlechunck, Forestry nineteen hundred and Gawd-knows-when. He made a few passes with his axe. "They won't get past me! I'll carve 'em!" he hacked viciously at an aged and crumbling stump. Five figures hove into view, carrying paint and paint brushes. One came over to Anthony Q.

"Can you tell me where the water tower is?" he asked.

"Up on the hill," panted the forester, not looking up. "I'm guarding it. Oh, you plead for mercy, do you, engineer? Take that, and that!" he buried his axe in the stump. The figures hit him over the head with spiked clubs and he passed out with a silly grin on his face. They climbed the hill.

Ten minutes later, a patrol of fifty foresters found him. "What do you mean by sleeping while on duty, Whittlechunck?" they asked. He didn't answer, just sat there with his eyes closed, and a silly grin on his face. They all hit him with their axes so he'd remember to stay awake next time. Then they saw the figures on the water tower.

"C'mon down and help us find the engineers," they yelled. A very small engineer climbed down slowly.

"What's the trouble?" he asked.

"Look what those *"'(?(*:-&""?! engineers did to poor old Whittlechunck," they chorused, pointing at the dismembered corpse. "We gotta find 'em!"

"You know what?" said the little engineer.

"What?" they asked.

"I think one of us is an engineer in disguise," said the little engineer.

"Oh, dear," said the foresters. They looked at each other.

ODE TO E DAY

By Gordon Dickson

There were hundreds of foresters then alive,
Of the engineers there were only five
But the whole Ag Campus was dark and still.
Only the engineers heard the moan
Of the icy wind; they were all alone
In big block letters the green paint smears-
TO OUR IDOLS, THE ENGINEERS-
They plied their brushes, WE DEDICATE-
ENGINEERS' DAY- the sun rose late
Then the whole world saw how the forester men
Had been caught with their britches down again.

The Queen Says, "Techs Are Swell"

Tech News reporters last night interviewed Laurel Anne Lein, Engineers' Queen, at her training camp in South Saint Paul. They reported that her general outlook was cheerful and that she was confident of being able to stand up to the strain of her arduous task. Said the beauteous Laurel, "Gee, engineers are suh-well."

Welding Contest Offers Big Prizes

For the student who wants national competition, the James F. Lincoln Arc Welding Foundation announces a $6750 award and scholarship program terminating April 1.

The papers are to describe conversion from other types of construction to arc-welded construction of machine parts, structural parts, or completed machines or structures. These need not actually be built, however.

The first prize is $1000, and the 76 other prizes total $4000. In addition, $1750 is made available in seven scholarships to the schools attended by the first three prize-winners.

Interested students should see Mr. T. P. Hughes promptly for further information and entry cards.

ALUM NOTES

EDITED BY STAN GENDLER, M.E., '44

AWARDED D.F.C. FOR HEROISM AT MIDWAY

Lieutenant F. E. Christoferson, I.T. '41, recently received the Distinguished Flying Cross for heroism in the Battle of Midway. Chris was in his scout plane when he discovered a four-engined Japanese bomber, a Kawanski 97, approaching in the direction of Chris' home aircraft carrier. Chris radioed the bomber's position to his carrier and then drove in to attack the giant plane. He made five attacks with his small plane and held the bomber's attention until two U. S. fighter planes arrived to destroy it. Lieutenant Christoferson almost made it back to the carrier, but dropped 1,000 yards short as his motor froze from lack of oil. The Jap had riddled his oil line. An escorting destroyer picked Chris up out of the Pacific.

FIGHTS NAZIS IN TUNISIA

Ewald H. Gustafson, M.E. '41, is now with the 1st Armored Division in North Africa. He received his commission as second lieutenant after completing the R.O.T.C. course and he was promoted to a first lieutenant last August.

AIR CORPS ENGINEERING OFFICERS

First Lieutenant Syrus Johnson, I.T. '40, is an engineering officer at Cochran Field, Macon, Georgia.

PILOTED THE GIANT B-19

Emil Sorenson, Aero.E. '40, who is stationed at Wright Field, Ohio, is one of the top test pilots in the country. His experiences include piloting the B-19 Army bomber, flying a captured German Messerschmitt, and diving the new Mustang P-56 at a speed of 675 miles per hour. He has done tests for the R.A.F., the R.C.A.F., and the A.A.F.

IN JAPANESE PRISON CAMP

Lieutenant Eugene W. Holton, I.T. '39, captured when the Japanese conquered the Philippine Islands, is now in a Japanese prison camp.

BECOMES A CAPTAIN IN THE AIR CORPS

First Lieutenant Arnold M. Soldoff, M.E. '40, recently became a captain in the Air Corps. Last November he married Miss Ruth Semmelman of Dayton, Ohio.

GOES TO AIR BASE AT ENID, OKLAHOMA

Lieutenant James P. Stodolka, E.E. '42, was recently assigned to duty as a service pilot in the 475th basic flying training squadron at Enid Army Flying School at Enid, Oklahoma. He is a member of Kappa Eta Kappa fraternity, Pershing Rifles, and the A.I.E.E.

WORKS FOR GOODYEAR AT AKRON

Charles Bostrom, Ch.E. '41, is employed by the Goodyear Aircraft Corporation as a process engineer at Plant "C." His address is 74 Atlas Street, Akron, Ohio.

DOINGS OF SIGNAL CORPS MEN

Major Carl A. Jacobson, E.E. '29, who was head of the Signal Corps department of the R.O.T.C. here at Minnesota last year, is now in the office of the Chief Signal Officer at Washington, D. C.

Lieutenant Daniel Drommerhausen, E.E. '42, recently completed a training period at Fort Monmouth, New Jersey, and is now an instructor there in company officer's work.

Lieutenant Robert A. Poe, E.E. '42, visited Minnesota last month while he was on his way to his new assignment at Camp Crowder, Missouri. He had just completed Signal Corps officer's training at Fort Monmouth, New Jersey.

BECOMES A CAPTAIN IN THE SIGNAL CORPS

First Lieutenant Lawrence E. Peterson, E.E. '33, son of Mr. Gustave I. Peterson of 1727 West 7th St., St. Paul, Minnesota, was recently promoted to the grade of captain in the Signal Corps of the U. S. Army.

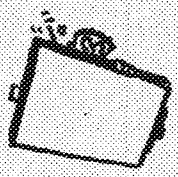
Captain Peterson was employed seven and one-half years previous to his entry into service as telephone engineer with Northwest Bell Telephone Co. at St. Cloud, Minnesota.

NOW WEARS SILVER MAPLE LEAVES

Lieutenant Colonel Carl E. Berzelius, I.T. graduate, is commandant of the Army's Pacific Coast Transportation Corps Officer's Training School at Camp Stoneman, California.

Colonel Berzelius, a Coast Artillery officer, was promoted from rank of major after the successful administration of the new service school, the initial class of which graduated this month. The commandant is a graduate of University of Minnesota, the Coast Artillery School at Fort Monroe, Va., and the Command and General Staff School at Fort Leavenworth, Kansas.

LAST DECEMBER'S CLASS OF AEROS



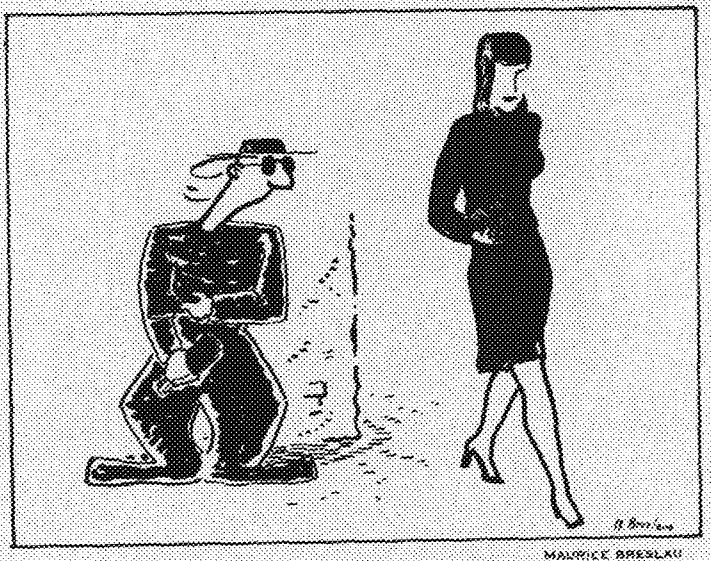
Two members of the December '42 graduating class, aeronautical engineers Dowl McFarland and Tom Brown are ensigns in the U.S.N.R. Another member, Louis Hoffman, is with North American Aviation at Kansas City, Missouri. Wayne Hay has a research fellowship here at Minnesota.

DESIGNS GLIDERS FOR THE NAVY

Ensign Kenneth Melin, Aero.E. '42, is working in the glider section of the Bureau of Aeronautics, Navy Department, Washington, D. C.

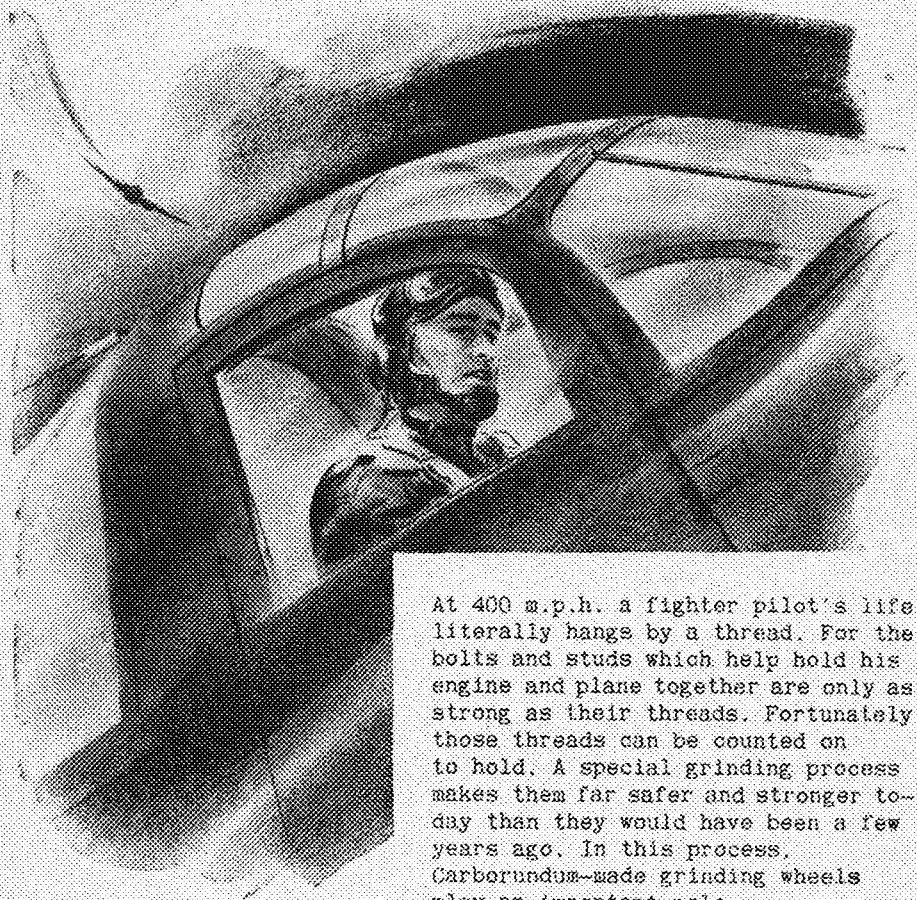
NOTED INVENTOR DIES

Charles E. Carpenter, manufacturer and inventor, passed away in Vassar Hospital, Poughkeepsie, N. Y., on November 9, 1942. He was 78 years old. Among his many inventions, thirty-four of which were patented, are the first electrically heated flat iron, a rheostat for controlling electric motors, a controller for flat bed printing presses, and a hydraulic governor for large alternating current motors. He was with the Cutler-Hammer Co. from 1903-1929.



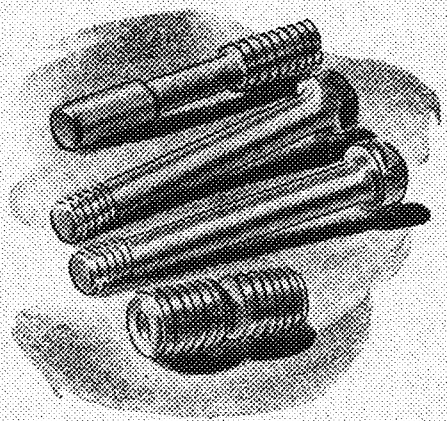
MAURICE BRESLAU

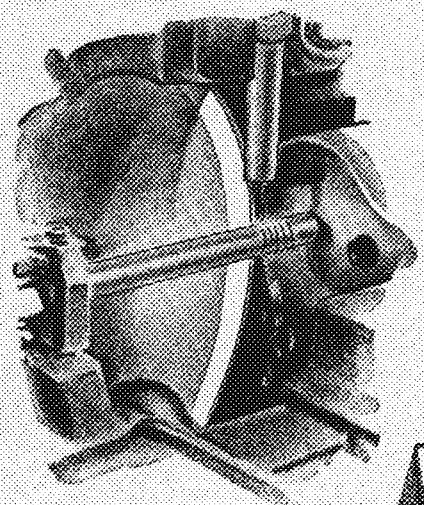
He flies a plane held together with threads!



At 400 m.p.h. a fighter pilot's life literally hangs by a thread. For the bolts and studs which help hold his engine and plane together are only as strong as their threads. Fortunately those threads can be counted on to hold. A special grinding process makes them far safer and stronger today than they would have been a few years ago. In this process, Carborundum-made grinding wheels play an important role.

The method of grinding produces threads of almost unbelievable accuracy, free from microscopic checks and cracks which might cause failure under stress. This greater accuracy justifies a smaller safety factor, reducing weight of dead metal. And in most cases, production is speeded and costs reduced.





Thread grinding is typical of the many ways in which products and processes developed by Carborundum are serving America's war industry. When you get out in the field and encounter a production problem that abrasives might solve, write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

"Carborundum" is a registered trade-mark of and indicates manufacture by The Carborundum Company.

A Learned Dissertation on the Intriguing Subject of

BEARDS

by Herbert F. Scobie

Wherein the Bristling Attitude of the Male Animal is Explained by an Expert

Not Orson Welles—But Herb Scobie

JIM RUSTAD

THE learned discussion which follows was written at the request of the editor who feels that concurrent with the celebration of Engineers' Day attention should be drawn to the high cultural standards of engineers and not to their technical achievements alone. This essay is expected to go down in history with Power Plant Lab Reports and that engaging book published in 1715 entitled "A Sound and Pleasant Proof that a Respectable Woman May Sometimes Enter a Coffee-House Without Damage to Her Good Name and Moreover She May, and Should, Treat Herself to a Pipe of Tobacco."

The subject of beards is an intriguing one because of the part they have played through the life of the human race and because of their present scarcity. The term *beard* originally applied to hair growing anyplace on the face, but modern terminology divides the face, like Cæsar's Gaul, into three parts. Accordingly, beard now implies hair on the chin, while that on the cheeks is referred to as whiskers, and mustache denotes hair on the upper lip.

Among the bearded races the beard was esteemed as an honor, significant of full manhood. Youngsters and eunuchs were beardless, and bearded women were considered witches. In the latter case, the beard is no longer a prerequisite.

With the advent of modern low-cost shaving equipment shaving has become the rule rather than the exception. The badge of manhood is no longer hair that grows on one's face, but the fact that one shaves.

In the days of the straight-edge, shaving was carried out with the skill of a surgical operation, and in some unfortunate instances was closely akin to it. Everyone has heard of the barber who exclaimed, "Gosh!" and fainted when the client informed him that the tie he wore into the shop was not red.

The hoe-type razor is much safer but can be dangerous in inexperienced hands. Additional features of the hoe-type include the fact that its special character confines it almost exclusively to the purpose for which it was originally intended. The versatile straight-edge was often used by other members of the household to sharpen pencils and cut linoleum whereas the extra-curricular activities of the hoe-type are confined almost entirely to shaving warts off dill pickles.

Hoe-type razors were used by a professor of Time and Motion Study to shave both sides of his face simultaneously, thus gaining three extra minutes for sleep in the morning.

The acme of perfection in shaving equipment was reached when the change-over occurred from single edge cutting tools to multiple edge equipment. The electric shavers available today have wrought tremendous changes in our daily lives. It was reported recently by the columnist of a local paper that he is able to start the day calmly and peacefully because his son brings his electric razor to him, enabling him to shave in bed. This eliminates the rude awakening he got on dashing water into his face shortly after arising. A motorist was recently arrested for careless driving because he was using an electric razor plugged into the dashboard as he drove along a main thoroughfare.

A man with a beard in modern times is considered as unusual as a girl without a God-knows-when chest. This has always been puzzling inasmuch as it is as natural for hair to grow on a man's face as it is unnatural for a woman to grow talons and lacquer them. Yet we find both sexes yielding to social pressure; men worry about 5 o'clock shadow, and women are unusually nursing broken fingernails. Incidentally, girls, try a piece of cellulose tape next time you snag a claw. It's just marvelous!

Society not withstanding, men do enjoy growing beards. Celebrations are held every year at which one of the features is the beards grown especially for the occasion. Sometime or other every man goes on an outing and refrains from shaving. On his return, the woman or women in his life require him to shave immediately.

This is especially the case if the outing was short and the beard is short and bristly. Anyone who has gone barefooted through a stubble-field can sympathize with the women. However, if the women would only allow the man to keep his whiskers a few more days they would become long enough for column action to manifest itself and the whiskers would go virtually unnoticed.

Having had a beard and mustache of one sort or another since the summer of 1940 has afforded me ample opportunity to study beard culture and the reactions of people to beards. The present product is the result of a number of experiments, conducted chiefly in the summer, which started over ten years ago. The original short term attempts led to inconclusive results and when an opportunity presented itself to run an extended test it was grasped.

The first time I appeared in Minneapolis with a full beard, I was as self-conscious as a man in white-tie and tails at a nudist colony. A few minutes in public were enough to convince me that a full beard couldn't possibly look more peculiar than the expression on people's faces. Jaws dropped like mercury during a cold wave as a full beard came into range of vision.

A full beard has many advantages. Not the least is illustrated by the actions of a civil engineering student of my acquaint-

(Continued on Page 156)

Combining PATRIOTISM *and* GOOD SENSE

Of course every one is willing to do without the essential materials that help win the war; everybody knows zinc and steel are among those materials. And *of course* it is just good common sense to take care of the things we have, including galvanized roofing, to make them last as long as possible and give the best service.

HOW TO CONSERVE GALVANIZED ROOFING

You'll find galvanized roofing of various types used on all kinds of structures, on farms, in industrial plants, in housing. It is a valuable material, and with proper care it can be made to last a long, long time; anyhow, until the war is over and necessary replacement material is available.

Do This . . .

See that all the roof supports are in good shape. If necessary renail and strengthen them, and replace broken or rotted members.

And This . . .

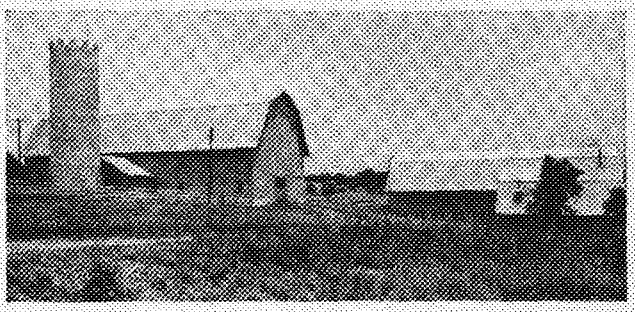
Then bring all the separate sheets into as close alignment as possible. If moisture has a tendency to creep through at the laps, lay a strand of asbestos wicking between the sheets at the laps, and renail the roofing with an approved type of zinc-coated lead-seal special roofing nail with a drive-screw shank. Stubborn lap openings can be effectively closed with hardware screws.

And This . . .

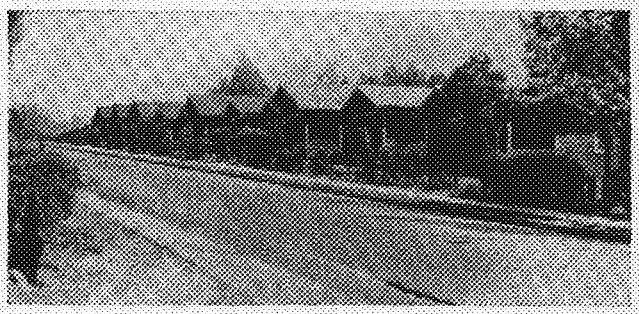
If any of the roofing is showing signs of rusting, paint it with two coats of metallic zinc paint, (see Federal Specifications TT-P-641) which will effectively stop the rust and prevent further injury to the roofing. In fact, the use of this remarkably good paint, which can be readily made by any paint manufacturer, will extend the life of galvanized roofing almost indefinitely.

In "How To Make Galvanized Roofing Last Longer", a booklet published by the Institute, complete and explicit directions are given for all of the above operations. Copies will be sent free upon request.

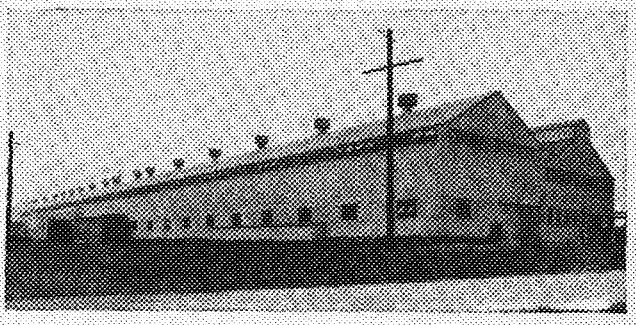
AMERICAN ZINC INSTITUTE
Incorporated
60 East 42nd Street, New York, N. Y.



Galvanized sheets constitute one of the most popular forms of roofing for farm buildings of all kinds. Everything considered, they are also the most economical.



In industrial establishments, where efficiency and economy of materials are of prime importance, galvanized sheets are widely used for various types of structures, from modest homes for employees to the largest of manufacturing plants.



MARY SAVES THE DAY

(Continued from Page 131)

hear what Warner has to say for us." Ron's voice faded in.

"And the queen is passing in front of me now—listen to that crowd roar!" a confused sound of cheering was heard.

"Louder, fellas!" came a voice offmike. The cheering welled up and drowned out Ron's voice.

"—and here comes the first of the floats. It's a large float, colored green and white and it depicts an engineer exterminating a bunch of foresters with a large can labeled 'Rat Poison.' The next float shows Hirohito committing hari-kari with a slide rule and Hitler cutting his own throat with a forester pin—"

Ron's voice ran on. He told the radio audience that this was the biggest, longest, and most colorful parade ever to be staged on Engineers' Day. He described floats half a block long, forty feet wide, and thirty feet high. He talked of an illuminated slide rule twenty feet in length that worked by electricity. He estimated the size of the crowd conservatively at eighty thousand and he had just finished with a grand finale of mounted engineers in full armor as the real parade turned in off University Avenue.

"And this, ladies and gentlemen," said Ron hurriedly, "concludes our review of the Engineers' Day parade; one, I am sure, that will live long in the memory of all engineers. Take it away, WLB!" And the real parade came barreling up past EE to find Ron talking happily into a dead mike.

Two hours later, Jack Rockwell, the grand old man of the TECHNOLOG staff, came wandering into the TECHNOLOG office. He had hoped to find it empty, but a sophomore EE and a female engineer had beaten him to it. A hulking forester with a black eye and a smushed nose lay bleeding quietly in a corner.

"Oh, well," he said. As he went out, he locked the door and hung a DO NOT DISTURB sign on the outside. Life has its little compensations.

SAME OLD STORY

(Continued from Page 132)

end a stormy existence, and be the cause of much strife, bloodshed and tears. It so happened that the School of Mines was not a part of the College of Engineering at that time, and the engineering students did not consider the miners as part of their number and consequently privileged to share in the heritage of the Blarney Stone, but the miners, it seems, felt they had been sorely dealt with and said since the stone had been found on their territory, it was rightfully theirs. Such opposite viewpoints possessed by two energetic groups of young men often lead to conflict and this case was certainly no exception. On the second annual E Day while the senior engineers stooped to kiss the sacred stone and be knighted by a senior whom they had chosen to be Saint Patrick, the sullen and bitter miners (visibly green and smouldering inside) began hatching a black and sinister

plot to abduct the stone. Fable has it that they made a gallant try but were thwarted and forced to retreat and lick their wounds. A few years later, however, they were more successful and at the height of the festivities, snatched the Stone from under the noses of the bewildered engineers, and in spite of a running battle royal that followed, were able to heave the disputed Blarney Stone over the railing of the Washington Avenue bridge into the swirling waters below. But the following year it mysteriously appeared again.

The engineers had secretly retrieved it and intrusted it to an organization called Plumb Bob, which is a secret society, I believe, made up of a few choice engineers having a 3.14159 honor point average, or better. From that day to this Plumb Bob has taken it upon itself to hide from year to year the Stone, and to form a guard for its annual appearance, choosing to keep fellow engineers in ignorance. Everyone felt safe now that such an illustrious group had taken over, but it wasn't many years later that the miners once again snatched the Stone from under their noses. This time they retreated to the Mines Building fighting a rear guard action as they went.

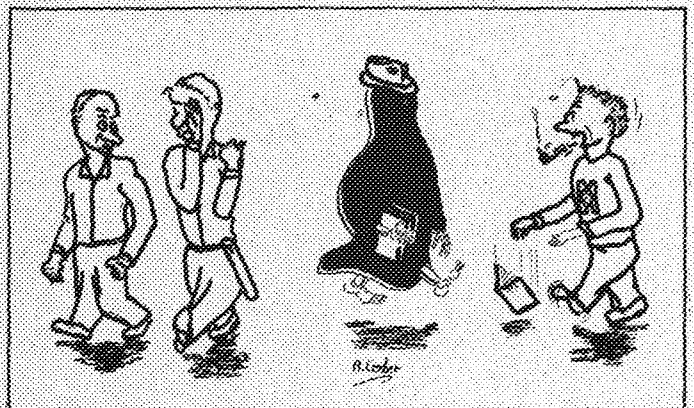
THE parades at that time were of the riotous type, specializing in "out houses" and obscure characterizations all designed to terrify the campus in general and secretly delight the coeds peeking from behind sorority house curtains. This helped maintain a wide breach between engineers and normal people and freshmen were all warned to beware of these strange, hairy creatures, who wore no shirts, rarely shaved or bathed, and at all occasions wore a scabbard at their hip. Their queen, who was chosen quite arbitrarily by the Tech Commission (this is an organization formed to do this and a few other jobs of similar nature but mainly to use up the profits from Engineers' Day by having dinners), was of necessity some hearty creature who was taking architecture and who gallantly sacrificed herself to her uncouth subjects.

As time went on, however, the engineers became more and more civilized. Most of them began shaving daily; some even wore shirts and took business courses. The faculty took "steps" toward cleaning up the parades but still the old reputation stuck, branding engineers as creatures apart.

Perhaps this reluctance of the rest of the campus to accept them caused them to revert to type once again—only several years ago. The miners, although now engineers, once again planned to steal the Blarney Stone. As the Stone was being carried up the steps of Northrop in preparation for the knighting ceremony, the guards were suddenly attacked and the bearers pushed inside the doors of Northrop by a group of huskies who forced them down the ramp to the side exit where a kidnap car awaited. On the side steps there was a struggle and fated Stone slipped from the litter and bounced down the steps, crushing a few as it went. The unfortunate lads responsible had to dish out about $50 for repairs."

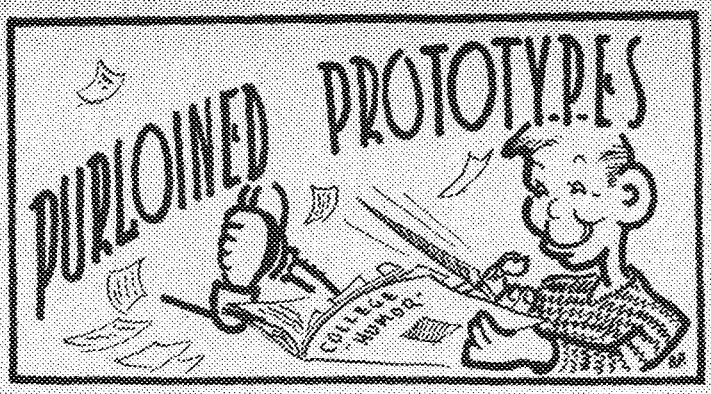
Somebody fumbled for a cigarette and mumbled something about the feud between the foresters and the engineers.

"Yes," I said, "although just how that started, I don't know. Maybe it was that both groups seem to have their celebrations at the same time and the competition for publicity was too keen, at any rate the engineers make their annual trip over to the Ag campus and paint the water tower and the foresters make a feeble attempt to retaliate. *(Continued on Page 156)*



M. GERBER

"He said he'd graduate from Tech if it killed him."



BY JOHN UPPGREN, M.E., '43 AND WILEY SOUBA, M.E., '43

We know a heck of a good dirty joke we'd like to tell you, but the editor won't let us. It sure is good.

* * *

A SEQUEL TO THE WOLF POEM

If she throws her "quiver,"
In the front seat of your "flivver,"
And says, "It's pleasant on the river,"
Brother———She's a wolf.

If that get-up that she's wearing
Turns your head and keeps it staring,
Cause the length's a little daring,
Brother———She's a wolf.

If she really is bewitching,
If she kisses with a twitching,
As if her rosy lips were itching,
Brother———She's a wolf.

If she really lets you pet her,
In any kind of weather,
And you really think you'd better—
Brother———Be a Wolf.

* * *

One difference between the modern girls and the 1900 models is that the latter blushed at a risque story while today they memorize it.

* * *

An insurance agent was filling out an application blank. "Have you ever had appendicitis?" he asked.

"Well," answered the applicant, "I was operated on, but I have never felt quite sure whether it was appendicitis or professional curiosity."

* * *

My kitty has gone gallivanting,
I don't know where she's at.
Curse this city
That lured my kitty,
By dawn she'll be a cat.

* * *

"One of them city fellers tried to sell me the Woolworth Building."

"What did you say?"

"I sez, 'All right, young feller, wrap it up.'"

* * *

"I know a place where the women don't wear hardly anything except maybe a string of pearls once in a while."

"My Gosh! Where?"

"Around their necks."

* * *

We wish that the editor would let us tell that dirty joke.

* * *

Bystander: "Look at the disgusting boy with the cropped hair cigarette, and wide trousers."

War Worker: "That's my daughter!"

Bystander: "My dear sir, do forgive me. I would never have been so outspoken if I'd known you were her father."

War Worker: "I'm her mother!"

Twinkle twinkle little star,
How I wonder how you are;
Gazing down on Comstock Hall,
You, alone can see all.

* * *

Two very proud parents had been presented with a pair of twins, but they didn't know how to tell them apart. They tried to think of all sorts of ideas, but none of them were much good. They thought of cutting one's hair, but they didn't have hair. Finally the father brewed up some very potent dye and carefully printed Tom and Daisy on their backs.

* * *

Wish we could tell that dirty joke.

* * *

What prof said when it was time for the class to begin, "When those young men in the rear get through flirting with the girls, I hope they will give me a chance," and then wondered about the soft chuckling?

* * *

Little Alfred had grown so weary of being asked by admiring strangers, "Whose little boy are you?" that one day he surprised everyone by turning the tables. Directing his innocent gaze upon a very young man who was calling upon his sister, the child demanded sweetly:

"Whose papa are you?"

* * *

Still would like to tell that dirty joke.

* * *

The professor was deeply absorbed in some scientific subject when the nurse announced the arrival of a boy.

"What—who—?" stammered the professor, absently. "Why interrupt me—isn't my wife at home?"

* * *

Olaf Larson, working in a warehouse, backed into an elevator shaft and fell down five stories with a load of boxes. Horror-stricken, the other employes rushed down the stairs, only to find him picking himself unharmed out of the rubbish.

"Ess de boss mad?" he whispered cautiously. "Tol 'em ay had to come down for nails anyway."

* * *

It was in London, and the healthy looking young man was turning away from a shop window. An aggressive, angular, non-maternal woman demanded, "Young man, why aren't you at the front?" The young man looked the lady over from head to foot and then retorted, "G'arn, you slacker, where's your war baby?"

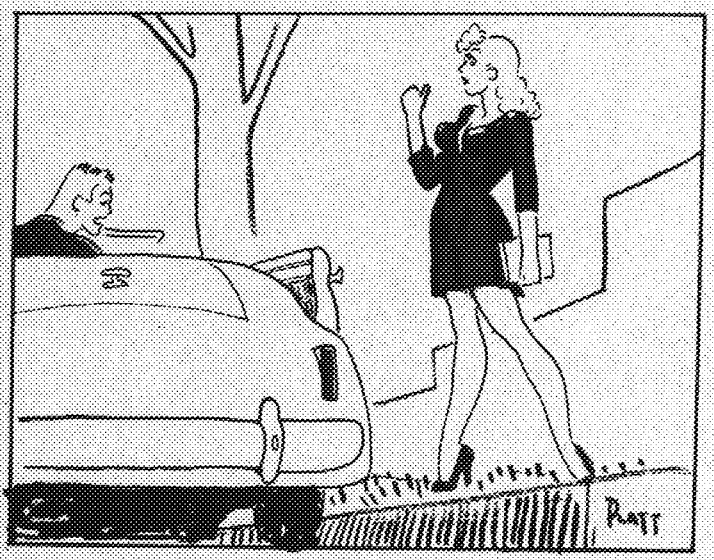
* * *

Prof. Ryan says, in regard to prism sizes, "These prisms are very small because they come in small sizes."

This is the dead line.

We managed to sneak in our dirty joke after the dead line, so the editor wouldn't have a chance to censor it. Here it is.

Pat: "Was that a blonde I saw you out with last night?"
Mike: "No."



How Far Do You Plan to Go?

INTRIGUING SUBJECT OF BEARDS

(Continued from Page 150)

ance who grew a magnificent beard. When he wished to travel by streetcar he donned an old hat and dark glasses, took up a white cane and calmly waited for the car. The conductor always helped him onto the streetcar and found a seat for him. Another friend had a fine-looking beard which gave him a cosmopolitan appearance. The expression of an unappreciative member of the Psychology Department was, "Looks like an inferiority complex cropping out."

People who enjoy soft boiled eggs might have some trouble with a full beard but that has not been my experience. Not being addicted to chewing tobacco, I cannot cite experiences along this line but it appears that some people do have trouble getting a plug that matches their whiskers.

A distinct advantage of the full beard is that shaving is not required; only an occasional trim around the mouth to keep the loose ends out of the way. Since a small beard and shaven cheeks are neater in appearance, modern beards usually take this form. To Oscar Mohn went the honor of converting my full beard to its present form. When asked if he'd had much experience trimming beards, Oscar replied, "I used to have two beards to trim but their owners passed on several years ago."

THERE are always a few individuals who are unable to bear the attention and admiration that a beard draws and are incapable of growing one themselves. They resort to all sorts of subterfuge to get your beard removed. Remarks are made, some to you personally, many more behind your back. Such people are unfamiliar with Mark Twain's fine expression, "Good breeding consists in concealing how much we think of ourselves and how little we think of the other person." In spite of everything it shouldn't take the moral support of ten men to form a "whisker-club" before growing a beard, least of all for the newspaper columnist who said he'd do as much with said support.

Anyone who wants to wear a beard should grow one and let the quips fall where they may. Little children think you are Santa Claus out of season and you solmenly assure them your whiskers will turn white come Christmas. Some people are sure you're an Australian bushman, possibly because they see a face peering through what is mistaken for underbrush.

One of the most amusing cases of mistaken identity occurred when a friend brought his wife into Shiek's Cafe for the first time. She was delighted to meet "the sheik" but her elation subsided when she discovered I was just another patron. Not so delighted was the woman who was a buyer for a large department store, and she was positive that anyone with a beard must be an Axis spy. Then there is the time two little urchins took note of the beard, went into a huddle, and finally emerged with the query, "Are you a magician, mister?"

PEOPLE being curious by nature, their most frequent comments are: (1) Why? (2) Doesn't your wife object? (3) Doesn't your face itch? (4) Did you lose a bet? Also should be mentioned those wholly unimaginative expressions: (1) Did you forget to shave? (2) Didn't you have a blade in your razor? (3) Why didn't you stand closer to the razor? Naturally one develops a set of stock answers to the oft-repeated questions. If asked "Why?" and you answer, "Oh, just for the hell of it," the invariable question follows, "Yeah, I know, but WHY?"

When someone mentions that they grew a beard like that once, but removed it when they saw how it made them look, the proper retort is that if you had a face like theirs you'd grow a beard to hide it.

There's always some wise guy who believes it would be a good idea to shave you with the assistance of a few bystanders. It has been found effective to look him calmly in the eye and say, "I don't like the looks of that tie you're wearing. It doesn't go with the rest of your clothes. I think I'll remove it for you."

The real reason for wearing a beard is a military secret which can be disclosed only now. It is expected that a most recent development will take its place beside Field Ration K as an important scientific advance of the present war. After almost three years of research, a new soap has been developed. The new soap makes whiskers grow inward instead of outward, thus obviating the necessity of shaving. In addition, the teeth are constantly kept clean by the automatic brushing and gums remain in excellent condition due to regular massaging. When the whiskers become too long, they are chewed off and spit out.

THE SAME OLD STORY

(Continued from Page 153)

LAST year we raised the interest in E Day considerably by introducing a queen contest. Many pretty girls from the other side of the campus were persuaded, browbeaten or enticed to file for queen. The judging was done by a newspaper columnist and a "girl" artist from a large advertising company. The queen was chosen on the basis of personality, poise and beauty, the judges separately rating each contestant on a basis of from one to ten on each quality. The lucky girl chosen was a journalism senior, and assistant editor for the *Gopher*. All went well until the evening before E Day when the pour girl mysteriously disappeared. Her sorority sisters from the Chi O house blamed the engineers for instigating a foul publicity stunt but the committee suspected the *Daily* editor, and the police participated while the *Daily* presses were stopped. The queen was finally returned, unharmed but distressed."

At this point somebody noticed the clock on the wall was at the half hour mark and one by one the fellows began leaving for their next hour classes. Before I knew it I was left there sitting alone with their goodby's ringing in my ears, a melted malted, and stack of unpaid checks. I blinked twice and reached for my billfold.

IN WELDED BLISS

(Continued from Page 142)

ing here in the kitchen. I need air. Look how pale I'm getting. Why I'm terribly thin; poor as a snake."

The kid walked into the room and interrupted, "Say, Da-a-a-dy-y, get those dirty socks and shirts out of the sink so I can wash, huh, Daddy?"

"Go away, kid."

"Well Mother said I should tell you to—"

"See, if I got a job, why you wouldn't have to work. You could take care of things here."

"Now just you be satisfied, Jim. I promised to take you out tonight for an airing. Besides you have your job to do here. Quick! Hurry up! Put that egg in the pan. If it runs down your arm another inch . . . *James!*

Jim got a mop and started to clean the floor while Winnie and the kid started to eat.

The scene was set and it had to happen sooner or later. It didn't happen very soon but it did happen a little later.

Jim was rubbing lotion into his hands to keep them soft and white. Winnie was smoking in her smoking jacket and slippers, and the kid was gravely turning the tuning dial back and forth across every station with the volume control on full blast.

Jim, long suffering soul, tired out from the day's housework, buried his head in a pillow to cut out the radio's noise, and contemplated his existence. Winnie looking over at Jim, noticed a piece of lint on the pillow upon which Jim's brain was turgidly cogitating. She proceeded to fill her lungs with a good drag of smoke, leaned over the pillow, and blew the lint off. Choking and gasping, Jim came out from under the pillow and through the cloud of blue-gray smoke and looked at Winnie with eyes that were red and smarting, and yet, infinitely sad. The kid found Bee-eee Oh-hhhh on the radio and screamed with delight, at the same time jumping up and down and punching Daddy in the abdomen.

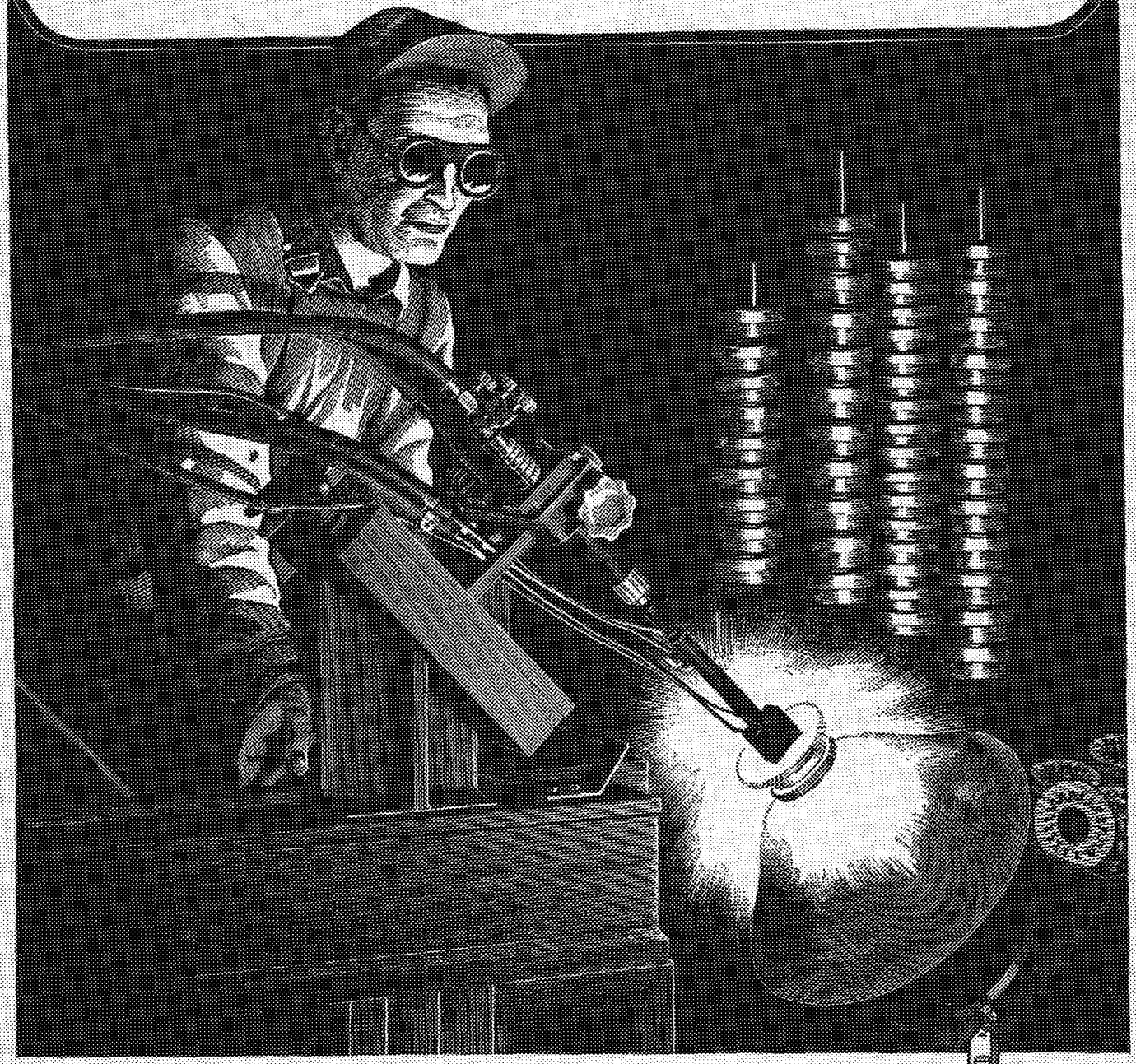
Into Jim's soft, sad eyes came a strange, hard glint.

"Archie, come here child," he said softly.

Archie reluctantly advanced within reach. "Whadda yuh want?"

After Jim was convicted of manslaughter and sent to prison, Winnie was free to marry her little foreman who was easier to handle anyway. She tried to forget her Jim; to put from her mind the ugly past. But hard as she might try, and forget as much as she could, she was only a welder's daughter and carried a torch for Jim.

GEAR TEETH HARDENED IN 8 SECONDS



IN only a few seconds the oxyacetylene flame adds greatly to the service life of this internal gear. Teeth and other surfaces subject to wear are rapidly hardened by the modern oxyacetylene flame treating process. The depth of hardening is easily and accurately controlled, without affecting the inherent toughness of the core metal.

Airco Flame Hardening gives all the advantages of other surface hardening methods plus speed and ease of application. Simple arrangements using one or more torches permit flame hardening of a large variety of metal parts on a production basis.

Many other applications of the oxyacetylene flame are finding ever widening application in speeding and improving production of ships, tanks, guns, rolling stock and planes. This versatile tool slices through steel with remarkable speed—welds metal into strong, light units—sweeps surface rust from metal structures to extend the life of paint jobs—gauges steel and iron quickly and accurately.

To better acquaint you with the many things that this modern production tool does better we have published "Airco in the News", a pictorial review in book form. Write for a copy.

AIR REDUCTION

AIRCO

General Offices:

60 EAST 42nd STREET, NEW YORK, N. Y.

In Texas:
Magnolia-Airco Gas Products Co.
General Offices: HOUSTON, TEXAS
OFFICES IN ALL PRINCIPAL CITIES

ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

As an appropriate toast for Engineers' Day, let me open with:

"Here's to the land we love
And vice versa!"

* * *

Miles Olson, Engineers' Day head, has gotten so egotistical that he now kisses his girl good night and says he is the second happiest person in the world.

* * *

Gene Whitacre applying for a lifeguard job:
Official: "Can you swim?"
Gene: "No, but I can wade like hell."

* * *

And of course you've heard of the clothing manufacturer who put out a two-way suit for people who don't know whether they're coming or going.

* * *

J. Johnston is a fellow who doesn't know whether to sleep in the morning or get up so he'll have a longer day to loaf.

* * *

Last night I looked upon the stair;
I saw a man who wasn't there.
He wasn't there again today,
My God, I wish he'd go away.

* * *

I had a bunny
His name was Jim.
Got sixteen more;
Her were no him.

* * *

Donald Franke, senior electrical, has learned how to apply his knowledge in a practical way. He has been using Ampere's "right hand rule" to obtain transportation.

* * *

Simile of the month: As careful as a nudist climbing over a barbed wire fence.

* * *

A girl slaps a boy's face, not to hurt his feelings, but to stop them.

* * *

Carroll Martenson thinks more toasts should be given to the girl who steals, lies and swears—steals into your arms, lies there, and swears she loves you.

* * *

Heard in power recitation:
Instructor: What is the advantage of a long pump handle?
C. Kvalness: You can get somebody to help you pump.

* * *

Davenport Chess—She moves into his arms and then neither moves for several hours.

* * *

She to Bob Giantvalley: Who was that lady I saw you outwit last night?

* * *

With queenly grace she floated along the street, but at the curb she paused, and her pink little brow furrowed as she gazed at the river of mud before her. Our hero seeing her plight, rushed to her side and tearing off his topcoat, spread it in the mud so that she might not soil her lovely slippers. She gazed at him in wonder for a moment, then murmured softly, "Well, of all the damn fools!"

* * *

He who laughs last has found a double meaning.

"Your honor, I was not intoxicated."
"But this officer says that you were trying to climb a lamp post."
"I was, your honor. A couple of cerise crocodiles had been following me around all day, and I don't mind telling you that they were getting on my nerves."

* * *

"You say you served in France?" asked the restaurant proprietor, as he sampled the new cook's first soup.
"Yes, sir, officers' cook for two years and wounded twice."
"You're lucky, man. It's a wonder they didn't kill you."

* * *

"How did you keep your donation secret?"
"I sent in an anonymous check."

* * *

"You told me to file these letters, sir," said E. John R. to Captain R.
"Yes," returned Captain R.
"Well, I was just thinkin' that it'd be easier to trim 'em with a pair of scissors."

* * *

Doctor—"You cough with much greater ease this morning."
Patient—"I ought to; I've been practicing all night."

* * *

A Britisher, while touring the United States, remarked to a man in the West: "You have an extr'ord'nary country here, you know; very extr'ord'nary—stunning women, rippin' big cities, and a hally lot of other things, but you have no aristocracy."
"No what?" asked the westerner.
"No aristocracy," replied the Britisher.
"Aristrocacy? And what's that?"
"Oh, people who never did anything—and whose parents and grandparents never did anything—whose families have always been people of leisure."
"Oh, yes; we have 'em here, but we call 'em tramps!"

* * *

Old Lady—"You don't chew tobacco, do you, little boy?"
Newsboy—"No, mum; but I kin give you a cigarette."

* * *

He: "Why did you quit your job?"
She: "The boss was bowlegged. I fell through his lap."

* * *

POME

I often sit and medi8
Upon the scurvy trick of f8
That keeps me still a celib8
Oh, cruel f8
I want a l0der maid sed8
To love me and be my m8
My 40 2dle is not so gr8
I cannot w8
Oh, f8, be9, be4 2 l8
Relieve my awful single st8
And when I've 1 this maid sed8
We'll oscul8

* * *

The modern girl may know her English, but she doesn't mind if a guy ends a sentence with a preposition.

* * *

Moral: The fan dancer who has the least number of fans has the most fans.

* * *

The second twin was named Encore because he wasn't on the original program.

* * *

When you knock at the door and find hubby home, then, brother, sell something.

* * *

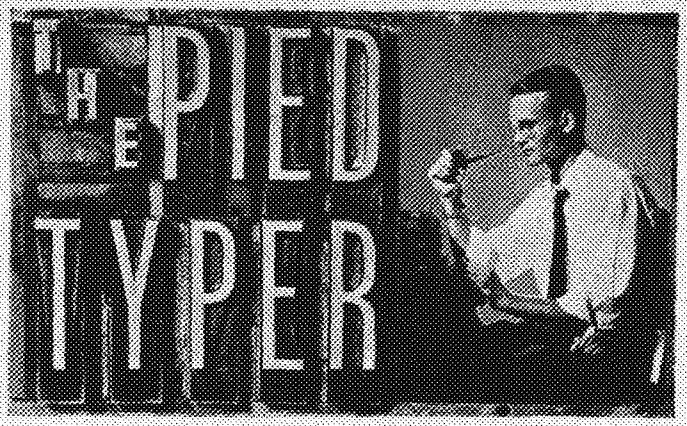
They say a half breed is a fellow with a cold in one nostril.

* * *

All women's dresses, in every age and country, are merely variations on the eternal struggle between the admitted desire to dress and the unadmitted desire to undress.

* * *

Having lived through this many issues, I'll try again. See you next month, I hope.



Well, this is it. We mean the Engineers' Day issue of the TECHNOLOG of course. Business with us is strictly not as usual. We have accelerated our schedule and come out with the E Day issue three months ahead of the usual time. We are sadly afraid, however, that the schedules of the editor and staff have been slightly decelerated. We can only hope that our instructors will stay in a lenient frame of mind until we can beat the books and catch up.

Also operating on an accelerated schedule was our annual TECHNOLOG banquet. Strictly impromptu entertainment was provided by the "Boys in the Backroom Quartet" shown in the above photo. From left to right they are Ed Proszek, TECHNOLOG Board member; Don Baer, layout editor; Professor Harlow Richardson, faculty advisor; and Gene Whitacre, business staffer. We are genuinely sorry that we can't run the picture with sound. Except for a few sour notes the boys were really fine.

* * *

We suppose we are expected to make a few well chosen remarks about *Skum's* story on the Institute of Technology. We read it, and begrudgingly admit that there were a few passages that we enjoyed. We suppose that this is because we were raised in an agricultural state. We were especially happy to see that SKI-U-MAH has given up at last and admitted that there is really only ONE magazine on the campus. We think that they were overly modest, however, in not mentioning that there is a small pamphlet published by an enterprising group of journalism students in room 14 Murphy hall.

* * *

We wish to point out that the unfortunate mistake whereby Doc Holtby was called a bonehead, that occurred in last month's Log, does not necessarily represent the opinions or policies of this magazine. In short, the error was purely typographical.

* * *

Our special thanks go to artists Bob Platt, Maurice Breslaw, Harold Gerber, and to photographer Jim Rustad for the fine work they turned out for this issue. Also, orchids and a bottle of Budweiser to layout editor Don Baer who spent long hours over typewriter and paste-pot dummying the pages.

J. R.

The Senior Class Proudly Presents—

◆ ◆

SENIOR PROM '43

◆ ◆

Grand Ballroom *Hotel Nicollet*

Friday, February 26

Featuring Two Great Bands

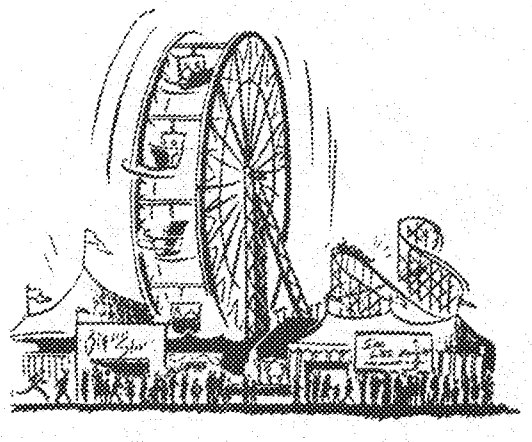
Red Melgren **Edgar Drake**

at the lowest price in history

TICKETS NOW ON SALE

$2.00 per couple *Including Tax*

G-E Campus News



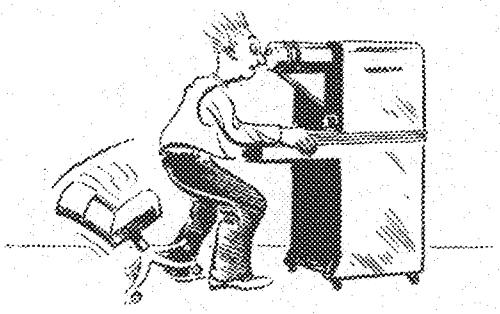
MERRY-GO-WHEEL

A DEVICE that rotates in the manner of a combination merry-go-round and Ferris wheel has been developed to speed the drilling of marine gear casings at one of General Electric's major plants.

Known as a universal indexing trunnion fixture, the device permits quick moving of the casings for drilling at any angle in a full circle and on any plane. Movement is controlled by a push-button.

About 110 holes must be drilled and tapped in each of the casings. Formerly it took a crane to move the casings (which vary in weight from 1000 to 2000 lb) after each surface was drilled, and every piece of work had to be set up at least six times.

Now work is set up just once—on a table that can be turned completely around in either direction with no more effort than it takes to push a revolving door—and 24 to 32 hours a week are saved.



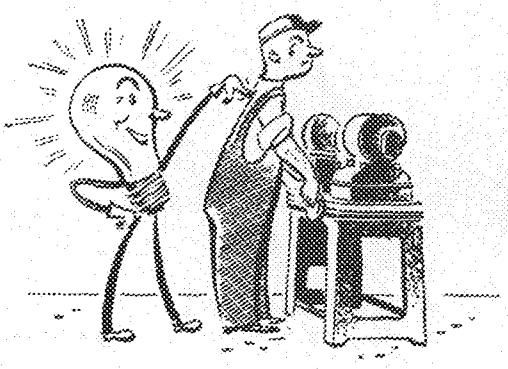
THE BETTER TO SEE WITH

PARTICLES as small as one millionth of an inch—one thousandth of the diameter of a human hair—can be clearly seen with the new G-E electron microscope.

Developed by Drs. C. H. Bachman (Iowa State, '32) and Simon Ramo (U. of Utah, '33), the new instrument can magnify a specimen as much as 10,000 times and reveal the actual composition and structure of such minute things as dust and smoke particles.

Here's how it works: a beam of electrons inside a vacuum chamber passes through the specimen, passes through an "electron lens," and produces a magnified picture on a fluorescent view screen. This image can then be photographed outside the tube and enlarged up to 100,000 times the size of the original specimen.

The microscope, designed for use in small laboratories and war plants, is portable and operates on ordinary house current.



THE LIGHT FANTASTIC

ACTUALLY it's just an ordinary light bulb, but used in an indicating method developed by a G-E foreman, it helps minimize errors in precision lathe work requiring an accuracy of five one hundred thousandths of an inch.

This new method eliminates the human element inherent in the old practice of using a magnifying glass to see when the tool makes contact with the surface to be cut.

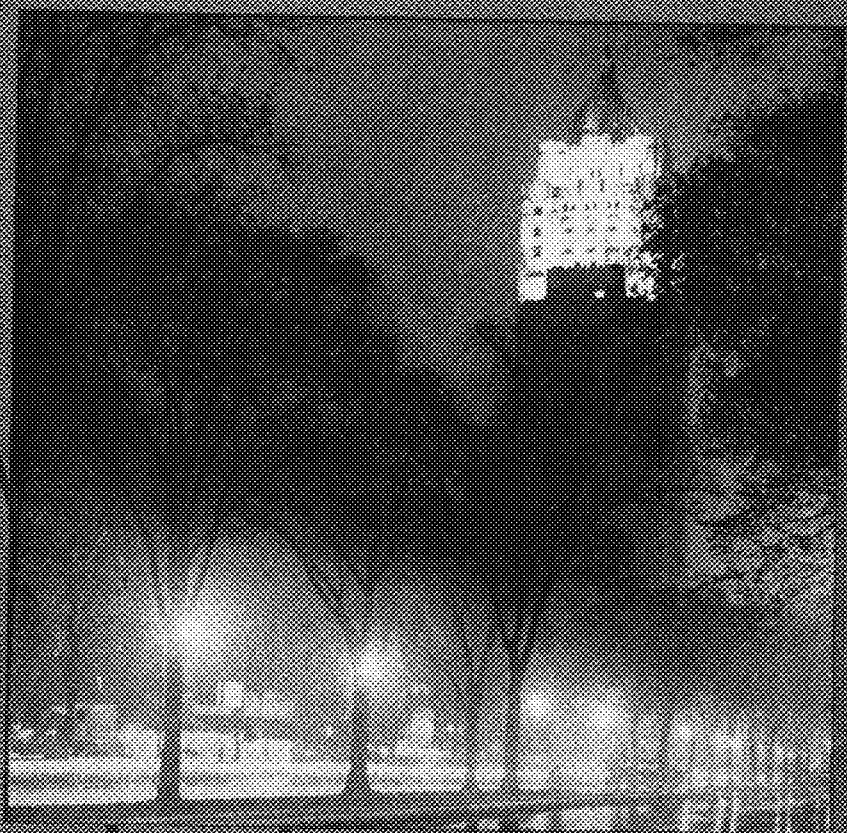
In this indicating method, electrical contact between tool and work is used to close a light circuit. The tool is brought up to the surface to be cut in the regular manner until it is just about to make contact. From this point on it is brought up very slowly until the pilot light flickers.

When the light is steady, the indicator is set at zero, and if it is set and read correctly, there can be no error.

If you'd like to try this on your own machine-shop equipment, write for a free diagram and description to Campus News, General Electric Co., Schenectady, N. Y.

GENERAL ELECTRIC

MINNESOTA TECHNIC



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CARRIER CURRENTS
HONORARY SOCIETIES
COLLEGE HUMOR

MARCH • 1943

15c

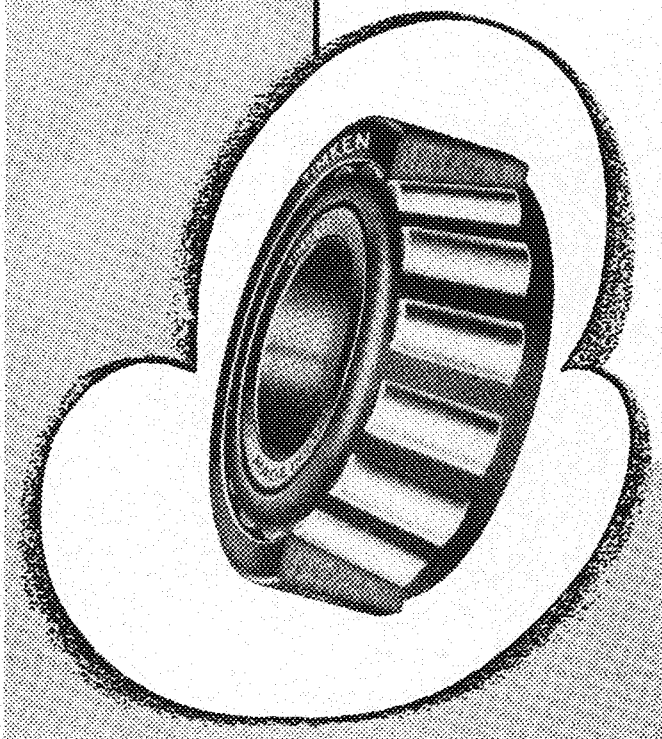
INSTITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA

Engineers who know their bearings are helping to win the war. Take a tip from them for your future's sake.

No matter how well a machine is designed in other respects it cannot operate with maximum efficiency if its bearings are unequal to the tasks assigned to them.

For example, friction elimination is only one function of bearings in modern mechanical equipment. Equally imperative and important are ability to carry and control radial loads, thrust loads and any combination of them; to hold moving parts in correct and constant alignment; and to adapt themselves to any condition of application without the slightest reduction of efficiency in any respect.

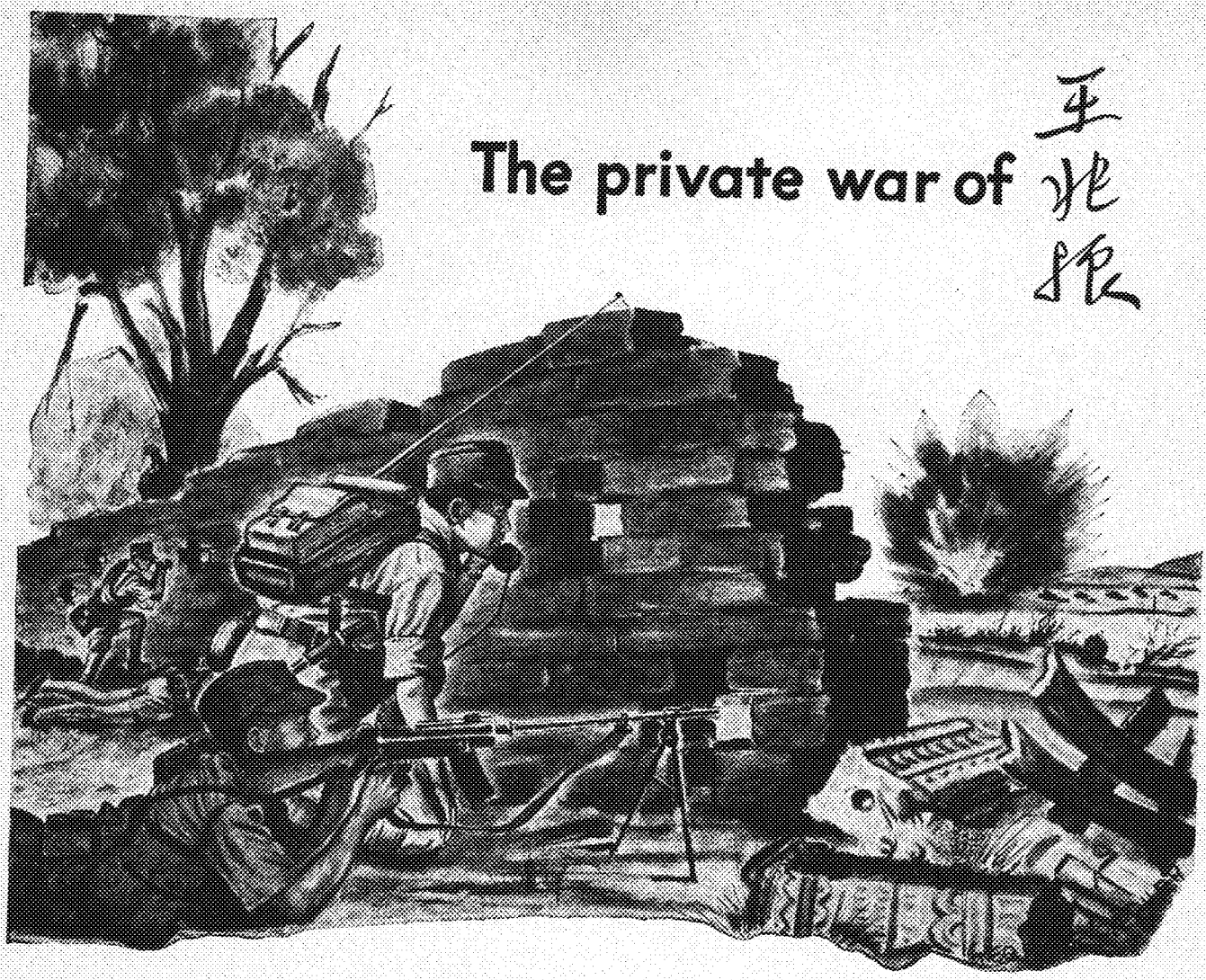
Timken Tapered Roller Bearings have a success record covering more than 44 years and embracing every kind of equipment used in industry and transportation as well as modern weapons of war, including tanks, trucks, armored cars, guns, airplanes and warships.



With a thorough knowledge of Timken Bearings at your command you never will be confronted with a bearing problem you cannot solve. Begin to acquire this knowledge now. Timken Bearing specialists will be glad to assist you. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN
TAPERED ROLLER BEARINGS

"All there is in Bearings"



The private war of 王兆振

DR. CHAO-CHEN WANG carries a slide rule instead of a rifle. Logarithms are his bullets. Differential equations, his high explosives.

Yet he's waging just as deadly a war, against the hated Japs, as any of his brave compatriots in far off China.

For his is a war of electronics at work!

Since joining Westinghouse last summer, this young Chinese scientist has made several important contributions in the field of electronics design.

One of them—*a new method for measuring the output of ultra high frequency radio tubes*—may prove as valuable to the United Nations as a million machine-gun bullets fired at the enemy!

Dr. Wang is an expert in the mathematics of ultra high frequency communications. He does his "Jap fighting" in one of the Westinghouse Electronics Laboratories.

Here he employs his special genius in calculating — in advance — the performance and characteristics of electronic tubes *before* they actually take form.

* * *

DR. WANG, and other young engineers who enter our employ every year, are constantly contributing to the "know how" of the Westinghouse organization.

Westinghouse believes in helping young engineers grow and advance as rapidly as possible—for upon these scientists of tomorrow our whole future depends.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

TUNE IN the Westinghouse Program starring John Charles Thomas—NBC Network, Sunday, 2:30 P. M., Eastern War Time.

DR. CHAO-CHEN WANG studied electrical engineering at Chiaotung University in Shanghai. He was sent to Harvard University by the Chinese Government where he specialized in ultra high frequency communications. Before joining Westinghouse, he received his M. S., in 1938, and his Ph. D., in 1940.

Westinghouse

PLANTS IN 25 CITIES—OFFICES EVERYWHERE

What did *you* do today ... for Freedom?

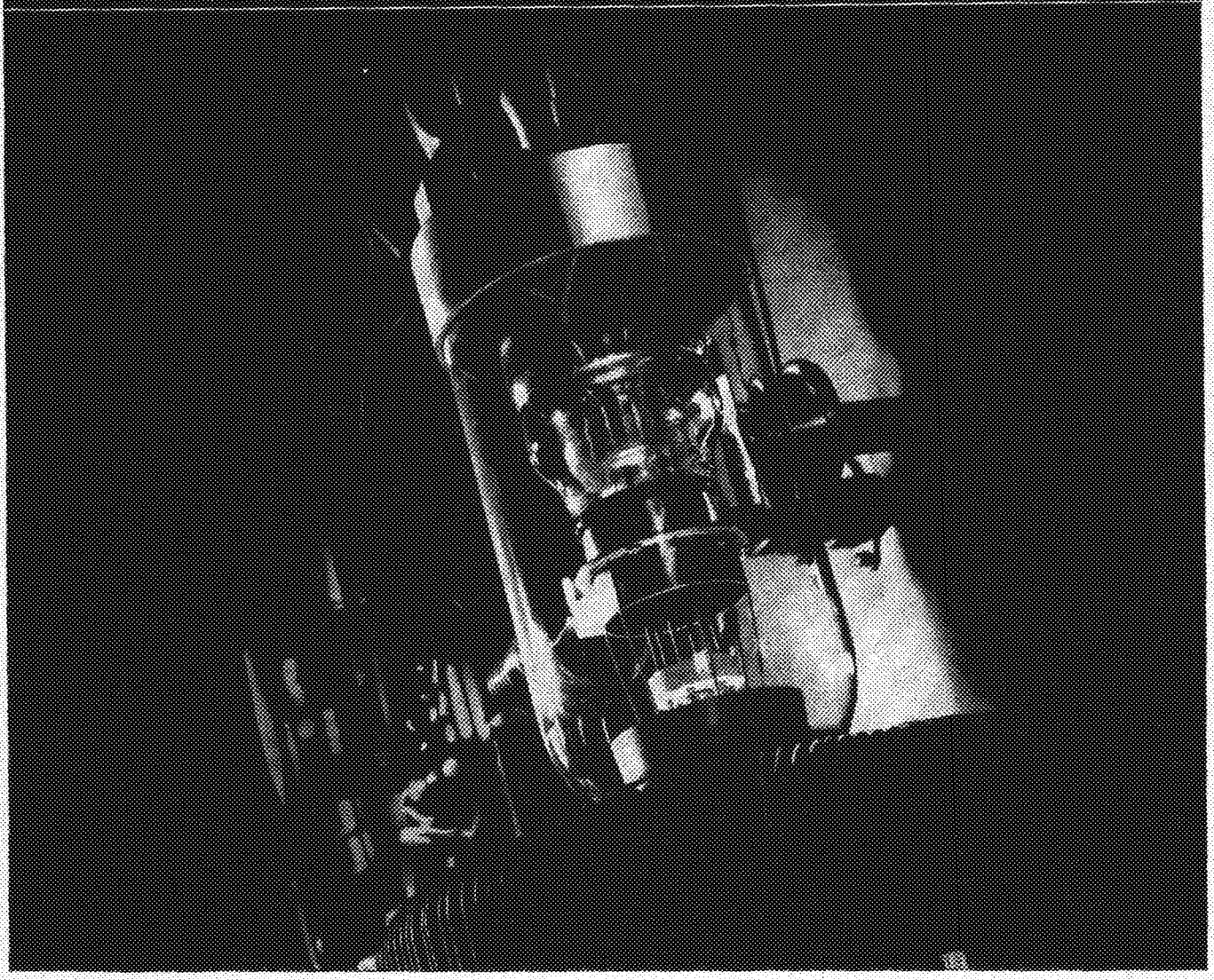
Today, at the front, he died . . . Today, what did *you* do?
Next time you see a list of dead and wounded, ask yourself:
"What have *I* done today for freedom?
What can I do tomorrow that will *save* the lives of
men like this and help them win the war?"

To help you to do your share, the Government has organized the Citizens Service Corps as a part of local Defense Councils, with some war task or responsibility for every man, woman and child. Probably such a Corps is already at work in your community. If not, help to start one. A free booklet available through this magazine will tell you what to do and how to do it. Go into action today, and get the satisfaction of doing a needed war job well!

EVERY CIVILIAN A FIGHTER

CONTRIBUTED BY THE MAGAZINE PUBLISHERS OF AMERICA

This is Fred Allen's horse...



EVER wonder how Fred Allen manages to ride into millions of homes every week and emerge life-size and full-voiced from radio loud speakers?

The "horse" he rides is a big radio transmission tube like the one shown above. One reason it carries him smoothly and without interruption is that Corning research has perfected a glass for radio tubes that will stand heat and voltage of modern transmission.

Corning furnishes glass for the tubes in your own radio set, too. Just as it furnishes glass for many of your lamp bulbs; for the Pyrex cooking utensils in the kitchen back home. But to many, and particularly to the man who is making engineering his life work, Corning research is most interesting because of the things it has discovered that glass can do in competition with other materials, and do better. Glass springs, for instance, that apparently never tire out. Glass acid pumps that replace valuable metal alloys and give longer service in the bargain! Glass piping, and valves, nuts and bolts that resist chemical attack. Every day Corning is working on ways in which glass, still fairly plentiful, can be used to replace metals that are vital to war industry.

Glass is important today. And as more is discovered about this remarkable material, no one can predict the boundaries of its usefulness. For instance, glass precision gauges (ring, plug and others) are now being produced that are in many ways superior to ones made of steel.

As you get further into engineering, keep an eye on glass. The greatest things in glass are yet to come. Corning Glass Works, Corning, N. Y.

CORNING
means
Research in Glass

This Month . . .

BY ROLAND HOAGBERG, E.E. '46

DON FRANKE, author of the article on carrier currents, is the news editor of the Minnesota TECHNOLOG. Don is a senior electrical engineer and after graduating this month he will go to work for the General Electric Company in Schenectady, New York, as a test engineer. He now works in the E.E. department as a teaching assistant and helps with the general maintenance and construction work.

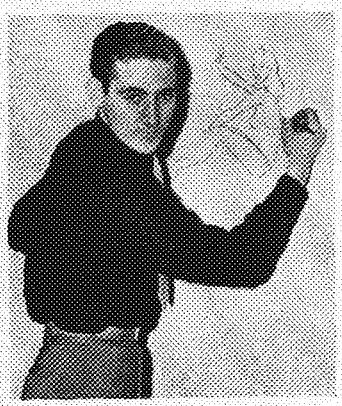
MISOGYNIST?

In the summers of 1940 and 1941 Don was a swimming instructor and councilor at Boy Scout camps at Lake Sylvia and Bay Lake. Besides camping he enjoys listening to semi-classical music and writing. When he graduated from Anoka High School he received the Bausch and Lomb Science Award.

In addition to his work on the TECHNOLOG Don was a member of the 1942 Engineers' Day publicity committee. He is a member of Eta Kappa Nu, Plumb Bob, and the American Society of Electrical Engineers.

Don is fairly well contented with his little niche in the world, but claims he has a major weakness for blondes. Also for brunettes and red-heads. In fact one might almost say that he has a weakness for women.

BOB PLATT is the Petty and Varga of the Minnesota TECHNOLOG. During the last two years he has been responsible for many of the cartoons and illustrations which appeared in the magazine. Cartooning is only a side line of Bob's as he is a junior in the School of Architecture and he intends to be known for his designing rather than his humor. He came to the University from Marshall High in Minneapolis.



CURVE ANALYST

Besides drawing some of Bob's spare time is spent doing wood carving and sculpturing. He designed the cover on the current TECHNOLOG and he also designed the 1943 Engineers' Day button.

A few of his many extracurricular activities include being a member of the Tech Commission, the TECHNOLOG Board, the University Crack Drill Squad, Scabbard and Blade, and the Architect Student Council. Bob is a member of the Advanced Corps R.O.T.C.

Bob is the strong silent type of man who has absolutely nothing to do with women, except a red-head by the name of Muriel. He says he believes in free speech because he thinks that very little of it is worth anything anyway.

EARL ANDERSON, architect freshman, is a staff writer for the Minnesota TECHNOLOG. When Earl entered the University he had to decide between Architecture and Journalism. He compromised by registering in the Architectural school and kept his journalistic talents alive by writing several articles for the TECHNOLOG. Earl's article on honorary engineering fraternities appears in this issue.

TOSS UP

His home town is Denver, Colorado, where Earl and the chamber of commerce claim that golf and tennis can be played 362 days of the year.

He assisted the Engineers' Day publicity committee by writing articles which were published in the Minnesota *Daily*. Earl is enrolled in the Navy's R.O.T.C. and V-1 programs, and is a member of Delta Kappa Epsilon fraternity.

JAMES McGARVEY, writer for the TECHNOLOG, is a junior chemical engineer. Jim's article on the Alaska road appears in this issue of the LOG. A native of Newark, New Jersey, he came to Minnesota to take a pre-medicine course. In the summer of 1942 he relinquished his idea of being a psychiatrist and transferred to chemical engineering.

HITCH-HIKER

Jim's hobbies are writing, dancing, playing basketball and pool, experimenting with chemicals, and hitch-hiking. He estimates that he has hitch-hiked about 12,000 miles. This includes 8 trips between Minneapolis and Newark.

His desire to see more of the country led him, last summer, to Seattle, Washington. While he was in Seattle he worked as a longshoreman and lived on the University of Washington campus.

Jim has no trouble keeping up with his studies, probably due to the fact that he has a nice quiet place to study. You see, he lives in a mortuary.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

MINNESOTA TECHNOLOG

THE COVER is a first prize winner in the all U photo contest. The picture is by Myron Carlson.

THE FRONTISPIECE shows a huge stator and its windings. The photo is from the Westinghouse Electric and Manufacturing Company.

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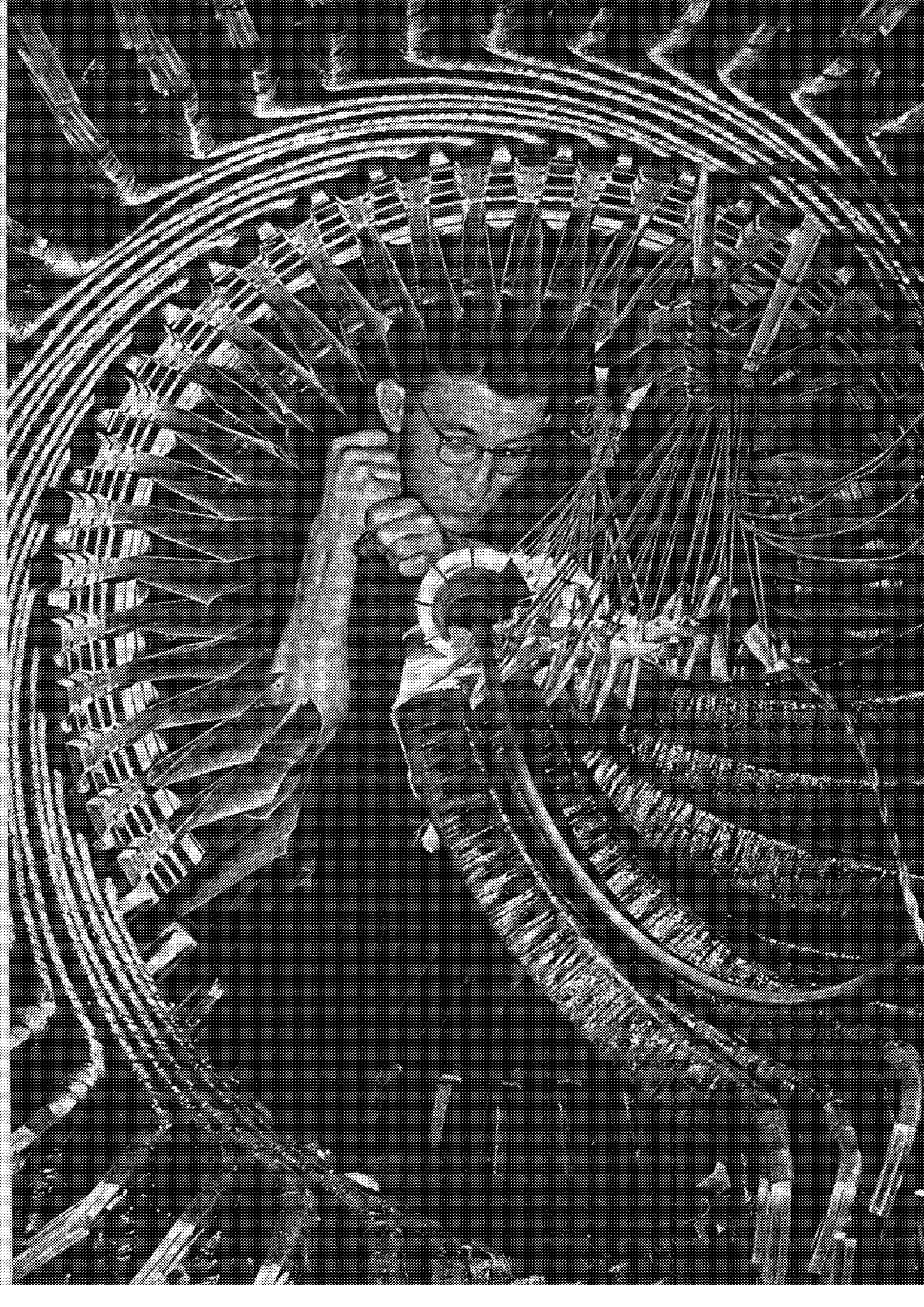
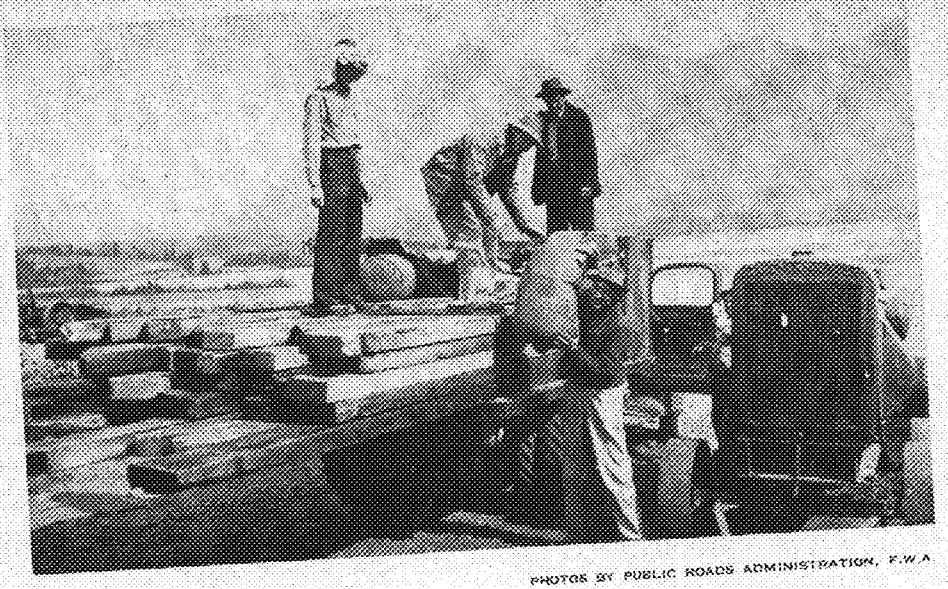




PHOTOS BY PUBLIC ROADS ADMINISTRATION, F.W.A.

BRIDGE ENGINEERS finish one job on the Alaskan Highway and move on to another. Man with netting around hat expects to be dive bombed by mosquitoes at any moment.

Engineering the ALCAN HIGHWAY

By James McCarvey, Ch.E., '44

JAP subs must be having slim pickings in the North Pacific, for much of the material which formerly went by open sea from Seattle to Alaska may now be trucked over the Alaska road. The construction by Army engineers of 1,459 miles of new road in the six months from early March, 1942, until November 20, 1942, official opening date of the highway, rates with the building of the Panama Canal as an engineering accomplishment in sheer volume of work and the speed with which it was accomplished.

The first step toward the building of the Alcan highway was taken in May 1930, when an act of Congress authorized the President to appoint three special commissioners to coöperate with representatives of the Dominion of Canada in a study regarding the feasibility and economic practicability of the construction of a highway to connect the northwestern U. S. with British Columbia, Yukon Territory and Alaska.

The commissioners made a study of the entire subject and on May 1, 1933, gave their report to the President who submitted it to Congress. They recommended that further negotiations be conducted with the government of Canada to ascertain its attitude toward entering an agreement whereby the road might be constructed; that if a satisfactory agreement could be reached funds should be made available to the Alaska Road Commission for carrying out its purposes, and that the respective governments in formulating the road construction program should conform as far as practicable in their own interests to the general route proposed for the highway so that as many as possible of the local projects could be available for and form a part of the main one; that consideration be given by the road building agencies of Alaska and Yukon Territory to the construction of the Fairbanks-Dawson road without waiting for the adoption of the entire project in order to develop the immediate territory and provide an early connection between those communities, as well as complete a vital link in the proposed through highway.

It is interesting to note that in pointing out the economic benefits to be derived by the U. S. through the opening of the inaccessible country, the committee suggested that construction of the highway would foster air commerce with Alaska. This appears rather ironic in view of the fact that for at least half its length the route of the road was actually determined by already located airports.

With the submission of the report the life of the commission expired. Other discussions were held between representatives of the governments of the U. S. and Canada, but no agreement was arrived at, so to further explore the project and to work out if possible a plan for construction of the highway, in May 1938, Congress authorized the President to appoint a commission of five members to be known as the Alaska International Highway Commission. This commission was to coöperate and communicate directly with any similar commission which might be appointed in the Dominion of Canada, and was required to report their study of location and construction of the proposed highway to the President two years later. The President was requested to submit their report to Congress.

In reporting to the U. S. government in April 1940, the commission indicated that construction of the highway was feasible at a reasonable cost. They pointed out the benefits to be derived in much the same language as that of the first commission. Their report differed in that they recommended that funds be appropriated so that they might continue their work.

After the outbreak of the war in the Pacific, the strategic position of Alaska made it imperative that a safe route for the shipping of supplies be found. The Army took over the task of punching a truck-trail through the wilderness, and with this change progress was, to say the least, accelerated.

In February 1942, Fred Capes, construction expert of the Public Roads Administration and Colonels William Hage and R. D. Ingalls, made a preliminary survey. Engineer troops then had to move supplies across the frozen Peace, Sibanni Chief, Bucking-Horse, and Fort Nelson Rivers before the spring thaws began. An unusually early thaw almost proved fatal, but

(Continued on Page 172)

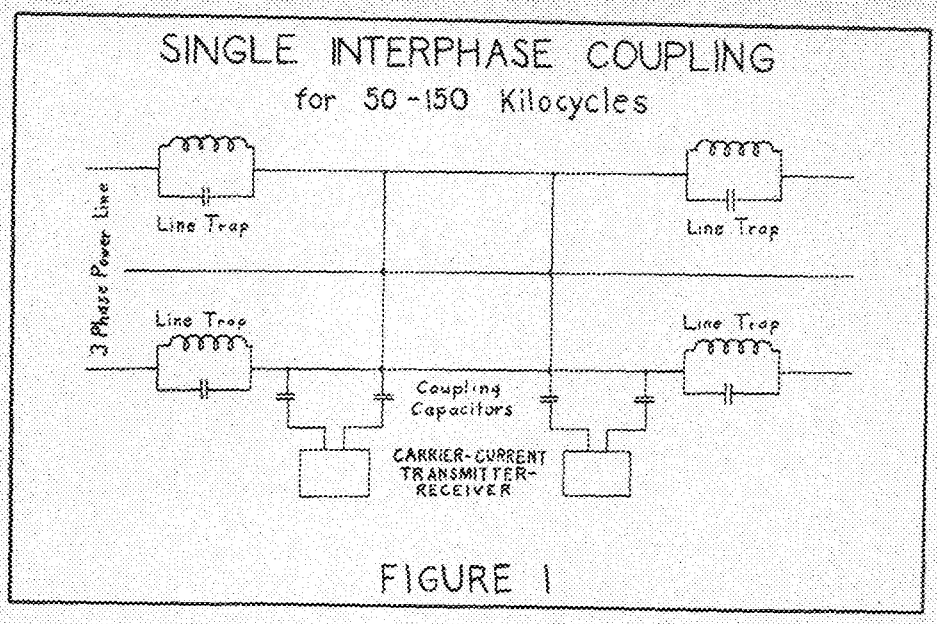


FIGURE 1

CARRIER-CURRENT

By Donald A. Franke

POWER-LINE carrier-current, probably unknown to the average individual, may become as important to his wartime existence as the munitions he is making as his contribution to America's all-out war effort, should the Axis begin large scale bombings of American cities.

The new device, resembling an electric meter in appearance, may be connected directly to the lighting circuit in the homes of air raid wardens and others. On receiving the proper carrier-current impulse over the lighting circuit, the new home device sets off a warning buzzer and flashes one of four lights—yellow for preliminary caution, blue for advance caution, red for an air raid, and white for the "all clear" signal.

Raid Alarms

It is estimated by the General Electric Company that "If and when approval (from the WPB) is obtained, we believe it will be possible to manufacture them (the home units) in quantities that should allow a selling price in the neighborhood of $30.00 each."

Before going any further, a word on the fundamental principles involved in carrier-current transmission would probably be of interest. Briefly, then, carrier-current operation is based on the superposition of one or more high frequencies on a circuit without interfering with its primary purpose of carrying energy at a lower frequency. The frequencies used are generally classified as high-frequency (usually 3 to 150 kilocycles), and low-frequency (below 3 kilocycles).

The frequency selected for the proposed air raid warning system is 720 cycles per second, which would correspond to a twelfth harmonic of the usual 60-cycle power frequency. Several reasons for this choice may be given. In the first place, it can be shown that no "even" harmonics can exist in the 60-cycle output of rotating machinery, so there would be no interference from the harmonic components of the 60-cycle power wave. (Of course, it is quite practical to generate power, the fundamental frequency of which is 720 cycles).

Then at 720 cycles, the control energy will readily pass through distribution and other power transformers, and thus allow control on the conventional 115/230 volt house lighting circuit. (It can also be shown that these different frequencies will flow along the same wires without in any way affecting the usual operating characteristics associated with the particular frequencies involved, and that the constants for each frequency may be calculated as if the other frequencies were not present.)

Because the 720 cycle frequency is relatively low, and because the transmitter power required for 720 cycle carrier operation ranges from 4,000 to 50,000 watts, in contrast to the usual 5 to 100 watts employed in the high-frequency carrier applications, the ease with which such 720 cycle power can be mechanically generated by the usual motor-alternator makes practical the operation of tuned relays or "controllers," without the use of vacuum tubes or other amplifying means. The difference in the low transmitter power required for high frequencies as contrasted with the large power required by the low frequency circuit is that the high frequency system uses voltage-control of vacuum tubes and thus requires little power, whereas the low-frequency system must supply the actual energy required to actuate the controllers.

To obtain approximately 5 volts of control energy on a 115 volt secondary, the transmitted voltage on a 2300-volt feeder is approximately 60 volts of carrier, and on a 4000-volt feeder there is required approximately 100 volts of carrier. The actual carrier voltage, current, and wattage required by each controller, however, are very small.

Another advantage of the 720 cycle frequency is that transmitters are already in use in many cities to control street lighting and domestic water heaters. Then too, as indicated previously, no expensive wiring is necessary to "pipe-in" the control energy to the air raid warden's home; it is only necessary to plug the device into any lighting socket in any home.

If a new transmitter is required, however, the most common installation will generally cost less than $2,500, complete for nine different services, but some propositions for important east and west coast cities may cost anywhere from $10,000 to $50,000.

Wartime applications of power-line carrier-current are not limited to this one device, however. Some public references to its use show that carrier-currents are being used in such places as shipyards, naval and marine bases, and military supply depots for normal and emergency control of outdoor lighting, obstruction lights, remote starting and stopping of pumps, and operating valves, signals, and other purposes as similar to the peace-time applications. Strictly war applications, however, cannot be revealed even in the broadest outline until the end of the war, according to E. C. Markley of General Electric's carrier-current sales division.

Rugged Reliability

The first commercial carrier-current installation went into service at Utica, New York, on December 6, 1922. Since that time, carrier-current installations have proven not only an extremely reliable form of communication, but also it soon became apparent that these channels, operating on power transmission lines, were even more reliable than the transmission and reception of the electric energy itself! This seeming paradox is primarily a result of the fact that most power-line failures still leave sufficient insulation to provide protection for the relatively low voltages of the carrier signals. In the New England hurricane of 1938, for example, the inherent rugged mechanical strength of the big transmission lines enabled power company officials to report that many carrier current installations operated in spite of damaged and broken conductors.

Until about 1930, very little use was made of power-line carrier-current except for the relatively simple telephone communication. After 1930, however, the increasing trend toward automatic and semi-automatic control of outlying substations and generating units, particularly small hydro-stations, brought significant contributions to the field. Modern applications of

PHOTOS BY GENERAL ELECTRIC COMPANY

PLUGGING IN PHONE makes it possible to talk over power lines to another operator hundreds of miles away.

the high-frequency carrier-currents common in power system usage include telephone communication, pilot relaying, transfer trips, remote control or indication, coupling-capacitor potential devices, supervisory control, automatic load control, and telemetering or measuring from a distance. It becomes apparent, then, that carrier-current applications have become an integral part of the modern power system, and without them the high degree of reliability of our electric power distribution systems would probably be impossible.

Saves Metal Too

According to Mr. Markley, the widespread use of carrier-current is due to its savings in materials, man-power, and time.

The average carrier-current installation, for example, is saving more than 15 pounds of copper for every pound that it uses, with some cases reporting a saving in excess of 800 pounds for every pound used. In installation man hours, alternative methods would require at least 1000 per cent more man hours than does the carrier-current installation, and in maintenance and line patrolling, it is estimated that for every hour demanded by the carrier-current equipment, 18 hours would be required by other methods.

The question may quite logically be asked: How is the carrier-current equipment isolated from the tremendous quantities of energy carried by the power transmission lines?

Figure 1 illustrates the single-interphase coupling, a simple and popular form of line coupling for 50 to 150 kilocycle applications, such as supervisory control. This system employs two of the three wires used in the usual three-phase transmission line, and thus a complete metallic circuit is provided.

The *line traps* consist of an air-core inductance coil which is rated to carry the regular power current of the transmission line, and is "shunt-tuned" by an adjustable tuning pack which is varied so that the combination "resonates" at the carrier-current frequency, and thus offers maximum impedance to that carrier frequency while offering negligible impedance to the power frequency of 60 cycles. Although some carrier-current energy leaks through the trap, the trap serves to isolate the portion of the line used for the carrier from the rest of the transmission system. The line traps thus increase the operating range of the carrier apparatus by greatly reducing the carrier energy losses in extraneous lines and networks. The trap may be compared to the screen in the gasoline line of an automobile; the screen stops the water, but allows the gasoline to pass on to the carburetor.

The *coupling capacitors* serve to electrically connect the carrier-current equipment to the high-voltage transmission line without materially affecting the operating characteristics of either set of equipment. The capacitor is connected with series tuning inductance, and, in direct contrast with the line traps, is designed to offer low impedance to the carrier frequency while offering high impedance to the power frequency.

The high frequency carrier systems use voltage control of vacuum tubes as the means of sending "directions" from one point to another, and thus some of the carrier waves may be "modulated" to achieve the effect desired at the outlying substation or hydroplant. These systems, which may include the raising and lowering of gates, the transmission to the central office of voltage, current, kilowatt-hour readings, telephony, automatic switching, etc., evidently require many different frequencies operating over the same set of transmission lines, and necessitate the use of a great many vacuum tubes. Indeed, an installation just being put in one of the Dakotas will use over 1200 tubes!

Because of the ease with which the 720 cycle carrier already adopted for the water heaters, and now for the proposed air raid protection device, can be converted from the standard 60 cycle power frequency by the induction-frequency converter, no vacuum tubes are required.

The 720 cycle controllers already in mass production operate on properly spaced, timed impulses of electrical energy. One type of controller employs a bimetallic load switch, which closes under the action of a local heating resistor which is energized for 10 seconds by the 60 cycle supply through the contacts of the carrier current relay, and opens when energized for 30 seconds or more. This type, then, operates on the time duration principle.

Stop-Watch Accuracy

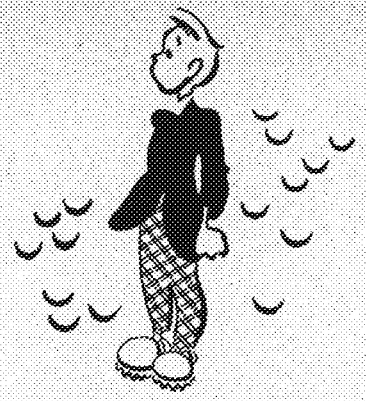
A more flexible type is the multiple-purpose controller that operates on the time-interval principle. It is possible that the air raid protection device operates on this principle, although actual details are not available. The load-switch mechanism consists of a synchronous motor driving a timing cam, and a simple magnetic clutch that are controlled—started, stopped, and engaged—in synchronism with the transmitter. The spacing between the starting carrier impulse and the subsequent operating impulse determines whether the load switch opens or closes, and this spacing may be as little as a half-second between impulses.

Because each type controller may be operated from the same transmitter, the possibility of using both types is intriguing. As a matter of fact, some systems use the first type to operate water heaters or other off-peak loads, and the second type is used for control of all-night and part-night street lighting, plus remote starting and stopping of pumping motors.

Thus the versatility and practicability of the 720 cycle carrier are demonstrated facts, and the application of carrier-currents to civilian defense probably awaits only the release by the WPB of the critical materials required.

NEW AIR RAID WARNING device is designed to use ordinary electric lines for the transmission of warnings to wardens and other civilian defense officials.

AS WE SEE IT



Get Yourself a Date

ONE of the engineer's big problems and one of his most interesting ones is women. There are engineers who *never* have dates and there are engineers who go to the other extreme. It does not seem to make much difference in their marks, as some of the best marks are made by fellows with steady girls, and vice versa. What should be the engineer's attitude toward women?

For the fellow that rarely has dates or never, that is his own business. Most fellows like to date girls though, and most could find the time one night a week. The girls are usually willing, although it must be remembered that most of them have studies and other dates so it would be well to make arrangements in advance so she could make plans too. If a fellow doesn't date women his excuse is pretty much the same. Either he doesn't have time, or doesn't know any girls. Both of these handicaps can be overcome if he gives it a few minutes' thought and plans his work.

Two good bets for getting to know women are to have a friend line you up with a date or visit some of the open houses. If you're shy or a little scared, double with some friend who will smooth you over the rough spots. Gals are just ordinary folks like the rest of us and you don't have to have the dough of Rockefeller or the looks of Beau Brummel to get along with a girl. They don't demand impossibilities.

It does a fellow good to get out occasionally with the other sex, gets him familiar with some of the social arts, and will not in any way interfere with his school work if he uses a little judgment; besides, it's fun.

Are Engineers Cultured?

ENGINEERS have the culture of the modern times. It is earthly and practical. The engineer believes in the satisfactions that can be obtained from the material things of life. Art, music, literature, all have their place in his life, but his is a policy of putting first things first. His aim is to produce, and when he has done his work he will look to his leisure. He will enjoy his culture when he has earned it. He appreciates the finer things in life, but he also is aware of the necessity of earning a living.

He does *not* lack vision and imagination. He tempers his flights of imagination with a knowledge of their practical limitations. His are not wild flights of fancy. The engineer is not devoted to the hazy things conjured up by the mind, but rather to the more fascinating secrets of practical existence.

He knows his place in a world where affairs are in the hands of the capable doers and not the dreamers.

Happy Registration Days

WE would like to revise Sherman's famous statement concerning war to read as follows: Registering for classes in the Institute of Technology at the University of Minnesota is Hell.

The present system of registration may have been adequate to handle the comparatively small number of students who did not register by mail during normal years, but with the advent of the accelerated program, previously planned schedules have had to be changed by almost everyone and consequently it has become necessary for nearly everyone to register in person at the beginning of each quarter.

Under the present system all sophomores, juniors, and seniors register in one room. A conservative estimate would be that upwards of two hundred would-be registrants are often packed into this room, originally designed to hold about forty students comfortably. Crowds gathered in front of the drawing tables, which are lined up around the room and are used for registration desks, become so great that the tables (and the instructors who are doing the registering) are literally pushed against the wall. It certainly does not make for quick and efficient work by the men registering us when they have to stop periodically and unite their efforts to push the tables forward so that they again may have space in which to work.

Complacent officials in charge of registration may look down their noses and say, "Well, why don't you students form in orderly lines and carry out your registration in an orderly manner to prevent these difficulties?" The answer to this is apparent to anyone who will take the trouble to look into the room while registration is in progress. There just isn't room to form any lines!

Another problem seems to be that of providing a large enough personnel to assist in registering students in the more popular courses. Judging by the last winter quarter registration, at least twice as many men could be used to advantage in registering men for mechanical, electrical, and mathematics and mechanics courses.

The additional room needed is certainly available. The auditorium in the Main Engineering Building is not in use during the registration period, to say nothing of the class rooms. It may mean decentralization of registration, but personally we would rather walk around to two or three different rooms and be registered quickly and efficiently than have the dubious pleasure of being able to stand in one place along with some two or three hundred other students all attempting to stand in the same place as we are, and waiting and waiting and waiting and waiting—AND WAITING.

We call ourselves an engineering school, but would we as engineers condone such congestion and inefficiency in a factory or industrial plant?

These Are the Institute's

HONORARY SOCIETIES

"By Their Keys Will Ye Know Them"

BY EARL ANDERSON, ARCH., '46

MOST engineers can be divided into four classes: freshman, sophomore, junior and senior. Of these by far the most intelligent are the postgraduates. However, for those seniors, juniors and some sophomores who show exceptional engineering ability, special honors await. These honors are in the form of Plumb Bob, Tau Beta Pi, Chi Epsilon, Eta Kappa Nu, and Pi Tau Sigma, Minnesota's honorary engineering fraternities.

Plumb Bob

Plumb Bob is Minnesota's own; it was begun at Minnesota, and has stayed within the boundaries of the campus. It was founded in 1919, just after World War I. In the freshman class of that year were many who had just returned from the battlefields of France, and who had left much of their "book-learning" behind them. When final grades were passed out, it didn't take long to learn that more than the usual number had flunked physics. In the class of flunks were eight civil engineers who decided to band together and form an organization which they called Plumb Bob. The requirements for entrance into Plumb Bob at that time were (1) to be a civil engineer and (2) to have flunked physics or a five-credit math course. Eventually, members were taken in from the other engineering departments and the "scholarship" qualifications relaxed until now high scholarship is one of the requirements for membership.

In the spring quarter of their junior year, eight members are elected into the organization. Each of the eight engineering departments is represented. In the fall, the eight members elect four more so that the total membership is always twelve. In addition to high scholarship, the requirements for election into the fraternity state that the candidate be a senior and an active member in the Institute of Technology. The candidates are selected by the members. Final selection is made by the president of Plumb Bob, a member selected by the other members, Dean Leland, and a faculty member chosen by the other three. The three faculty members are Dean Leland, Professor Richardson (English), and Professor Kuhlmann (Electrical). John Glasrud is the incumbent president of the fraternity.

The objective of the organization is to further interests of the engineering schools at the University of Minnesota and to promote a closer spirit of fellowship among the students of the Institute of Technology.

One of Plumb Bob's most enjoyable duties is taking charge of the Blarney Stone on Engineers' Day.

Chi Epsilon

The civil honorary fraternity is *Chi Epsilon*, headed by President Henry Doepke. Chi Epsilon has nine members at present, eight seniors and one junior. The requirements for election into the organization are that the candidate must be a civil engineer who has completed two years of his work, and he must be in the upper one-fourth of his class. Honorary members are accepted, but must be prominent engineers.

The purpose of the fraternity is to further the cause of civil engineering and to encourage students to achieve better grades.

The first of nineteen chapters of Chi Epsilon was started at the University of Illinois in 1922. At the University of Illinois two groups of students wanted to start an honorary civil engineering fraternity. The two groups did not know of each other's plans, but when charters were to be drawn up, the plans of the two groups were discovered and they were united into one. Each had a separate name but the name finally decided upon was Chi Epsilon. The Minnesota chapter was begun late in the fall of 1923 and was the third chapter.

The most important social events of the year are the initiation banquet in the fall, and the combined spring initiation at the Curtis Hotel, which is known as the Tri-Honorary Banquet.

The new $200.00 showcase on the first floor of the Main Engineering Building was given by four of the honorary fraternities, led by Chi Epsilon.

The only fee is the initiation fee which pays for the bi-annual magazine and key. The war has stopped the national conclaves which were held every two years.

Pi Tau Sigma

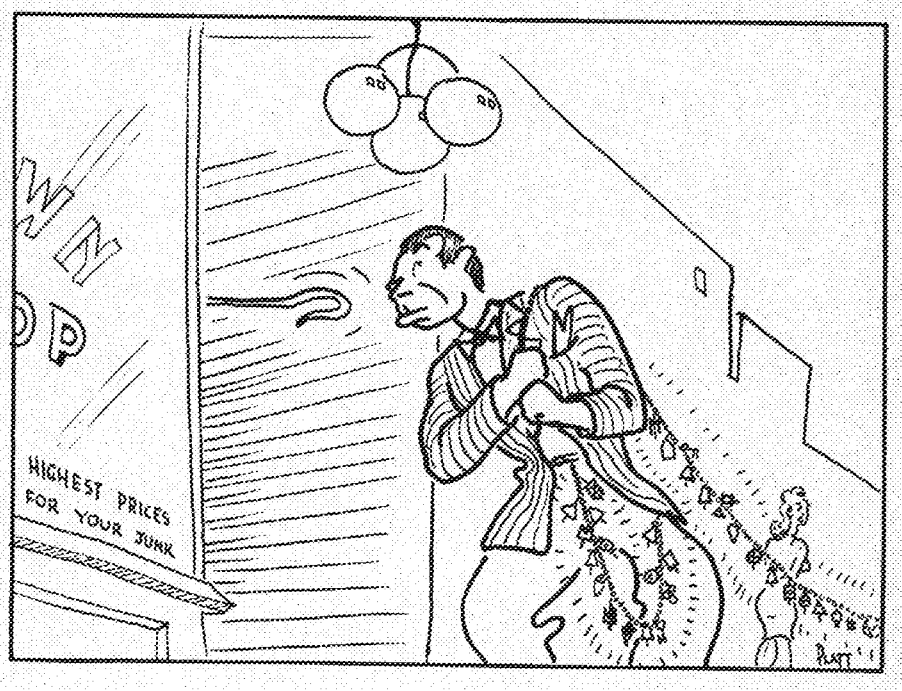
Pi Tau Sigma, the honorary mechanical engineering fraternity, was founded in 1915 at Lehigh University. At the present time, Pi Tau Sigma is represented at thirty schools ranging across the country from New York to Oregon. The Minnesota chapter was begun in 1922, and at present has twenty-three members.

The fraternity was founded when a group of mechanical engineering upperclassmen planned an honorary fraternity for mechanical engineers. They formed the first chapter of organized fellowship to foster the ideals of mechanical engineering.

Only juniors and seniors are eligible for election into the fraternity and they must be in mechanical engineering. The candidates are judged on their scholastic ability and personality. Robert Lindquist is the local president of Pi Tau Sigma.

The University of Minnesota was host to the Pi Tau Sigma national convention which was held last November 13-14. There were fifty-six representatives present

(Continued on Page 178)



ALCAN HIGHWAY

(Continued from Page 167)

by a prodigious effort the engineers dragged their equipment across the groaning and cracking ice before break-up began. A critical shortage of vehicles was alleviated by the unselfish cooperation of farmers and garagemen in the vicinity who loaned their trucks to help speed the task.

The three main approaches to the job were (1) by rail via Edmonton, Alberta, to Dawson Creek, British Columbia, which was the starting point of the project; (2) from Seattle via the inland water route to Skagway, thence by narrow gauge railroad to Whitehorse, Muckenzie, and the job; and (3) from Seattle by inland water route and across the Gulf of Alaska to Valdez, and thence by highway to the job. Much of the material was flown in to hastily constructed airports along the route.

Meanwhile in early March the Public Roads Administration acting under the request of the War Department began to quietly assemble a civilian force of workers, later to number 6,000 men. To the P.R.A. was assigned the task of making reconnaissance and location surveys, preparing plans, awarding contracts, and otherwise arranging for and supervising construction. All steps were planned in close cooperation with the Chief of Engineers and were subject to his approval.

500 Engineers

The launching of such a large project required an all-out effort on the part of the Public Roads engineers. A headquarters for the project was established at Seattle, Washington, and field offices were located at several points along the route. A force of 500 engineers and engineering aids was rushed to the field to make surveys and supervise the work of the contractors.

For quick enlargement of the supervisory staff, contracts were negotiated with four well-known engineering firms: C. F. Lytle Company and Green Construction Company (organized as a single firm) of Sioux City, Iowa; Dowell Construction Company of Seattle, Washington; R. Melville Smith Company of Toronto, Canada; and Okes Construction Company of St. Paul, Minnesota.

Actual joint construction operations began at many points along the route in May and June. The lateness of the decision to build determined the route in part and made it necessary that the road be reconnoitered, located, and built almost simultaneously. Airports which had already been built for air transport from the United States to Alaska formed points for the location of the road from Fort St. John to Whitehorse.

An alternative route recommended and already surveyed by the American Highway Commission, had to be discarded. Desirable locations between airports were first checked by aerial photography. The new method of stereography—taking parallel strips of photographs at slightly different angles so that the pairs when viewed through a stereoscope reveal the relief of the ground—was applied to build a relief map, avoiding the formerly necessary painstaking ground surveys.

Some ground locating followed, but meanwhile bulldozers were already at work. Also, it might be mentioned that mosquitoes now went to work. Men at work were sometimes so covered with insects that their hands looked as if they were covered with grey fur. Muskeg, the treacherous black ooze of the subarctic, was met and conquered. At times "cats" (tractors to the Arts students) were almost completely lost in mud 15 feet deep.

Nature, beside providing plenty of obstacles, also provided the means by which they were overcome. Timber was plentiful and was used for corduroying mud pockets. Both the necessity for speed, and the availability of timber made this method more advisable than the slower but more permanent one of digging out the mud down to bedrock and filling in with gravel.

Rivers were crossed by using pontoons; wooden bridges were thrown across lakes. Quickly set up saw mills supplied the planking. So fast did the engineers work that sap ran from the pilings while they were being driven. A squad of Negro engineers (4,000 of the workers were Negroes) bridged a river in two days.

Up north some trouble with ice was encountered. Ice ten feet deep was found under a relatively thin coating of moss. The ice then melted in the sun, causing the road bed to sink, so the engineers pushed back the moss (a wonderful insulator, incidentally) and covered it over with logs.

(Continued on Page 178)

PILE DRIVERS and other heavy equipment were moved over wooden skids to new positions.

PERMANENT ICE up to twelve feet thick was discovered under some parts of the Alaskan Highway.

CONTRACTORS' WORKMEN use tractor to string pile for construction of temporary bridge along the route of the highway. These men report mosquitoes of the Flying Fortress type.

TECH NEWS

EDITED BY DON FRANKE, E.E. '43

Miners Score Again!

Gleeful Miner Submits Exposé Says Theft Was "Too Easy"

Who would have thought that a "hunk" of granite could be so heavy, but it was well worth the time and effort to get away with the "stone" so neatly.

After two of our men had arrived just in time to see the "Dumb Fobs" who were supposedly guarding the Blarney Stone leave its "secret" hiding place in the E.E. building, we decided to "remove" it from its new spot in the Union.

I never knew that a bunch of guys could be so patient; but after waiting in the Union phone booth for three-and-a-half hours without killing one another, we figured we were pretty patient guys. Of course it was a little crowded with ten fellows in there; but between telephone calls and whistling at the girls who came in to telephone, time seemed to pass quickly. What really made it jolly was the fact that the other five phone booths were filled with fifty Foresters, but they became tired of waiting and left about 10 o'clock.

Finally after all the "so-called" Engineers had gone home to their little trundle beds, we put Louie, the lock-picker, to work. Before you could say "Benedict Glassrod," Louie had every door in the Union wide open. Two of the "weaker" Miners quickly lifted the "stone" and threw it out the door to two waiting Miners who ran down the hall with it. (It takes four "so called" Engineers to lift it off the ground, but one "brawny" Miner used it as a bowling ball that night.)

After we piled the rock into a waiting car, we quickly hauled it to the 2,000-foot level under the Mines School. There, with a pneumatic hammer, we engraved in the stone the immortal words "Mines—'43". After finishing the carving job, we took the "pile of granite" down to the 4,000-foot level where we left two men to guard it with their picks.

Of course every so-called "Engineer" knows what happened the next day, but what they didn't know was that we planned to return the "rock" for the "Crowning" exercise (Sometimes called "Who Can Kiss the Queen Without Drooling?") If it hadn't been for one "Engineer" who has the nerve to call himself a Miner, one Benedict Glassrod, everything would have turned out all right. As it was, we were betrayed by one of our own men.

In closing I hope there aren't too many feelings hurt by our "borrowing" the Blarney Stone. It's a good thing the Foresters didn't get away with it!

Pictured with the ill-fated Blarney Stone are the culprits, the tools, and the results.

Personnel Director Addresses Tri-honorary

Moved up a full quarter to enable graduating seniors to participate, the Tri-honorary banquet was given at the Curtis Hotel, February 25.

Arrangements for the banquet, which is the combined formal initiation dinner of Chi Epsilon, civil; Eta Kappa Nu, electrical; and Pi Tau Sigma, mechanical, were made this year by Eta Kappa Nu.

The toastmaster's duties were performed by Prof. J. H. Kuhlman, who introduced Mr. Lawrence Smith, Personnel Director of the Minneapolis-Honeywell Heat Regulator Company's Aero Division. The subject of Mr. Smith's address was "What Does Business Expect of an Engineer?"

Formally initiated into the honoraries were: Carroll A. Grubb, Philip J. Goldhammer, Donald R. O'Hare, and Clarence R. Volp, Chi Epsilon; David H. Westwood, Morton Berland, Walter N. Lundahl, H. Robert Mathwich, and Fred E. Barron, Eta Kappa Nu; and Henry B. Tilloison, Donald W. Grunditz, and Melvin Mark, Pi Tau Sigma.

Also, Mr. Everett Laitala was initiated to honorary membership in Pi Tau Sigma, and prizes to outstanding sophomores were given to Quentin R. Bohne, civil, and Edward Goldstein, electrical.

Movie on Bear Hunting Shown

The student branch of the American Institute of Electrical Engineers enjoyed its annual banquet at the Leamington Hotel, March 2.

Mr. Harold Sanderson of the E.E. staff "M.C.'d" the festivities, and Dr. Vernon Smith's movies on "Big Game Hunting in the Canadian Rockies" were shown by Mr. Roy Swanson.

Army Trains Engineers

Better get a job and hang on to it, men—all those army men who have just arrived are taking bona-fide engineering training.

While the army does not allow any announcement of the number of men sent here, we do know that they are divided equally into groups of chemicals, civils, mechanicals, and electricals, and that these groupings have already been determined by the army before the men arrive.

The men have all been to college for at least two years, and hail from all parts of the country.

The standard army course consists of six 12-week quarters, although the chemical and electrical sequences may require an additional quarter. Minnesota, however, does not offer the first three quarters, and thus it becomes necessary for the local staff to determine from their records in which quarter, fourth, fifth or sixth, the students will begin their training here.

These new students are housed in Sanford Hall, and are under army discipline. The work week consists of 24 hours in recitation, laboratories, or quiz sections; 24 hours of supervised study, and 5 hours of physical training. The examinations will be given on a national basis, and the army has outlined the course material it wants covered.

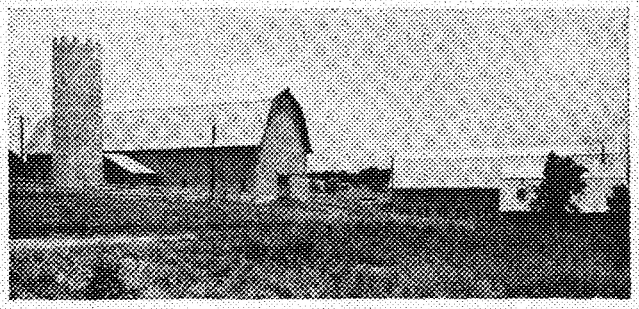
The only course offering any preference is the electrical sequence, which is divided into power or communications options for the sixth quarter only.

Combining PATRIOTISM *and* GOOD SENSE

Of course every one is willing to do without the essential materials that help win the war; everybody knows zinc and steel are among those materials. And *of course* it is just good common sense to take care of the things we have, including galvanized roofing, to make them last as long as possible and give the best service.

HOW TO CONSERVE GALVANIZED ROOFING

You'll find galvanized roofing of various types used on all kinds of structures, on farms, in industrial plants, in housing. It is a valuable material, and with proper care it can be made to last a long, long time; anyhow, until the war is over and necessary replacement material is available.



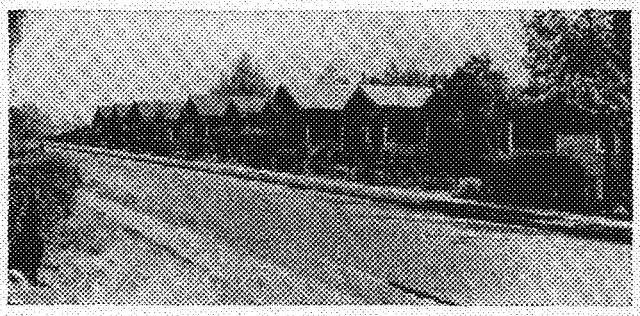
Galvanized sheets constitute one of the most popular forms of roofing for farm buildings of all kinds. Everything considered, they are also the most economical.

Do This . . .

See that all the roof supports are in good shape. If necessary renail and strengthen them, and replace broken or rotted members.

And This . . .

Then bring all the separate sheets into as close alignment as possible. If moisture has a tendency to creep through at the laps, lay a strand of asbestos wicking between the sheets at the laps, and renail the roofing with an approved type of zinc-coated lead-seal special roofing nail with a drive-screw shank. Stubborn lap openings can be effectively closed with hardware screws.

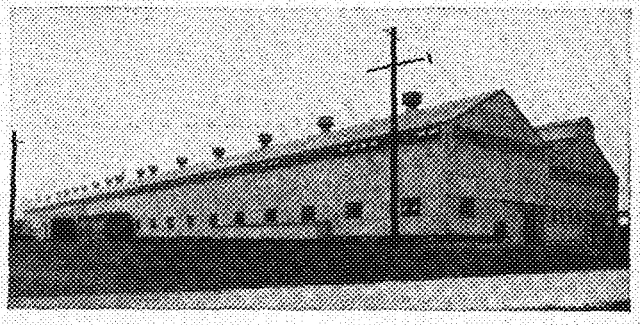


In industrial establishments, where efficiency and economy of materials are of prime importance, galvanized sheets are widely used for various types of structures, from modest homes for employees to the largest of manufacturing plants.

And This . . .

If any of the roofing is showing signs of rusting, paint it with two coats of metallic zinc paint, (see Federal Specifications TT-P-641) which will effectively stop the rust and prevent further injury to the roofing. In fact, the use of this remarkably good paint, which can be readily made by any paint manufacturer, will extend the life of galvanized roofing almost indefinitely.

In "How To Make Galvanized Roofing Last Longer", a booklet published by the Institute, complete and explicit directions are given for all of the above operations. Copies will be sent free upon request.



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

ALUM NOTES

EDITED BY STAN GENDLER, M.E., '44

FIGHTING IN NEW GUINEA

Lieutenant France Anderson, E.E. '39, M.E. '40, is now stationed in New Guinea with the U. S. Army Signal Corps. He writes that he shot a python which was yards long. However, he feels that it offers a poor substitute for Minnesota hunting.

WORKING FOR KAISER IN VANCOUVER

George C. Oldham, I.T. '29, of Ridgefield, Washington, Route 2, Box 14-A, is an engineer with the Kaiser Shipyards at Vancouver. The company is engaged in building invasion barges, Liberty ships, and airplane carriers.

SERVICE ENGINEER FOR SPERRY GYROSCOPE

Robert C. Lyons, I.T. '41, is a field service engineer for the Sperry Gyroscope Company of Brooklyn. At present his address is the Hotel Scharbauer, Midland, Texas. He is working with the Army Air Corps Bombardier School at Midland.

INSTRUCTOR AT WESTERN RESERVE

Gayle Priester, M.E. '33, is now teaching at Western Reserve University in Cleveland, Ohio.

ENGINEER FOR CURTISS-WRIGHT

Ralph Peters, I.T. '42, is an engineer with the Curtiss-Wright Corporation at St. Louis, Missouri. He and Mrs. Peters (the former Lois Mattson of Cannon Falls, Minnesota) live at 330 West Lockwood, Webster Groves, Missouri.

BECOMES CAPTAIN AT GREAT LAKES

Captain Harold R. Harris, E. '15, veteran of World War I, has been promoted from rank of commander to that of captain in the United States Naval Reserve. Captain Harris has been service school officer at the U. S. Naval Training Station at Great Lakes since March 1942. During this time the school has become the largest Navy school in the country.

TO GO TO CUBA FOR NICARO NICKEL

E. T. Carlson, I.T. '40, is employed by the Nicaro Nickel Company, a subsidiary of the Freeport Sulphur Company, and he is working in Freeport, Texas. He expects to be transferred to Cuba shortly. His address is Tarpon Inn, Freeport.

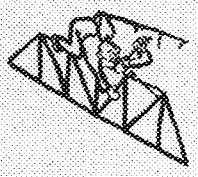
PLANNED NEW NAVAL STATION IN IDAHO

Four former Minnesotans worked on plans and engineering with the Whitehouse and Price firm of Spokane on the U. S. Naval Training Station on Pend D'Oreille Lake, Idaho. They are T. J. Prichard, Arch. '25, head of the department of Art and Architecture, University of Idaho; Ed Molander, Arch. '24, of Minot, North Dakota; F. F. Oakley, Arch. '20, of Spokane; and Ogden F. Beeman, Arch. '24, also of Spokane.

LIEUTENANT IN CHEMICAL WARFARE SERVICE

Norman Telander, Ch. '40, received his commission as second lieutenant in the Chemical Warfare Service at Edgewood Arsenal, Maryland, on December 23 and he is stationed there temporarily. He was married in Texas on September 6 to Miss Georgia Kathleen Danielson of Worthington, Minnesota.

FIELD ENGINEER FOR DRAVO CORPORATION



Walter H. Sargent, I.T. '42, is working for the Dravo Corporation as a field engineer in their ship assembly yard. His residence is at 401 West 14th Street, Wilmington, Delaware.

RETURNS TO BOLIVIA

Emilio Terrazas, C.E. '41, and Mrs. Terrazas, A. '44, the former Florence Rose, have arrived safely in La Paz, Bolivia, South America. The couple left for Bolivia December 30 from New Orleans and are now with Terrazas' parents.

LOCAL CHIEF ENGINEER GIVEN A.S.C.E. POST

George J. Schroepfer, I.T. '28, Gr. '30, chief engineer and superintendent of the Minneapolis and St. Paul sanitary district, was recently named an executive committeeman of the sanitary engineering division of the American Society of Civil Engineers at a meeting in New York. He lives at 5345 Clinton Avenue, Minneapolis.

DESIGNING TRANFORMERS FOR WESTINGHOUSE

F. D. Kaiser, I.T. '40, is with the Westinghouse Electric and Manufacturing Company at Sharon, Pennsylvania. His address is Box 397, Sharon. He is designing large power transformers and much of his time is spent on furnace and rectifier transformers.

BUTWINKLE ANNOUNCES ENGAGEMENT

Joe E. Butwinkle, Ch.E. '40, announced that he will be married in the near future but did not disclose who the woman in question is.

BECOMES A CAPTAIN IN THE ARMY AIR FORCE

Hugo G. Erickson, C.E. '28, whose home is at 5335 Grand Avenue South, Minneapolis, has been promoted from the rank of lieutenant to that of captain. Captain Erickson, former assistant city engineer of Minneapolis, is at the Army Air Force West Coast Training Center, Santa Anna, California.

DOING GLASS RESEARCH AT PRESTON LABORATORIES

Mellen A. Knight, Ch. '38, who received his Ph.D. degree from Penn State College, is now working at the Preston Laboratories on glass research. Mr. Knight's work for his doctorate was in ceramic chemistry.

IN BARRAGE BALLOON BATTALION

Lieutenant Ralph A. Zander, I.T. '37, is with the Barrage Balloon Battalion, Co. 30, Coast Artillery Corps, 1558 North Penn Avenue, Bremerton, Washington.

CHEMICAL ENGINEERS AT POWDER PLANT

Several members of the chemical engineering classes of 1941 and 1942 are in training at the Hercules Powder Company plant at Redford Ordnance Works, Redford, Virginia. Reported there are Kenneth Voge, '42; Alfred Wolker, '42; Gerald Thurston, '42; Tolke Lindberg, '41; Orfeo Befera, '42; Robert Bezanson, '41; Pat Butler, Ch.E. '29, is an engineer at the same plant.

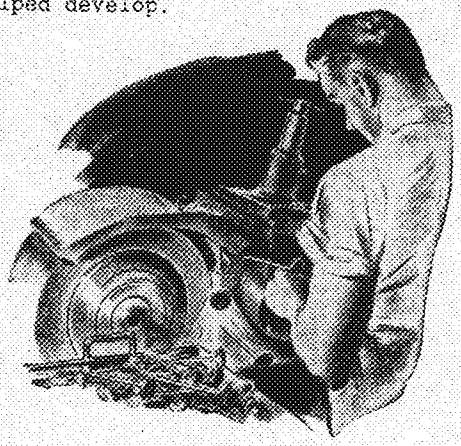
MAJOR AT ARMORED FORCE CENTER

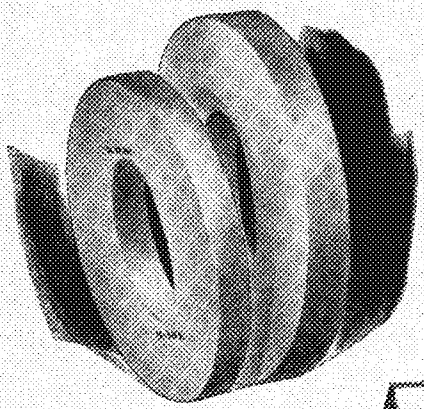
Major Webster F. Soules, I.T. '41, is with the Armored Force, Fort Knox, Kentucky.

What's the hottest spot in a Dog Fight ?

A pilot may keep cool in a "dog fight"—but not his engine! And to function smoothly at high engine temperatures all moving parts must be ground and finished with split hair precision. And that's where Carborundum comes in. For instance, the valve stems are ground to the required accuracy by a centerless grinding process which Carborundum helped develop.

The centerless grinder grinds the valve stems to an accuracy of five ten-thousandths of an inch. Does it, too, in half the time other finishing methods would require. Carborundum has led in the development of centerless grinding wheels to speed the output of valves, pistons, shafts and other such parts that go into a plane.





Industry at war is finding new uses for grinding wheels and other abrasive products...Weapons for Production...every day. When you get in the field and encounter a production problem which abrasives might solve, write The Carborundum Company, Niagara Falls, N. Y.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

ALCAN HIGHWAY

(Continued from Page 172)

Over the Rockies

In the Rockies, which the road crosses almost transversely, road work and blasting both cleared the way and supplied much of the construction material. The highest pass through the mountains is about 4000 feet above sea level.

Thanks to contractors of the P.R.A. who worked side by side with Army engineers, the road turned out to be much better than the rough truck trail which was all that the Army expected. The civilian workers followed immediately behind the Army engineers, widening, grading, and filling in.

Some entire sections were built by them alone. The road varies in width from 18 to 30 feet. At a few gorges it is as narrow as ten. The steepest grade is 15 per cent.

Brigadier General William Monis Hage, the Army engineer in charge of the construction of the truck trail, has been with the Army Engineers Corps for 26 years. It was he who supervised the building of the main road on Bataan Peninsula.

Although trucks are now travelling the road, it should not by any means be thought of as being completed. It will be closed for two months this year during the spring thaws, a condition which of course cannot be ignored.

Only The Beginning

Wooden bridges and culverts will have to be replaced by steel and concrete spans. The road will have to be widened, surfaced, and filled in. In some places it will have to be relocated. P.R.A. officials who are to supervise most of this finishing work estimate that it will be three or four years before conventional maintenance begins, which by the way is to be the duty of the United States until six months after the war, and that of Canada thereafter. Control of the highway region and its transportation is under control of the Northwest Service Command headed by Brigadier General James O'Connor.

The original plan, which was for the Army engineers to go on alone punching a truck trail through and for the contractors to follow them finishing the road to modern highway standards was abandoned for the sake of speed. It is obvious that 1540 miles of passable road are of more advantage than say 800 miles of a fine modern highway ending with a beautiful view in the Canadian Rockies. That decision shows the spirit that I think would serve as a good model for action to some of our befuddled politicians. The Alcan highway is not the end of road construction in Alaska, for its objective is not Fairbanks but all Alaska. A branch to Anchorage now leaves the main road at Copper Center. Twenty-five miles north of Copper Center at Gulkana a road east to the Nabesana area will be connected to a branch road leaving the highway at Tanana Crossing for Valdez on the Gulf of Alaska.

Can't Torpedo Trucks

Minneapolis and St. Paul are to serve as two of the most important railroad terminals for supplies to Alaska, as all railroads from Chicago to Edmonton pass through Minneapolis and St. Paul.

If I may be permitted to end on a personal note: I worked this summer in Seattle doing longshoring—loading boats—many of which we knew were going to Alaska carrying munitions, gasoline, and food to American soldiers there and in the Aleutians. I often wondered then, "Will this boat get through? Will this coal, gas oil, food, and these guns and plane engines get through—or will they end up on the bottom of the Pacific and will our countrymen be left waiting without those supplies which they need so terribly?" Well, now I feel pretty sure that, for the most part, they must be getting there. YOU CAN'T TORPEDO TRUCKS — ESPECIALLY WHEN THEY ARE A COUPLE OF HUNDRED MILES INLAND.

HONORARY SOCIETIES

(Continued from Page 171)

from schools throughout the country. Chapters at Marquette and Iowa State were voted into the national organization. Business sessions, initiations, banquets and inspection tours which extended through the University and to the hydraulic laboratories on the river were highlights of the three-day convention.

Pi Tau Sigma's social activities include date luncheons, parties and the initiation banquet. The initiation fee provides for a key and a yearly magazine published in the spring.

Tau Beta Pi

Tau Beta Pi, all-engineering honorary fraternity, had its origination at Lehigh University in 1885 and now boasts 35,000 active members and alumni. It is one of the largest honorary fraternities with seventy-two chapters throughout the United States.

The Minnesota chapter consists of thirty-eight seniors and two juniors. Every department in the Institute of Technology with the exception of chemistry and physics is represented. The members are selected on the basis of scholarship, service and character, and they must be in the upper one-fifth of their class. Dan Schiavone is this year's president.

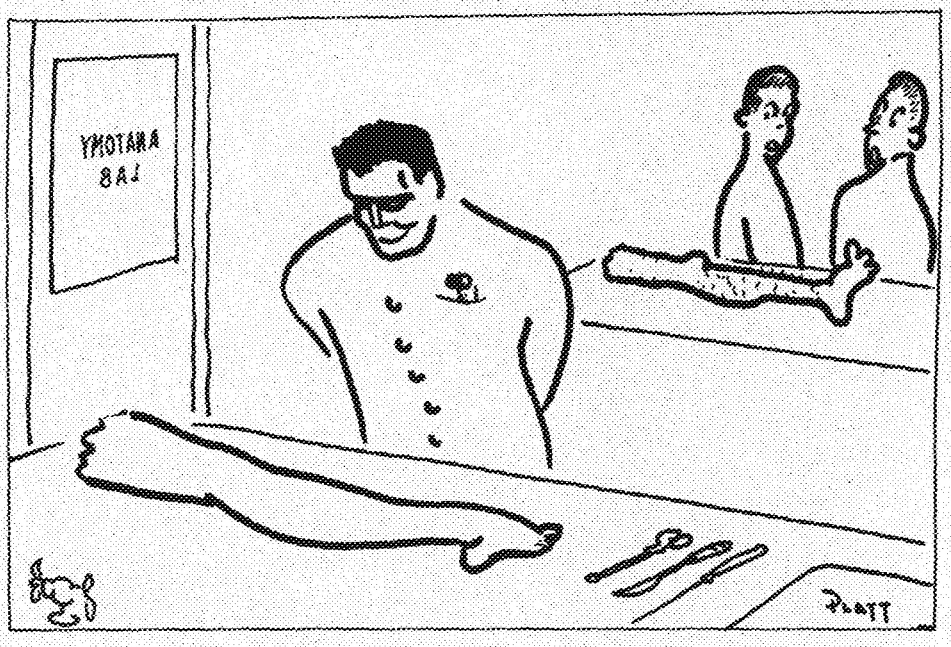
Tau Beta Pi is very proud of their bookcases which they donated to the engineering library. So far there are two filled bookcases in the library and a third has been ordered and paid for. The organization has voted to give twenty-five dollars each year for books for the library; however, this year's donation has already passed the fifty dollar mark. The Tau Beta Pi section was designed for pleasure reading and none of the books are technical. This is the third year that the fraternity has donated for the books.

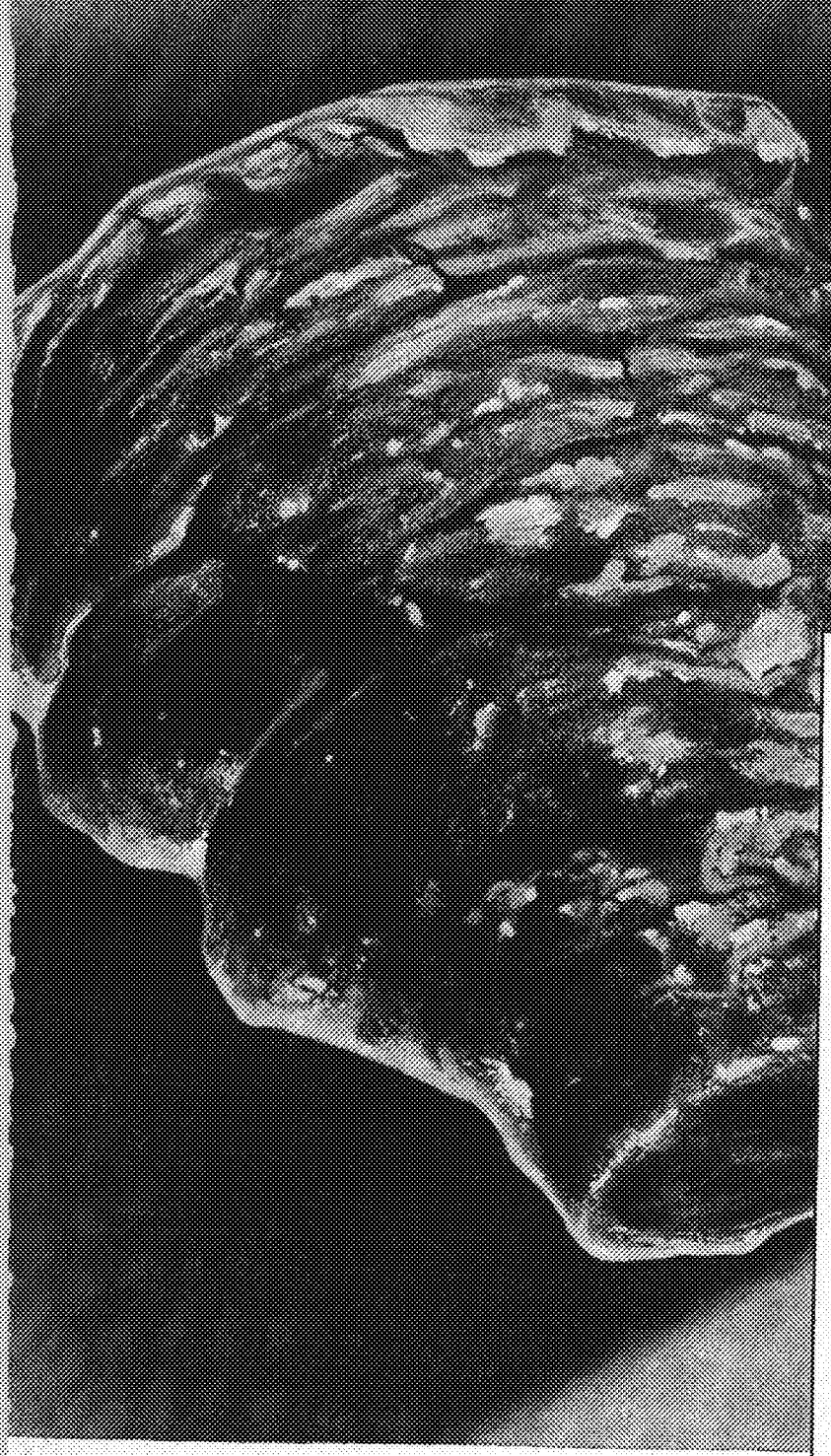
Eta Kappa Nu

Representing the electrical engineering department is *Eta Kappa Nu*, which was founded at the University of Illinois. It started as a club in 1904 and since that time has expanded into a fraternity with thirty-six college chapters and eleven alumni chapters throughout the United States. Professor J. M. Bryant, head of the electrical engineering department, was an instructor at the University of Illinois when Eta Kappa Nu was organized and had much to do with the founding of the fraternity. The Minnesota chapter was organized in 1920 and has twenty-one members at the present time. Paul Moran was elected this year's president.

Each year a national award is offered by Eta Kappa Nu to the electrical engineer who has given the greatest contribution in the field of electrical engineering. In 1940, the award was given to Cledo Brunetti, a Minnesota alumnus who graduated in 1934. The Minnesota chapter offers an award each year to the most outstanding electrical engineer of the sophomore class. This year's award was given to Edward Goldstein.

The annual Tri-honorary Banquet was held February 25. The fraternities included in the banquet are Eta Kappa Nu, Chi Epsilon, and Pi Tau Sigma. Several new members were taken into each fraternity at the banquet. Other social events given by Eta Kappa Nu include a party for the graduating seniors, luncheons and smokers.





This "Carrot" means healthy metals

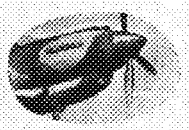
YOU CAN SEE why metalworkers call this lump of calcium metal a "carrot." This is the way it looks when it comes from an electrolytic cell in which it is made.

Calcium is a soft, silvery-looking metal. Although it is abundantly present in such common materials as chalk and limestone, its recovery as a pure metal is extremely difficult. Yet it is vitally essential to this country.

In the making of stainless or high-alloy steels, calcium drives out impurities, giving cleaner, better steel for casting or rolling. In magnesium casting, small amounts of calcium improve the finish of the surface and minimize scaling. Calcium is an essential in the making of many metals.

This hitherto rare metal has been made in this country only during the past few years. Before Europe exploded, the United States was dependent upon France as a source of supply.

But back as far as 1935, thinking that this country should have a domestic source, ELECTRO METALLURGICAL COMPANY, a unit of UCC, started a major research program. After four years of work . . . as French supplies dwindled . . . a plant was put into operation for the manufacture of the gray metal. Today, ELECTRO METALLURGICAL COMPANY produces many times as much calcium metal as this country ever imported . . . and production is increasing.



IN THE AIR SOONER! Vital aircraft parts flow from production lines quicker because the use of calcium metal results in better metal.

BETTER HEALTH! Pure calcium metal is used as a drying and purifying agent in the manufacture of certain new disease-fighting drugs.

CHEMICAL HELPER! Calcium is necessary in making a number of rare metals—many of which heretofore were unavailable commercially—and all of which are vital.

METAL-SAVER! In the melting of copper scrap for use in certain types of electrical equipment, calcium is used as a purifier and a restorer of electrical conductivity.

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

Suggestion for an opening sentence for a novel depicting college life:

"A small coupe drew up in front of a fraternity house and 12 passengers alighted."

• • •

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

• • •

A college student is one who enters his alma mater as a freshman dressed in green and emerges as a senior in black. The intermediate process of decay is known as a college education.

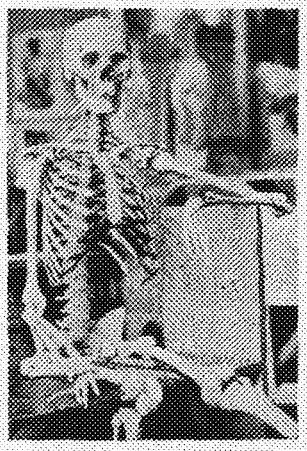
• • •

Hear about the cannibal who passed his friend in the street?

• • •

Kindly clergyman, pinching little boy's knees. "And who has nice, chubby, pink legs?"
Little boy: "Betty Grable."

• • •



MARK HIMSELF

Breathes there a man with soul so dead,
Who never to himself hath said,
"Hmm, not bad!"

• • •

She loves me
She loves me not;
But I don't care—
She's not so hot.

• • •

The proof of this column is in the wastebasket.

• • •

What food we morsels be!

• • •

"Up and atom!" cried the molecule.

• • •

Pathetic figure—that boy that lisps trying to tell a girl that he likes her size.

• • •

Someone asked me if I knew Jack Rockwell. He's just a casual acquaintance. I only know him not to speak to. Some people get results, he only gets the consequences.

• • •

"Hell, yes," said the devil picking up the phone.

• • •

A sultan is just a guy with an exaggerated idea of his own capacity.

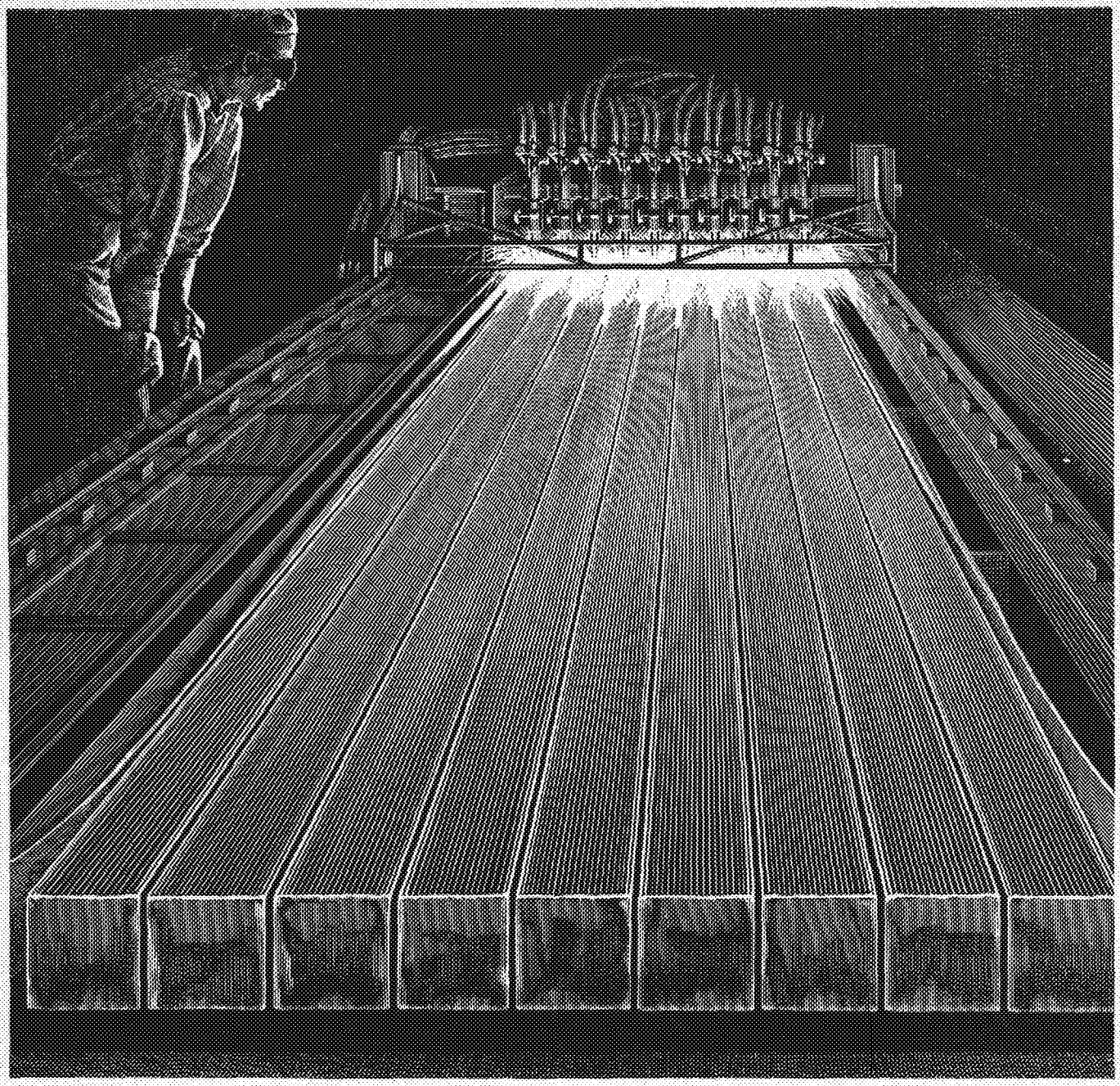
• • •

He paced the hospital corridor nervously. Cold sweat stood out on his brow. If they would only hurry! God—every minute seemed an eternity. Would they never let him know? This couldn't happen to him. She meant his whole life, his everything, his—all.

The door opened! A nurse approached him timidly. Her lips parted. He held his breath as she spoke: "Yeh, I can get off tonight!"

• • •

She used to be a school teacher, but she has no class now.



SLICING STEEL SLABS — and production schedules

STEEL billets were needed. Only slabs were available. That was the problem presented by expanded wartime demands which had to be licked, quickly. It was — by the process illustrated above. Ten oxyacetylene cutting torches, mounted on a frame propelled by two Airco Radiagraph machines, streak down the 140" steel slabs and slice them into billets.

It's one of the many examples of how American resourcefulness, teamed with specialized knowledge, is making minutes more productive. Oxyacetylene cutting and welding and the electric arc are blazing new trails to faster and better production in almost every war industry. The minutes, hours, even days of production being gained by these modern tools are now helping us to overcome our enemies' headstart.

If you work with metals you should know the complete story of the oxyacetylene flame and the electric arc—their speed, efficiency and broad range of usefulness in metal working. This knowledge is vital today—invaluable in the peace to come.

"Airco in the News" shows many interesting uses of the oxyacetylene flame and electric arc. Write for copy.

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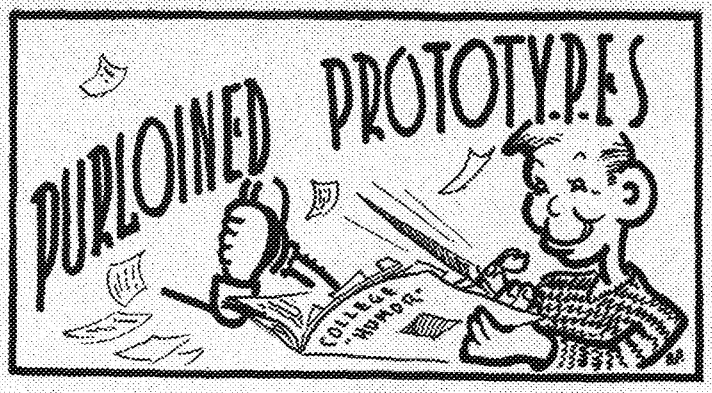
Alumni subscriptions may be purchased now under a special arrangement with the Professional Colleges Bookstore. The subscription cost (only $1.50) will be deducted from your bookstore dividend in advance.

To avail yourself of this opportunity just sign the coupon below and deposit it in the containers or bring it to room 17, Murphy Hall.

To the treasurer of the Professional Colleges Bookstore:

Please deduct $1.50 from my 1943 bookstore dividend for a subscription to eight issues of the Minnesota Technolog.

Signed .....



BY JOHN UPPGREN, M.E., '43, AND WILEY SOUBA, M.E., '43

Here is our last column. We would like to thank the editor for keeping the column so clean by dint of his careful censoring. Now everybody thinks we are a couple of good clean kids—which we naturally are. We hope our successors will not have the various difficulties to contend with which plagued us—irate parents of Arts College students, The Technolog Board, and the Dean of Students are but a few. We enjoyed writing it and do hope that it presented a modicum of entertainment for those of you who read it.

* * *

A sweet young thing tripped into a store to buy her newlywed husband a pair of trousers. She was taking her newly acquired task seriously. After making her selection she asked if the trousers would give good service. The clerk explained that they were made of virgin wool, to which she replied: "Sir, I am interested only in the quality of the cloth, not the morals of the sheep."

* * *

Love is one game which is never postponed on account of darkness.

* * *

Everything in the room combined to present a gruesome appearance; the floor was covered with the product of a past catastrophe; the outlines of corpse-like forms lined the darkest wall; the remaining walls were not less gruesome because of great blood splotches that the eye resented. To one entering this place the horror of death seemed to saturate everything. A man with a three days' growth of beard on his ugly face leaned far over the battered and deeply hacked table. In his hand there waited a long, gleaming wicked looking knife.

"Have you no heart at all?" pleaded an anxious and timid voice.

"No," he returned gruffly.

"Very well then, give me about a pound of liver instead."

* * *

A big silver dollar, and a little brown cent,
Rolling along together they went,
Rolling along the smooth sidewalk,
When the dollar remarked—for the dollar can talk:

You poor little cent, you cheap little mite,
I'm bigger and more than twice as bright,
I'm worth more than you a hundred-fold,
And written on me in letters bold,
Is the motto drawn from the pious creed,
"In God we trust," which all can read.

Yes, I know, said the cent,
I'm a cheap little mite, and I know
I'm not big, nor good, nor bright.
And yet, said the cent, with a meek little sigh—
You don't go to church as often as I.

* * *

A professor, coming to one of his classes a little late found a most uncomplimentary caricature of himself drawn on the board. Turning to the student nearest him, he angrily inquired, "Do you know who is responsible for that atrocity?"

"No sir, I don't," replied the student, "but I strongly suspect its parents."

She—"But, darling, if I marry you I'll lose my job."

He—"But can't we keep the marriage a secret?"

She—"But suppose we have a baby?"

He—"Oh, we'll tell the baby of course."

* * *

John: "Sit down; I won't bite you."
Joan: 'Why not? Don't you like me?"

* * *

She: "I drove my ball clear out of sight."

He: "Did it go into the woods?"

She: "No."

He: "Here's another ball then."

* * *

The hen is immortal; her son will never set.

* * *

First cannibal: "Is I late fo' dinner?"

Second cannibal: "Yo' is. Everybody's eaten.

* * *

Thought of the day: Many a sober-faced little lamb goes riding in the moonlight and comes home with a sheepish grin on her face.

* * *

Have you heard about the absent minded Broadway producer who got married and sent out press invitations to the first night?

* * *

Econ lesson for today: Girls without principle draw considerable interest.

* * *

Heard at the Engineers' Brawl.

Murph: "May I have this dance?"

The queen: "Certainly, if you can find a partner."

* * *

Do you remember the sailor who, when asked what he'd done with his wages, answered: "Part went for liquor, part for women, and the rest I spent foolishly."

* * *

A certain soldier in the States received a ten-day furlough, so he could get married and go on his honeymoon. On the eve of the tenth day he wired his commanding officer:

"It is wonderful here. Request ten days extension of leave."

"It's wonderful anywhere. Extension refused. Return at once."

* * *

Engineers are often baffled by the fact that some of the girls with streamlined figures offer the most resistance.

* * *

Demure Young Coed: "I swear that men's lips have never touched mine."

Sorority Senior: "That's enough to make any girl swear."

* * *

One cure for insomnia is to take a drink every quarter hour. It may not put you to sleep, but it will make you more satisfied to stay awake.

* * *

Goodbye and good luck.

Louise Upgren

This month we would like to start out by paying tribute to our copy editor. We have always felt that a special day should be set aside to honor these patient, tireless, and hard working fellows. Bob Gantvalley, the Log's copy editor, is the kind of a guy who can always be depended on to do his rather thankless job on time and to do it well. His job is rendered doubly difficult by the notorious fact that an engineer is not usually at his best when his tools are spelling and grammar. Bob, you've done a swell job, and now that you've stood up and taken your bow—get the heck back to your desk and get those articles for next month copyread.

• • •

To prove to the skeptical that the TECHNOLOG definitely starts some of the trends in current literature we would like to tell you that a book entitled *Tunnel from Calais* by David Rome has just been published by Macmillan. The book is fiction and deals with "what happens along the white cliffs of Kent when the discovery is made that the Nazis are completing a tunnel under the English Channel from Calais." We would like to refer you to an article in the February 1941 issue of the TECHNOLOG called "Axis Ace In The Hole" in which the author, Mrs. V. Byron Bingham, pointed out the possibility of such a tunnel and described preliminary work which had been done on a tunnel from Calais to Dover.

• • •

Every once in a while there comes to our tired ears a story that makes us think that life is worthwhile after all. Such a story is this. It appears that one of the big tank companies had sent blue prints to the shop of a tank having convex riveted heads. A simple enough design, it you know what we mean. To the amazement of the designer the shop foreman came up to the engineering department to report that he could not make the tanks. His explanation was simple enough. "You want ten tanks," he said. "I have only eight men, and with this design I have to leave a man in each tank. There is no way of getting them out." All of which may help to explain why engineers are slightly nuts.

• • •

We are happy to report that we have some really top-notch articles coming up for the next few issues of the Log. Included are an article by Jean Picard on high altitude flying, an article on licensing of engineers, and articles by Messrs. Siler and Seely, both of the University faculty, and both well-known writers.

• • •

Just a reminder to those soon-to-be-prosperous seniors who are graduating this quarter that they will do well to start their coupon clipping careers by clipping the coupon that appears elsewhere in this issue which will entitle them to secure eight issues of the TECHNOLOG. One of the best ways to keep in touch with the old "engine school" is to subscribe.

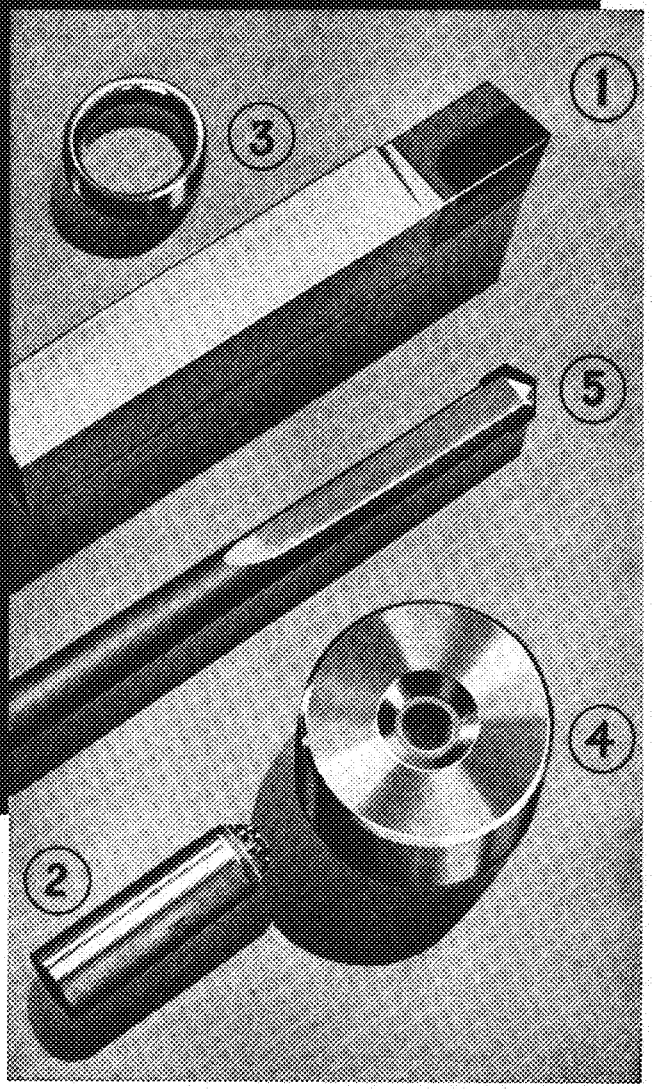
• • •

We just had a card from Mr. Laddy Markus, double-E extraordinary and one-time editor of the TECHNOLOG, wherein he informs us that he has just been promoted to the position of assistant editor of *Electronics* magazine. Although we never knew Mr. Markus personally, we wish to extend our congratulations to him and also convey to him our hope that his case proves that all TECHNOLOG editors do not come to a bad end. We must admit, though, that there are times when we are doubtful about the last.

J.E.

These are the 5 WAYS in which industry is stepping up WAR PRODUCTION

With Carbides



1. Cutting Metals Faster! . . . Carbide tools commonly double the volume of metal removed per hour. Cut wide range of material, from "tough" armor plate to "soft" plastics. Continuous or interrupted cuts. Adaptable to most old machines, as well as new.

2. Dressing Grinding Wheels Easier! . . . Diamond-impregnated Carboloy dressers make diamonds do a full day's work every day! No time out for remounting. No lost diamonds. No "pampering" temperamental stones. Diamonds held permanently in place. Used in 3 sizes for wheels up to 42" diameter.

3. Keeping Machines Running! . . . Stopping "shut-downs" caused by excessive wear on such parts as rollers, cams, guides, gages, valves, etc., used on plant equipment. Just a small insert of carbide at the point of wear often increases life of parts up to 100 times longer. (Carboloy guide for wire stranding machine illustrated above is typical wear-resistant use.)

4. Drawing Metals! . . . Drawing, sizing, extruding metals through carbide dies provides better finish, greater accuracy, larger output, more continuous operation. Used for wire, bar, tubing, sheet metal. Widely employed for drawing cartridge cases from .30 cal. through 105 mm.

5. Installing Equipment Faster! . . . For installing new equipment, wiring and piping, or relocating present machines, carbide masonry drills drill holes 75% faster in concrete, brick, tile, porcelain, plaster.

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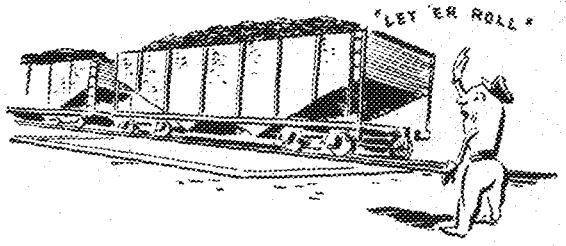
G-E Campus News



LET HER ROLL!

AT A PLANT of the Hanna Coal Company in Ohio, loaded coal cars are emptied by being rolled onto a rotary dump, fastened to the rails by a mechanical device, and then rolled upside down over a chute.

Now the dump is not supposed to revolve again until the empty car has been righted and sent on its way. But once in a while, when a car took a particularly long time to move off, the dump would revolve the next full car and derail the empty one.

The difficulty was remedied when a G-E photo-electric relay and light source were installed on opposite sides of the track at the "empty" end of the dump. Now the dump can't revolve so long as the light beam between the light source and the phototube in the relay is blacked out by the body of the empty car.

NOTHING TO IT

HERE'S how the G-E supercharger works—à la Hollywood.

In Warner Brothers' "Desperate Journey," a Nazi officer asks a captive American flyer, "How do you manage to supercharge the engines at the extreme cold of these high altitudes?"

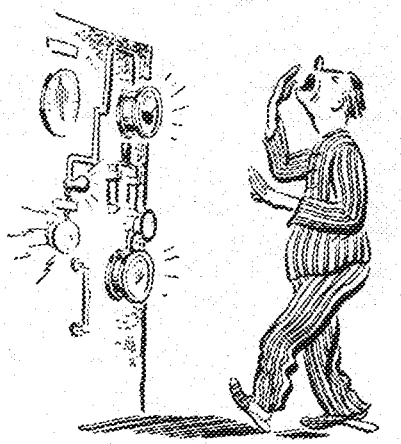
Johnny, the prisoner (played by Ronald Reagan) is crafty. He stalls a bit and then, assured that no one can overhear, he whispers, "It's done with a thermo-trockle."

"A what?" The awed Nazi leans closer.

"A thermotrockle amfilated through a daligoniter," explains Johnny, beginning to sketch with his left hand.

"You see, the dornadyne has a frenicoupling and the amacmerer premulares the kinuraspel hepulace—here—and the—."

All of which thickens the plot, confuses the Nazi, and gives Johnny an opportunity to slug his guard and escape—without revealing a single military secret.



TESTING

BACK when Herbert Hoover was in the White House, four specimen rods of an alloy steel used in steam turbines were imprisoned in a thermostatically controlled electric furnace at one of the G-E laboratories.

The purpose was to study the effect on the metal of prolonged high temperature and stress, in order to improve the design of the turbines.

Usually these "creep" tests are run for only 1000 to 3000 hours, but the engineers never took these four specimens out of the furnace until the other day—thus obtaining what they believe to be the first data based on a 100,000-hour test.

Throughout the 100,000 hours an ingenious alarm system guarded the specimens. In the event of trouble, a red light would flash and a bell would ring, summoning a watchman who could get one of the engineers out of bed to remedy the situation.

MINNESOTA TECHNIC

IN THIS ISSUE

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THE MIGHTY MESABI
COLLEGE HUMOR

APRIL • 1943

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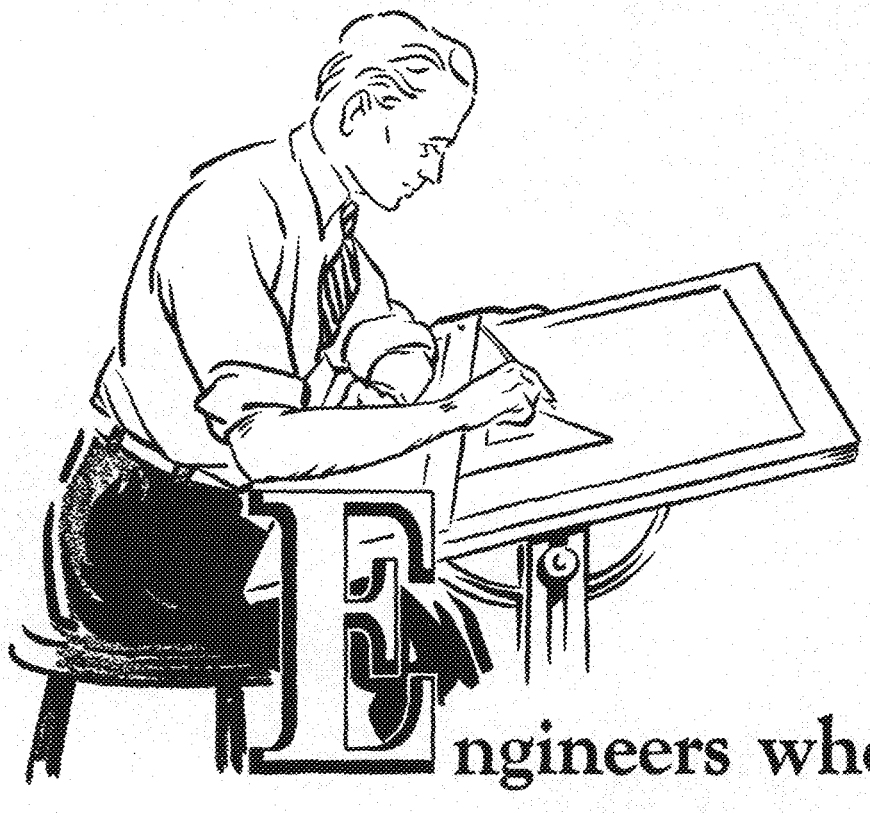
INSTITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA



Engineers who know their bearings are helping to win the war

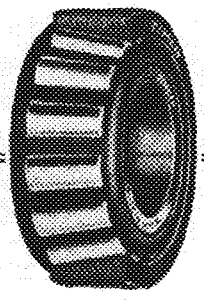
Timken Tapered Roller Bearings in untold millions have gone and constantly are going into American fighting equipment and the industrial machines that produce it—placed there by engineers who know from years of experience what Timken Bearings can do.

Many of these veteran engineers began to acquire their knowledge of Timken Bearings while in college, and if you asked them they would tell you that this has been an important factor in their success.

For there is no bearing problem, however complex, that cannot be solved by the multiple abilities of Timken Bearings — the total elimination of friction; the safe carrying of radial, thrust and combined loads; and the holding of moving parts in correct and constant alignment.

Begin now to obtain *your* knowledge of Timken Bearings.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

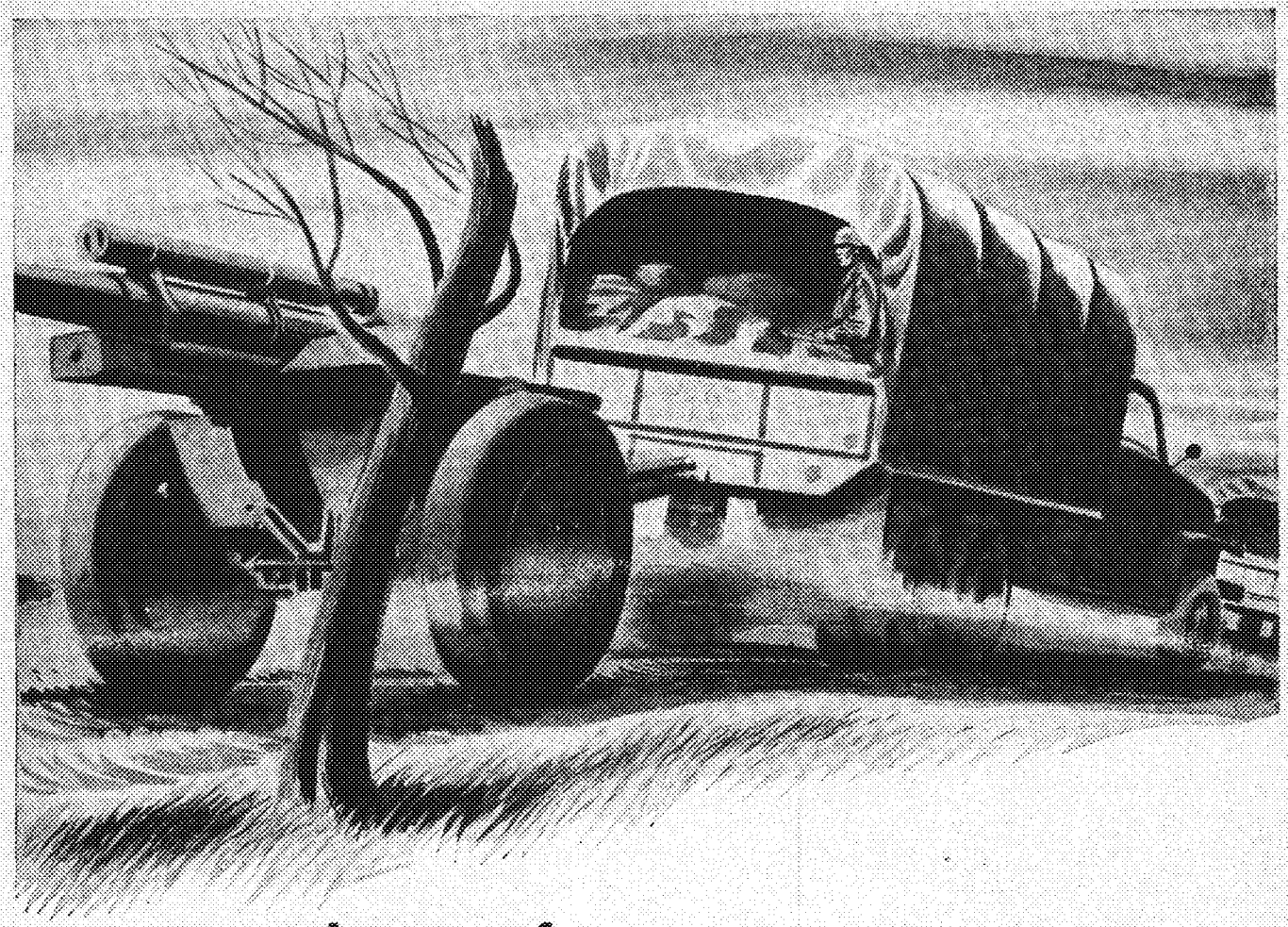


TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

"ALL THERE IS IN BEARINGS"



Speaking of superior races . . .

Every wheel that rolls on the battlefield turns in a polished bearing race, ruggedly built to take the terrific shock of combat service.

To withstand such punishment, bearing races must be hardened by heat-treatment. Hard and soft spots occasionally occur. Such races may fail—at times when failure means disaster.

Recognizing the vital need, Westinghouse Research Engineers P. H. Brace and C. S. Williams set to work to develop a quick, sure method of detecting these flaws.

Their ingenious electromagnetic flaw-detector is based upon the fundamental law that the *permeability* of a heat-treated steel part varies with the degree of hardness.

In actual practice, Brace and Williams first *completely* demagnetize the bearing race under test. Next it is rapidly rotated and strongly magnetized. While the race is still turning at high speed its magnetic field is explored with a specially designed electromagnetic "pick-up."

Variations in the magnetic field of the bearing race, due to hard or soft spots, induce feeble currents in the pick-up system. These currents are amplified and shown on a cathode-ray oscilloscope.

A uniformly heat-treated bearing race traces a *luminous straight line* on the oscilloscope screen. Faulty heat-treating shows up as a pattern of *hills and valleys.*

The Brace-Williams electromagnetic flaw-detector is now being used commercially—a typical example of Westinghouse *electronics at work.* It assures quality in millions of bearing races for our armed forces, *to keep 'em rolling on to victory!*

* * *

What Brace and Williams did—by employing Westinghouse "know how" to develop the magnetic flaw detector—many young Westinghouse scientists are now doing in other fields of fundamental research.

Today, they are helping to solve the technical problems of modern warfare. Tomorrow, they will tackle the job of building a better world for all of us.

Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

ELECTRONIC FINGERPRINTS—Westinghouse Research Engineer C. S. Williams demonstrates the principle of the electromagnetic flaw-detector. Hard spots in the steel test piece show up as an irregular line on the oscilloscope screen. Williams joined Westinghouse after receiving his B. S. in Electrical Engineering at Northwestern University.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at work

Would you turn your back on a wounded Soldier ?

You think you wouldn't... you don't mean to...

But unless you are giving every precious minute of your time... every ounce of strength that you can spare... towards helping win this war as a civilian, you are letting down those soldiers who are sacrificing lives to win it for you.

What you are asked to give up isn't much compared with what they're giving up. The extra work you undertake is small compared with the gigantic effort they are making. But to a wounded soldier, what you do can mean the difference between life and death.

You make the choice.

LOOK AROUND YOU! *Pick your war activity—and get into it! In your local Citizens Service Corps or Defense Council there is something for every man, woman and child to do. If no such groups exist in your community, help to organize them. Write to this magazine for free booklet, "You and the War," telling what you can do to help defeat the Axis. Find your job—and give it all you've got!*

EVERY CIVILIAN A FIGHTER

Contributed by the Magazine Publishers of America

This Month . . .

BY EARL ANDERSON, ARCH. '46

MARY JEAN SCHAEFER, Journalism Junior, has written the article on the Curtiss-Wright cadettes. She had used the subject of the cadettes for a recent class assignment. Having collected all the material beforehand, it was a fairly simple matter to whip it into shape for an article for TECHNOLOG. Another point in her favor is that she is a woman and so by applying that well-known intuition she would be able to supply any facts which were not obtainable elsewhere.

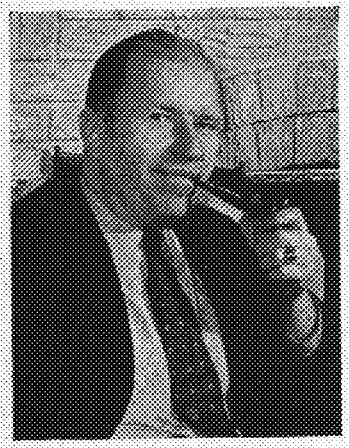
"Schaef," as she is called by her friends, aspires to a radio-writing career. She is getting a good deal of practical experience by writing for the TECHNOLOG. Having been co-editor of the "Lowdown" column of the *Skirm* this year, she would naturally welcome this chance to rise from obscurity.

NOW TECHNOLOG

Among her many activities, Mary Jean proudly boasts of being on the AWS board, on the J.B. and Freshman week committees, and woman's page editor of the *Daily*. She is rather an athlete, too, being on her sorority's (A.O.Pi) softball team, plays ping-pong, likes canoeing and dancing, the latter more smooth than athletic.

Mary Jean tells us that she was once chased by a bull. What effect this might have on her writing we don't know, but we'll stick it in for what it's worth.

CHARLES E. DOELL, who wrote the article on licensing of engineers for this issue, graduated from Minnesota in 1917 with a degree in civil engineering. While he was still in school, he worked part time at the Minneapolis Park Board and is now secretary and assistant superintendent of the Park Board. Mr. Doell is editor of the *Bulletin*, the monthly publication of the Minnesota Federation of Engineering Societies. He is a member of the Minneapolis Engineers Club, and a past president of the 5th district Minnesota Association of Professional Engineers. Other organizations of which he is a member are the American Legion, Athletic Club, and the American Institute of Park executives.



CIVIL FAMILY

Mr. Doell's hobbies are gardening and fishing and his son, Jim, is following in his father's footsteps and is now a junior in civil engineering.

AL WEDGE sends the lowdown on "Men and Machines" from the New Kensington Work of the Aluminum Corporation of America in New Kensington, Pennsylvania. Al graduated with a B.M.E. degree last year and is now working for Alcoa as an industrial-engineer in their sheet mill.

AL ON THE LEFT

While in school, he participated a great deal in student activities. He was vice president of the Union Board of Governors and Tech party chairman. Besides being a staff member of the TECHNOLOG, he was also chairman of the TECHNOLOG Board. He is a member of Phi Kappa Psi; Pi Tau Sigma, honorary mechanical engineering fraternity; Iron Wedge; and the American Society of Mechanical Engineers.

When he isn't busy belonging to some organization, he manages to get in a little golf and basketball. People are his hobby and his goal is a career as a sales engineer.

MR. KENNETH SEELY gives his ideas on how the world is becoming smaller due to airplanes and other recent discoveries.

SMALL WORLD

A native of Abbotsford, Wisconsin, he attended high school in Minneapolis and graduated from the University of Minnesota in 1926. In 1927, he began teaching as an English assistant at De Paul University in Chicago. He taught at Marshall High in Minneapolis last spring, and came to the University of Minnesota as an English instructor in the Institute of Technology last fall.

He is a member of Phi Beta Kappa, Phi Delta Kappa and the usual number of teaching organizations.

The editorial policy of the TECHNOLOG is to present material for technology students which it is hoped will strike a happy medium between the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, October through May, by the students in the Institute of Technology of the University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in the hands of TECHNOLOG subscribers highly worth-while and interesting reading material; second, to offer technology students an invaluable opportunity to get writing, selling, and working-with-others experience.

MINNESOTA TECHNOLOG

THE COVER shows a typical soldier advancing to the attack ready to take advantage of every opportunity to overcome the enemy. Photo by U. S. Army Signal Corps.

THE FRONTISPIECE. Under pressure of 50 tons, the commutator for a 1,500 h.p. d-c motor is tightened in a press. Following this, it will pass through four cycles of stationary seasoning, one of rotary seasoning.—Courtesy of *Allis-Chalmers Electrical Review.*

STAFF

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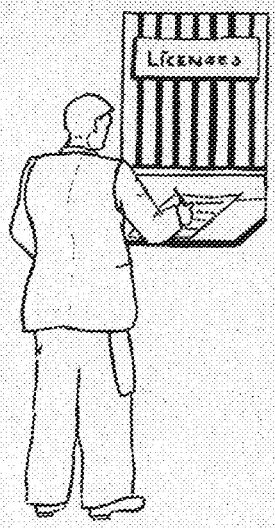
SHOULD WE LICENSE ENGINEERS?



By CHARLES E. DOELL
EDITOR, THE BULLETIN, MINN. FEDERATION OF ENGINEERING SOCIETIES

IN the interest of the public welfare, competence is required of individuals engaged in the various professions and trades having to do with the life, health and property of citizens of which the public is composed. Recognizing this fact, Minnesota, in common with other states, requires that individuals engaged in various professions and trades must prove their competence before proper authorities. Once having done so, such individuals are "licensed to practice" and are supplied with proper credentials. Others are prohibited from practicing that particular profession or trade.

Such a "licensing" or "registration" law is in effect for the professions of Architecture, Engineering and Land Surveying. A university degree is not in itself a "license to practice" engineering any more than it is to practice law or dentistry or medicine. Individuals in each profession must prove competency before an appropriate State Board of Examiners. In the case of engineers, the applicant must have had a certain amount of practical experience before he is permitted to apply for registration. Because of this provision and because the provisions of the law for engineers have not been rigidly enforced in the past, engineer graduates may have been inclined to neglect registration—indeed neglect to later take their professional degree or doctorate at the University.

This neglect of continued education and subsequent registration is not recommended. Lack of outward evidences of education and competence is detrimental to the profession and its individual members. The impatience of graduates to become actively engaged in their life work may, for the moment, overshadow the importance of their becoming part and parcel of the profession they are to follow. Sober reflection and a short time of actual practice should demonstrate that such neglect is costly.

The Year Book of the State Board of Registration for Architects, Engineers, and Land Surveyors (316 New York Bldg., St. Paul Minn.) contains all information on the subject of registration (including the law itself) necessary for those interested. Copies are obtainable at that office.

To you who are preparing yourself for an engineering degree, you will want to know that to be eligible for registration, you must be at least 25 years old and shall have practiced engineering for at least five years either as an employer or employe, each year of successful completion of study being a year of such practice. When you request registration, the Board may require a written examination, and for you young men that is the most satisfactory method. So do not neglect to keep alive all the pertinent principles of engineering learned at college.

The law does not specifically define the practice of engineering—and consequently there has been an all too slow appreciation of who must be registered. But the Board has established what it considers such practice and that is in line with many other state laws and no doubt is a valid interpretation. Here it is:

> The practice of professional engineering includes any professional service, such as consultation, investigation, evaluation, planning, design, responsible supervision of construction or operation; in connection with any public or private utilities, structures, buildings, machines, equipment, processes, works, or projects, wherein the public welfare, or the safeguarding of life, health or property is concerned or involved, when such professional services require the application of engineering principles and data.

A careful interpretation of the above will demonstrate that there are few exemptions. Teachers are exempt and so are contractors who simply do what is required of them by the engineer's plans and specifications but they probably are not exempt if their work requires the application of engineering principles and data. But the point is not "who is exempt"—rather "can I qualify," for it can readily be seen that legally a man is not an engineer and has no right to impersonate one unless he is registered. So the object is to register if at all possible.

It should be added that in most states the registration law is more carefully enforced than in Minnesota but even in Minnesota the profession is becoming more conscious of its obligations and welfare every day. There is now organized professional policing to aid the efforts of the Registration Board.

This brings us to the work of the Minnesota Association of Professional Engineers (MAPE), a state branch of the National Society of Professional Engineers (NSPE). A prerequisite to membership is registration.

This organization is taking an active part in policing the profession and aiding in the enforcement of the law. At the same time it is organized to protect the interest of the professional engineer and to promote his welfare as no other single engineering body is organized to do. It takes only an incidental interest in the technical development or the social aspects of the engineer and consequently embraces all specialized branches of the profession. On matters of professional welfare and the attitude of the profession in the social scheme of things, it alone can speak for the profession.

MAPE and NSPE are not in competition with the many societies composed of qualified professional men organized as technical societies of the several branches of engineering or the clubs of those interested in engineering organized for more or less social purposes. These occupy a very important place in organized engineering. One provides for the continued technical development of the engineer and the other provides for business and social contact. MAPE supplements the work of these societies in providing the medium thru which the profession as a whole gives expression to its place in our social structure and thru which it can render its proper service to society.

The student should look forward to taking his place in the engineering profession by:

1. Registration as soon as he is qualified.
2. Membership in his professional organization which in this state is MAPE and in other states the state branch of NSPE. After graduation and before registration, Junior Memberships are provided for.
3. Membership in the technical organization composed of specialists in his particular field, such as ASCE, ASME, AIEE, and the many others.
4. Membership in one of the several more or less social clubs whose members are interested in engineering such as The Minneapolis Engineers' Club, Engineers' Society of St. Paul, Duluth Engineers' Club.

Most of these organizations in this state are coordinated through the Minnesota Federation of Engineering Societies with offices at 819 Guardian Building in St. Paul.

Production's

TROUBLE SHOOTERS

The Industrial Engineer

BY ALBERT C. WEDGE, B.M.E.
JUNIOR ENGINEER ALUMINUM COMPANY OF AMERICA

FOR an engineering college graduate getting a start in industry, one of the best practical educations in this world of men and machines may be obtained in the field of industrial engineering. Activities in this field present the essential points which management must advance to labor in the successful operation of any large industrial organization. Essentially, it is a job of selling—selling improved methods, production schedules, job rates and incentive systems to labor.

This job of selling is hindered by the fact that the industrial engineer is the outgrowth of the "efficiency expert" prevalent during the depression years following 1929. Increased efficiency often meant reduction of labor forces so that quite naturally the workers resented the presence of these men in the mill or factory. A recent edition of *Fortune* magazine stated that in a survey of workers in the Pittsburgh area, the men listed their greatest dislikes as "Hitler, Tojo and industrial engineers" in that order. A reputation like that is difficult for any industrial engineer to overcome particularly when he is a "kid" right out of college. In most cases any dislike shown is due to the fact that the industrial engineer represents a force which may be reflected in the workers' pay check and not to a dislike of the individual himself.

The staff organization existent in many of our industrial firms goes far in giving an "apprentice" a start toward successful labor relations, an item of first importance in becoming a good industrial engineer. Under this plan several industrial engineers are attached to each department of the plant. They cannot give orders to the workers but work hand in hand with the foreman of the operating division in carrying out their responsibilities. At the head of the group are the chief and assistant industrial engineers who coördinate all the activities. After being assigned to a specific department the newcomer works under an older, more experienced man as he learns not only the theory and derivation of the work, but also the proper methods of presenting the work to the superintendents, foremen and the workers themselves. A man may be a good analyst and statistician but unless he is open-minded in recognizing the workers' viewpoint and diplomatic in handling discussions with labor, he is of little value as a departmental industrial engineer.

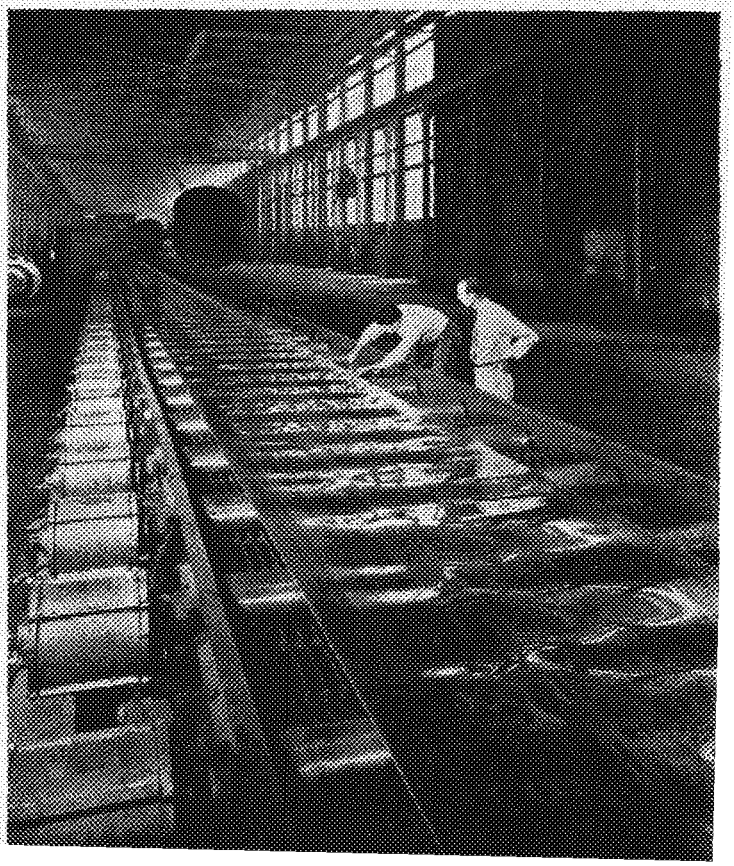
Many engineering students have the idea that industrial engineering means "time and motion" study. In a sense this is true, but as the metallographer uses the spectroscope, the civil engineer the transit, the electrical engineer the ammeter, and the chemical engineer the Bunsen burner, so the industrial engineer uses both motion and time study as his tools. They are important tools but are useful only in so far as they aid in obtaining the many facts and figures from which working proposals may be evolved. Other tools used by the industrial engineers are production data, job description, man-machine and process charts, work simplification, and standardization.

The number of these tools and the way in which they are used depends on the type of work being done and the specific problems encountered. For example in a job methods analysis of a machine operator it is first necessary to make a study of the job, and then simplify and standardize the operation through motion study and the use of man-machine and process charts. On the other hand, in setting a production standard on the machine it is necessary to use time study to obtain representative time values for the proper practices, motion study to judge the performance of the worker, and production data to predict logical results. Many different combinations of these tools are possible as they are applied to the infinite number of jobs in industry. Too many industrial engineering courses in engineering colleges stress small assembly jobs and other jobs requiring a high degree of manual dexterity giving the student the impression that this is the only type of work requiring industrial engineering.

Industrial engineering work has a broad scope and touches on many different phases of production. With the construction of a new plant or addition, the industrial engineer's work may be primarily plant layout as he adds his knowledge to that of others in determining the most efficient design of the physical plant and layout of the production equipment. He aids the engineering and purchasing divisions in the selection of new equipment, particularly that for materials handling, and also advises the employment division of job requirements when selecting new workers. As the new plant gets under way the work centers around four main functions: establishment of production standards; determination of job rates; development of attainment systems; and fact finding. Many problems arise in the performance of these functions and although they are continuous in nature, much more time and effort are required in the establishment of standards and the various attainment systems than in control. It may take several years to develop a working bonus system but once it has proved successful in operation controlling it becomes a routine function. After the plant has been operating five to ten years or longer, the industrial engineering problems for the most part deal with control of existing standards, job rating, methods improvement, standardization of new equipment and jobs or changes in the old ones, and fact finding relative to production costs, utilization of equipment and personnel and any other problems requiring information requested by management.

Establishment of production standards is perhaps the most important function as far as management is concerned. The ideal of any manufacturer is to produce the maximum amount of the best product at the lowest cost with the available facilities. The operating, planning, metallurgical, engi-

A TWO BLOCK LONG section of aluminum sheet is being rolled in a giant rolling mill. The industrial engineer plays an important part in determining the best possible plant layout for such manufacturing processes.



neering and research divisions do their part in obtaining the correct fabrication of the product; the sales, accounting and traffic divisions perform their duties in selling the product to the customers at a satisfactory margin of profit; while the industrial engineering division has the responsibility of establishing a measure of production performance with correct practices for checking attainment. This standardization involves dealing with men, machines, materials and working conditions. The coördination of materials and machines with humans under proper working conditions creates an organization capable of producing quality finished goods. There must be definitely established practices specifying products, methods, duties and responsibilities before the performance can be measured and evaluated. Establishment of these production standards involves the use of all the tools of industrial engineering and the aid of nearly every other functional division of the company.

A production standard is essentially a figure representing the normal time necessary for the average worker to complete some operation on the material being processed. The term "average" worker has been and continues to be a difficult term to define. Many definitions and many leveling systems have been used in various industrial firms, but each one seems to fall short of the ideal; in the final analysis the determination of the average worker depends upon the experience and judgment of the industrial engineer. By comparing actual production for the various units with the standard, any "bottleneck" to production can immediately be discovered. Proper steps may then be taken by the qualified person to correct the situation whether it requires new or improved equipment, more highly-skilled workers, improved methods or workplace. Thus standards provide an accurate measure of production efficiency and utilization of available resources.

In the establishment of wage rates for various occupations within an industrial organization, a job rating plan is used. This type of plan helps to establish proper rates and to maintain uniformity and fairness in wage payment. A series of requirements present to some degree on every job are listed in order of importance. These requirements include such items as skill, accuracy, manual dexterity, working conditions, accident hazards, monotony of work, education, versatility, dependability, initiative, physical effort, and responsibility for equipment. By making job descriptions and analyzing every job as to the extent that each of these requirements is present, a comparative listing of the jobs may be made within a given wage scale and an hourly wage established for each job. Job analysis and rating is useful in hiring new workers and making advancements although company-union agreements have set up definite procedures to follow when filling job vacancies, taking such factors into account as ability, company and departmental seniority, continuous service and lines of progression for jobs of similar nature.

Increased production efficiency is possible only through the joint efforts of workers and management. Management receives its gain through lower costs, greater output and increased profits. Workers may be rewarded for their contribution through an incentive or bonus system. With production standards established, such systems can be set up quite readily. Since the standards are based upon the production which can be attained by the average worker, any performance better than average merits reward through additional earnings. Two types of workers can share in bonus earnings, direct and indirect labor. Direct labor includes those workers who perform an operation on some part of the commodity being produced which brings it a step closer to completion. Such an operation brings about a physical change in the appearance or properties of the product. The worker's efficiency is determined by comparing his performance directly with the established standard for the type of work being done. In general, bonus is paid on the basis of the efficiency attained above a certain percent considered as normal in working for a period of time. The exact system used varies from one company to another. When the worker is paid on a piece-rate basis of dollars per one, ten or a thousand units, the worker's potential earnings are determined by the total number of units he can produce during his working time.

Indirect labor presents a different problem. Included in this group of workers are such servicemen as cranemen, power and hand truckers, sweepers and janitors, electricians and millwrights. Some system must be developed to determine the contribution of these workers to the production shown by direct labor. No universal system is in use at present. Development of bonus systems to include indirect labor is one of the current problems facing industrial engineers.

Fact finding refers to the presentation of facts and figures gleaned from study and analysis and covers an infinite number of problems confronting management. It often calls attention to management errors through constructive criticism and enables supervisors to make decisions based on definite facts. This is particularly necessary in settling differences brought up by the workers in the factory or mill.

In connection with the introduction of new methods and equipment, there may arise certain "grievances" presented to the operating heads by the workers or their chosen representatives. After hearing such complaints and suggestions, the industrial engineers attempt to find solutions which are satisfactory to management and workers alike. In arriving at the solution they may have to work with the operating foremen, the departmental metallurgist, the cost office, the maintenance engineering staff, the planners, and industrial engineers in other departments. All work in the final form is checked by the chief industrial engineer to see that it is in line with similar conditions in other departments and consistent with operating principles and company policy. The completed work is then referred back to the operating men who present it to the union committee at a subsequent meeting. The industrial engineers are on hand to answer any questions that may arise, and to assist company represeniatives in negotiations.

Many of the new problems now facing industry require the knowledge and experience of industrial engineers. One of the most important of these is manpower. Unskilled men and women workers are entering mills and factories with little or no industrial experience. This shortage of skilled workers brought on by increased industrial activity, can be alleviated by breaking down and simplifying skilled jobs into several jobs requiring less skill, manual dexterity and physical exertion. An effective training of these new workers in the correct job methods will make them

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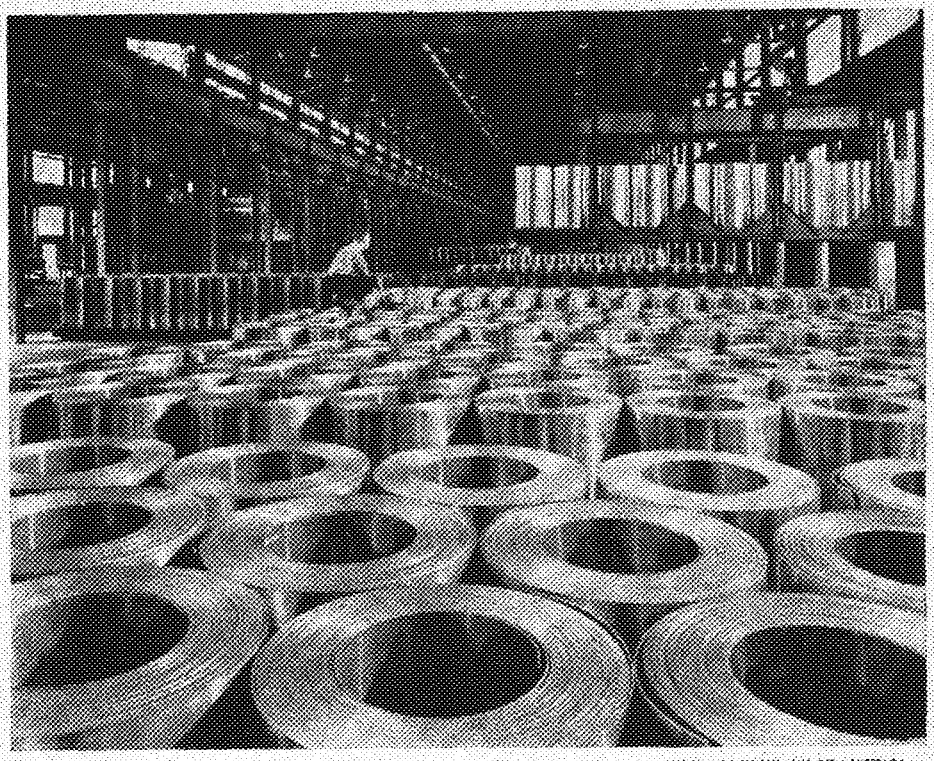

PHOTOGRAPHS FROM ALUMINUM COMPANY OF AMERICA

THE INDUSTRIAL ENGINEER is concerned with materials handling as well as with other phases of manufacturing. Movement and storage of materials in process in the plant, such as these coils of sheet aluminum, are also his problem.

The Future of the
MIGHTY MESABI

By JAMES F. McGARVEY, CH.E. '44

THERE is not a true Minnesotan, worthy of the name, who does not know the tremendous importance of the great iron ore deposits of the Mesabi range both to our war effort and to the peacetime steel industry. I doubt very much, however, if it is well known that reserves of high grade open pit ore now existing will be exhausted, at the present rate of production, in about seven to ten years. The Mesabi range is not an inexhaustible supply of high grade ore.

To use a comparison, which should be readily understandable to any engineer, consider the girl situation here at the "U." There are, I have been told, about 4,000 Minnesota co-eds. (As any fool can plainly see around the campus, there are quite a few.) Now of that 4,000 there are a relatively small number of queens, who, for various reasons, are eagerly sought after by veritable multitudes of young males. Also there is a much larger number of the fair-to-middlin' class, who are also sought after but not by such multitudes. (Often only one or two.) Then there is a surprisingly large percentage who are not sought after at all. (You will notice that I still adhere to the old-fashioned belief that it is the male that does the seeking after.)

This is very roughly analogous to the iron ore situation on the range. Lake Superior ore is graded as follows: class 1, or direct shipping ore, so called because it is shipped directly to the mills without any further concentration, with an iron content of 50 percent or more, further subdivided into open pit and underground ores, and of which there are reserves of about 500,000,000 tons each; class 2, with an iron content of about 40-50 percent, some of which is now being concentrated by washing and jigging (a process similar to shaking a popcorn shaker so the heavier, unpopped kernels settle to the bottom), and of which there are reserves which will yield on concentration about 160,000,000 tons of direct shipping ore, and, class 3 with an iron content of about 30 percent, not used at present at all, of which there are reserves which if concentrated would yield about 50 *billion* tons of direct shipping ore.

Class 3 ore, or taconite, as it is called, is of two kinds, magnetic, and nonmagnetic. The reserve of magnetic concentrate on the Mesabi range alone, if concentrated, would yield about 5 to 10 billion tons of direct shipping ore (what's a few billion tons among friends?), and furthermore an economically practicable method of concentration of this type ore is known, and is in use in New York state.

Besides this reserve of magnetic taconite, there is an enormous bulk of nonmagnetic taconite, and class 2 material for which no practical concentration methods are known. It may be concentrated by various complex laboratory processes, but it is not at present to be considered as an iron ore reserve.

Present demands for Lake Superior ore call for a production of 100 million tons in 1943. During 1941, the last year for which figures were available, 80 million tons of ore were shipped, an increase of about 60 million tons per year, from the 1938 figure of 19 million tons, or an expansion of 20 million tons per year, per year. Of this 1941 shipment, 59.7 million tons came from the Mesabi range, 16.1 from the Michigan-Wisconsin, 1.8 from the Vermillion, and 2.4 from the Cuyuna. Thus a rise in production of 20,000,000 tons per year must be effected in two years. Quotas must continue to rise, to reach a peak of 110 million tons per year in 1945.

Since all but a very small amount of the ore from all of the mines except those of the Mesabi and Cuyuna ranges is mined underground, a process which does not lend itself to rapid expansion, the bulk of the increase must be absorbed by the mines of the Mesabi range, the Cuyuna ore being high in manganese and phosphorus, which limits its use to a quantity short of its capacity as a producing agent. (Just read an economics book.)

The reserves of open pit direct shipping ore amount to about 357 million tons. Within a range of 10 percent plus (not minus) this figure may be accepted with certainty. To meet production schedules for 1943, 77 million tons of ore must be taken from the Mesabi range of which 55 million tons will be open pit, the remainder wash and jig concentrate and underground ore. Since only a limited amount of ore suitable for washing and jigging concentration exists, the amount of open pit ore mined yearly will have to increase, since underground mining production will remain relatively static. Therefore, unless some action is taken now the reserve will be exhausted in 1950 if the present high demand does not slacken before then.

The obvious answer to this dilemma lies in the establishment of a large-scale magnetic taconite concentration industry, to be started immediately. Such a plant was in operation at Babbitt, Minnesota, at the eastern end of the Mesabi range, about twenty years ago. It proved unable to compete with open-pit direct ore but during the three years it was in operation it produced 150,000 tons of high-grade sintered concentrate, proving that concentration of magnetic taconite on a large scale is possible. Reopening of this plant to serve experimentally as a model for the construction of more such plants, and to produce ore would seem to be indicated as a reasonable step.

Long term loans by the government would be necessary to interest private industry in such a venture, as well as jacking up the price of Lake Superior ore to parity with, if not above, that of Lake Erie ore. Scathing condemnation has sometimes been heaped upon the heads of mine operators for "skimming the cream" from the mines. When indulging in such criticism one should not overlook the fact that economic pressure now existing makes it uneconomical for

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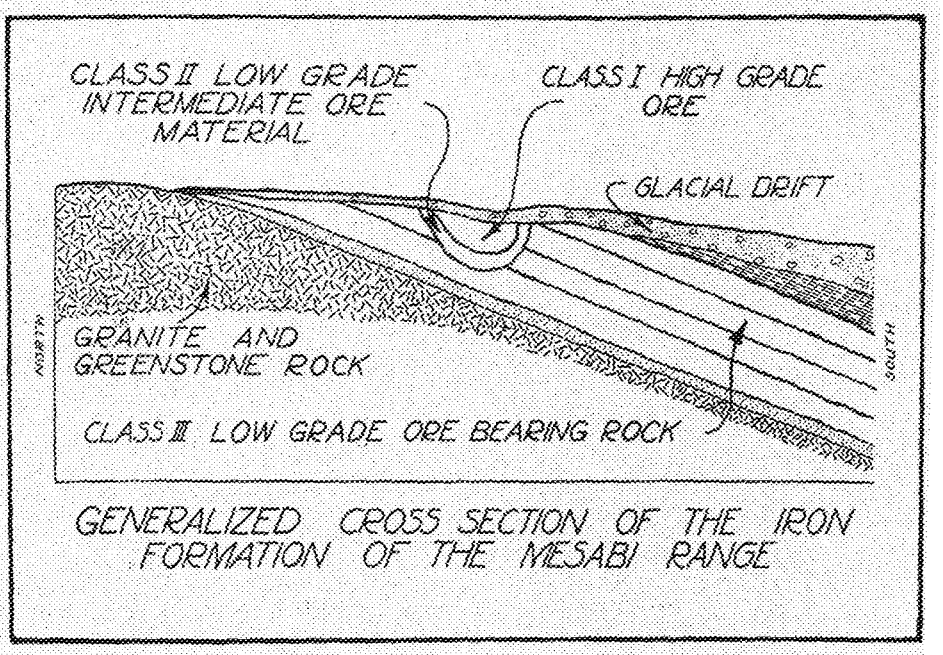


GENERALIZED CROSS SECTION OF THE IRON FORMATION OF THE MESABI RANGE

CURTISS-WRIGHT'S GIRL ENGINEERS

By Mary Jean Schaefer

THAT masculine domain—the engineering buildings—is no longer an exclusive haven for men. Brawny campus engineers are now sharing their tumbling classrooms and sacred hallways with 100 Curtiss-Wright cadettes. In the middle of February, an intensive 44-week training period began at the University for these cadettes, qualified college women coming from 22 states throughout the country, who were hired by the Curtiss-Wright Corporation to be specifically trained for important assignments in its many engineering departments. Similar programs of technical training are being offered by the engineering schools of six other colleges and universities—Iowa and Pennsylvania State Colleges, Cornell, Purdue and Texas Universities and the Rensselaer Polytechnic Institute—each giving instruction to 100 cadettes.

But—"What the hell!" you say. "Engineering is a man's field. It's no place for women. Why encourage women to take this technical training?" The answer is obvious. The source of supply of engineers has been reduced to practically nothing. Something had to be done. Curtiss-Wright, like all of the other aircraft corporations, has annually hired a large number of graduating engineers and has trained them in the performance of their engineering duties. But 65 per cent of America's engineering graduates of June, 1942, went directly into active service. And figures show that 85 per cent of the present undergraduate engineers are in the enlisted reserves, leaving only 15 per cent for industry. Of the 12,000 engineers graduating each year, that means 1,800 technically trained men left for industry. The Curtiss-Wright Corporation alone needs 1,000 men annually. Something had to be done and Curtiss-Wright, through its cadette training program, is doing it!

To be eligible for this training, coeds were required to have completed *successfully* elementary college mathematics and to be in at least their sophomore year of college. Many of the cadettes were majoring in mathematics when they heard about the Curtiss-Wright course. Interviews were conducted by representatives of Curtiss-Wright at women's colleges and co-educational institutions throughout the country and final selections were based on the coed's scholastic record, the school's recommendation as to character, and the coed's interest in the type of work or desire to do something active toward helping win this war.

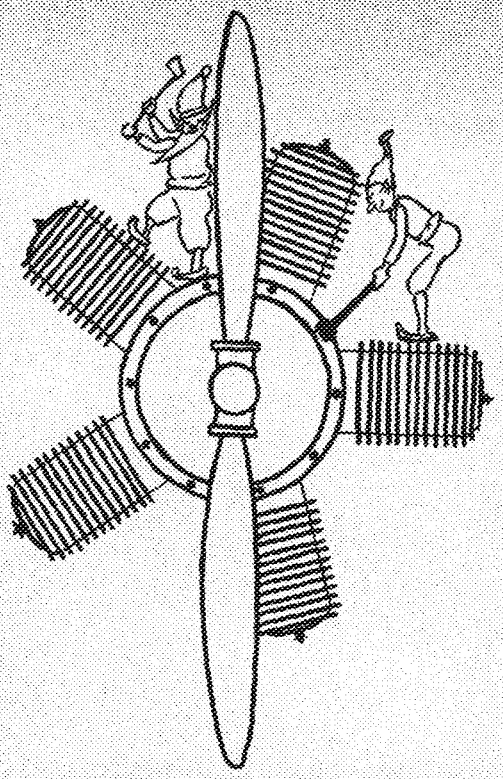
The cadettes are enrolled here as special students and are eligible for all the benefits available to regular students—medical care, recreational facilities, athletic activities, clubs and social events—but their heavy schedules, for the most part, rule out lounging at the Union and stomping at the twilights. They're in classes from 8:30 a.m. to 5:30 p.m. Monday through Friday and have Saturday classes till 12:30 p.m. Thirty-two hours of classwork, lab and shop work plus eight hours of supervised study doesn't leave much time for daytime extracurricular activities, as is true of any other job.

For the first 22 weeks of their training, the cadettes are taking courses in engineering mathematics, job terminology and specifications, elementary engineering mechanics and properties and processing of aircraft materials. Many of their classes are very similar to specific advanced training courses taken by engineering juniors and seniors. They'll go on with engineering mathematics in the second part of their training but their other courses will change. Instead they'll be studying the theory of flight, aircraft drawing and design, the strength of materials, aircraft structural analysis and aircraft materials and testing. After successfully completing their intensified courses, the cadettes will be assigned to Curtiss-Wright plants and to engineering jobs according to their qualifications and interest. Their salaries, depending upon the type of work they do, will range from $130 to $150 a month, based on a forty-hour week.

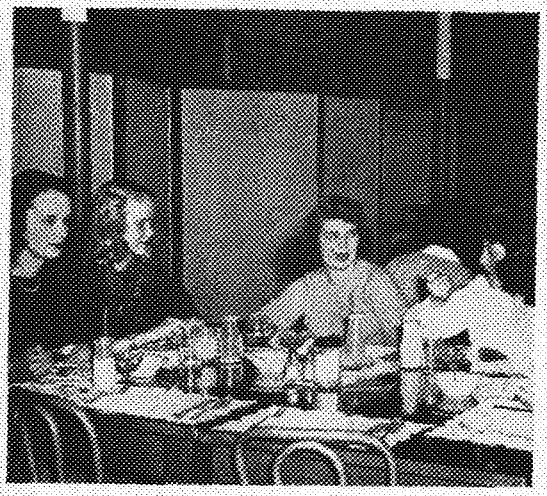
How will the cadettes stand in relationship to graduate engineers? Well, it's obvious that a year's training cannot substitute for the four-year engineering education previously required for a job in industry. It will suffice, however, in developing a large number of young women who can be expected to fill some of the first-job assignments so that the graduate engineers now in those positions can be promoted into more technical duties where they are so desperately needed, thereby providing greater utilization of total engineering personnel.

And after the war, when there will be plenty of engineers for those aircraft jobs, what part will women play in aviation then? This program to use women for engineering positions is primarily for the duration, but aviation is facing a new post-war era of expansion and service. When that time comes, women and men alike will be evaluated upon individual performance and capabilities.

Many of these cadettes plan to go back to college to complete work for their degrees after the war. Many will marry. Others hope they will be able to continue in the engineering field. But until that time comes—well, this is a women's war too, and by being Curtiss-Wright cadettes these coeds are doing their part for Victory.

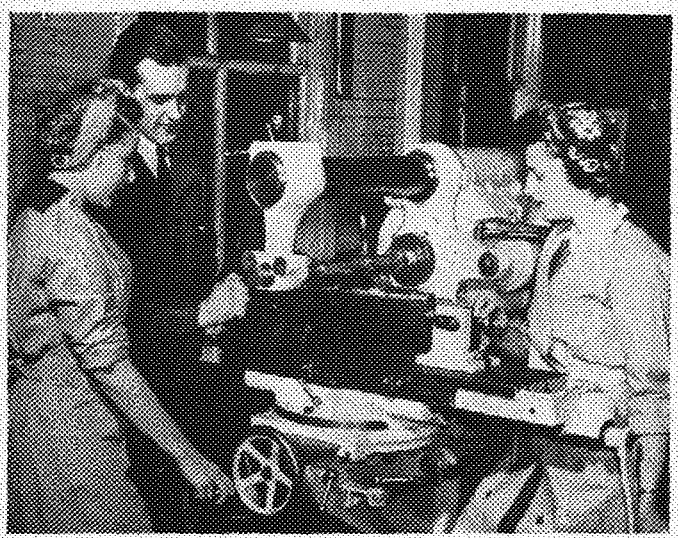


A Day With The CURTISS-U

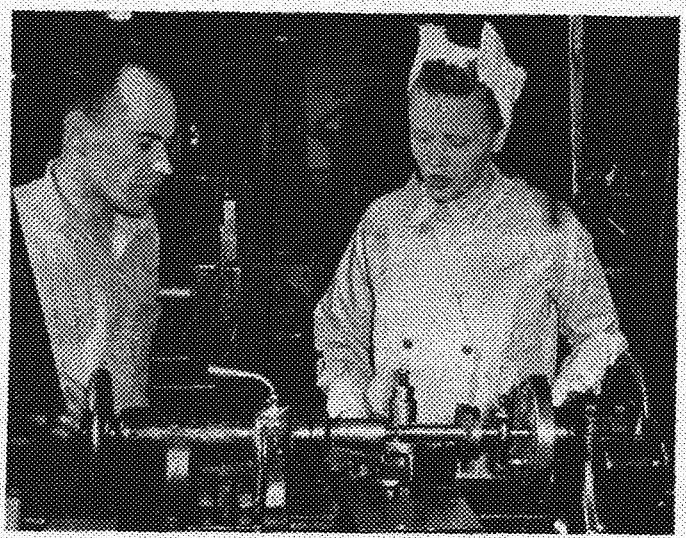


● The girls eat all their meals in the Shevlin cafeteria. Left to right are Eileen Gilmore, Barbara Sanford, Jane Hoolfstetter, and Mary Crawford.

● The cadettes live in Shevlin Hall which has been converted to a dormitory. The girls live under dormitory regulations: they must be in by 12:00 p.m. on week nights, while 2:00 a.m. is the deadline on Friday and Saturday nights.



● Here Bill Schwarz, laboratory instructor, explains the many intricacies of a milling machine to two of the cadettes, Frances Baca and Virginia Havens. One of the first projects on the milling machine for the cadettes is the cutting of a gear.



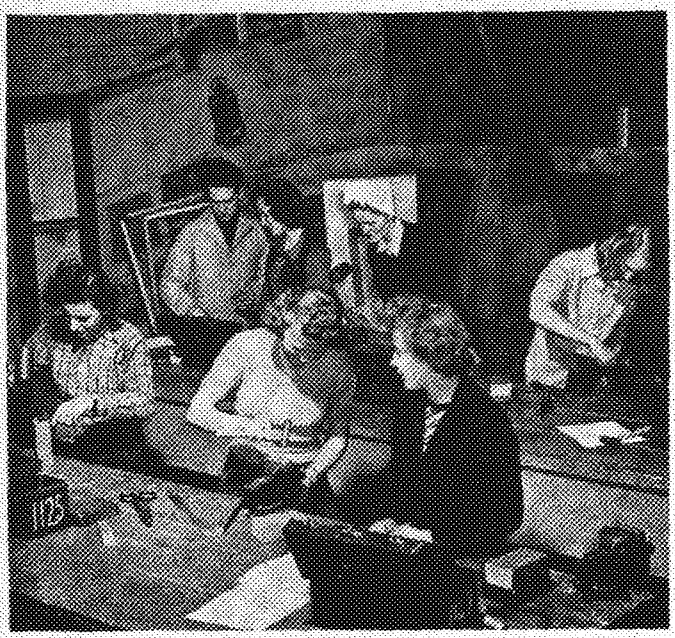
● Mary Anne Hamilton seems to be very intent on the threaded shaft she is turning. Shop courses are not intended to make expert machinists of the girls, but rather to give them an insight on what can be done on the machines.

GHT CADETTES

● Believing in the old adage that says one picture is worth 10,000 words—especially where pretty girls are to be described—the TECHNOLOG devotes these pages to the Curtiss-Wright Cadettes at the U. of M.

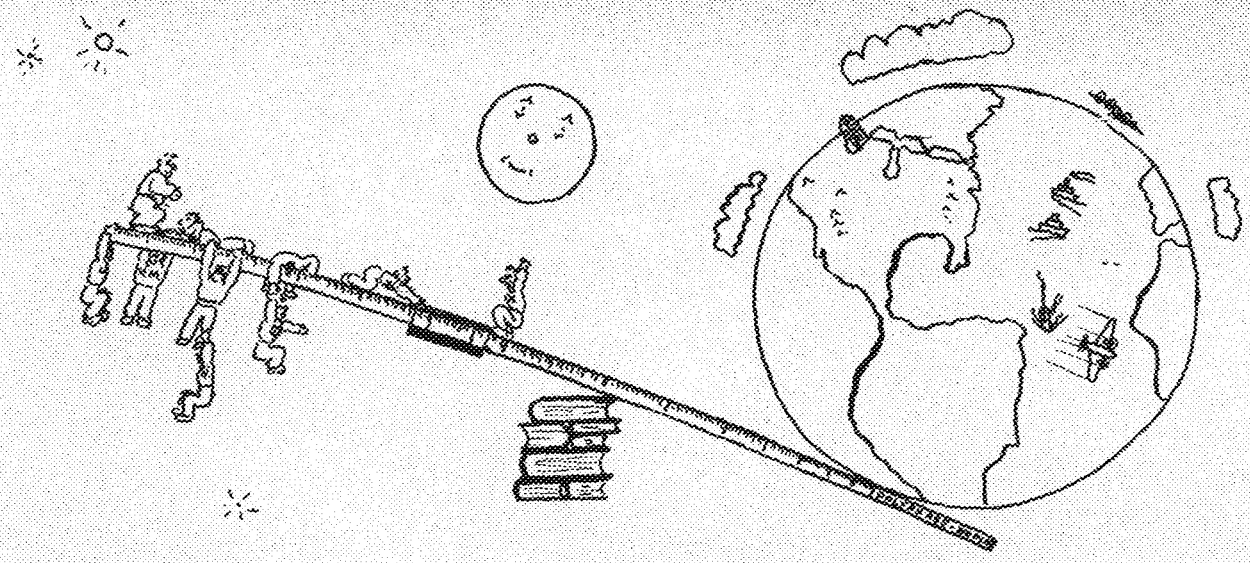
● Drafting may be one of the first jobs the cadettes will tackle upon completing their training. For this reason several hours a week are spent in drawing labs. Glenna Willingham watches while Mrs. Shirley Landwehr practices some lettering.

● In order to become familiar with an airplane's structure, these girls have started labeling the parts of a model plane. Shown in the picture above are, left to right, Pat Marker, Peg Smith, Nelda Smith, Mary Comer, and Jean Kneeland.



● By making simple projects of dural, they become familiar with the working properties of this aircraft material. Left to right are Harriet Talmage, Lelaroy Williams, Lois Stender, Instructor Wayne Hay, Glenna Willingham, Jean Mandt, Barbara Sanford.

● In the enginering mathematics classes the girls are introduced to the most ancient and honorable rite of engineering —that of slipstick pushing. Professor Turrittin of the mathematics and mechanics department explains while his class listens.



IDEAS OFFER A BETTER WORLD

The role that the engineer will play in the world to come will depend upon the engineer's ideas

BY KENNETH SEELEY
INSTRUCTOR OF ENGLISH

IF Archimedes expressed the engineer's technological ideal when he said, "Give me whereon I may set my foot, and I will move the world," he expressed also the ideal of the engineer in society; for in human relations there is a fulcrum for leverage and that fulcrum is an idea.

That the engineer will actually play a large part in the present and coming world is a probability bolstered not only by the shifting of education into high gear to produce technically trained men but by the prevalence of the idea. "Our peace will be written by engineers," is a cliché.

One world

If ideas are the key, the engineer may ask: Why? What ideas? The answer is that first, a global world is new—eighty-six books of new ideas have just appeared or are about to appear on the postwar world. "In such times," as a librarian puts it, "books grow mighty, and mighty books are born." That second, the world is small ("five hundred times smaller than in Columbus' time—no point is more than sixty hours away"). And that third, ideas are decisive in peace as well as in war.

What role the engineer, the fabricator of a culture, will play in a world of societies desperately struggling to adjust themselves to global technological, social, and human conditions will depend upon the engineer's ideas. For not birth, not money, not technical knowledge alone, but the nature of the engineer's technological, social, and human ideas will determine his contribution to his problems in a new—and small—world.

Ideas are weapons

If it is no longer necessary to argue with Max Lerner that *Ideas Are Weapons*, and, in the full contrast of Rostov with Soerbaja and Singapore, that "only men themselves on fire can scorch the earth," one can ask for fuel for the fire and tools for the process. Reading, the preeminent means for the communication of ideas, has something to contribute to the engineer who, in this war to organize and operate a new and small world, would grasp human as well as engineering factors in global terms.

Willy-nilly, we all live in a climate of opinion. We see movies, or listen to the radio, or read books; and if we read books we may read books of value for a new world. If an engineer is a freshman or takes a later course in English, he can select books which implement his insight into the postwar world. In fact representative titles chosen from student reading reports, like Sigrid Undset's *Happy Times in Norway*, W. L. White's *They Were Expendable*, Quentin Reynolds' *London Diary*, De Seversky's *Victory Through Air Power*, Simmons' *Air Piloting*, George R. Stewart's *Storm*, Gunther's *Inside Latin America*, and Ernest Hemingway's *For Whom the Bell Tolls* show that some of the "frosh" already are selecting them.

But all this leaves the armed forces out of the picture—or does it? "In the army," reports the March 20 *Saturday Review of Literature*, "reading is the second most popular activity in off hours." In camp, according to earlier library reports, Nobel-prize winning Pearl Buck's *The Good Earth* was a popular book, just as, by recent studies, it was the most popular college novel. In army camps, most-asked-for novel was *For Whom the Bell Tolls*.

The best in print

Hints of the ideas the engineer needs lie all about him—in the very atmosphere of society, on the radio, on the screen, in social intercourse; but at the root, and more freely and fully expressed than anywhere else, in hundreds of books of many kinds that may be read according to ability and taste. And this not in recent books only, a proliferant foreground now beginning to burst into being, but in background works, the tradition of a whole world, which gives

this foreground point and stability and direction. What is wanted is, according to library experience, "not a lot of books, but the number one books, the best in print."

Eye witness action

Books representing foreground interests divide into three unequal phases: (1) The war, in its origin at least, a fight against enslavement, (2) Latin-America, (3) Postwar problems. The place to lay instant hands on informational treatments of these topics is in the excellent War Information Room on the first floor of the University Library. An extraordinarily interesting monthly critical list compiled by Helen P. Mudgett of the history department and others is at hand; it is obtainable—also free—from Mrs. Stein, 410 Administration Building. This list covers books of human experience and also informational works.

Though everyone has his favorite works on the war among (1) the foreign correspondents, like eagle-eyed William Shirer's famous *Berlin Diary* (1934-41) or Vincent Sheean, or Leland Stowe (*No Other Road to Freedom*); or (2) fictional lives like Steinbeck's *Moon Is Down* or Phyllis Bottom's *Mortal Storm;* or (3) refugee experiences like Dirck Van der Heide's *My Sister and I*, his interest is apt to be seized by a later and strictly U. S. type of book, such as Lt. Col. Robert Griffin's *School of the Citizen Soldier; The Exchange Ship* of Max Hill, whose experiences are eye-witness, last-minute, right from the land of the Jap, or the day-by-day, minute-by-minute ACTION in Richard Tregaskis' *Guadalcanal Diary*. There are, of course, a host of factual books on the European and every other phase of conflict. Best military book for the layman is Max Werner's, *The Great Offensive, the Strategy of Coalition Warfare*.

A continent's "feel"

Scores of factual or idea-books now furnish a background for hemisphere solidarity. But more imaginative books are required to grasp what geographers call "the feel of a continent." The two best in a narrow field of choice to yield the engineer something of this feeling are Thornton Wilder's beautiful and moving *The Bridge of San Luis Rey*, and Thomas Ybarra's hilarious autobiography of Venezuelan-American contrasts, *Young Man of Caracas*.

At the present moment, publishing interest in the postwar world, which stepped up its tempo with Wallace's speeches and Willkie's trip, reaches an intensity heretofore unknown. Eighty-six titles grace page eight of the *Saturday Review of Literature's* special number on this subject. Everybody's doing it! For those who wish historical background, it may be found in F. Lee Benn's *European History since 1870*, Second Edition, 1941, and in the U. S. War Department's *Background of Our War*, 1942. Psychological background of human experience may be found, for Germany, in Anne Seghers' *Seventh Cross* and in the great last chapters of Thomas Wolfe's *You Can't Go Home Again*, and for Japan in Pearl Buck's excellent *The Patriot* and in Max Hill's *Exchange Ship*. Among best recent books on postwar problems are Robert Strasz-Hupé's *Geopolitics, the Struggle for Space and Power*, called a "must" book by Mrs. Mudgett; Herbert Agar's *A Time for Greatness;* Hiram Motherwell's *The Peace We Fight For*, just out; Raoul de Roussy de Sales' *Making of Tomorrow;* James Reston's *Prelude to Victory* (25 cents); Norman Cousins' *The Good Inheritance;* Shridharani's *Warning to the West;* and in a foreboding novel, Arthur Koestler's *Darkness at Noon*.

For the only real background for this new world, the one which represents the tradition of our whole culture, one must go to books like *The Golden Thread*, or Mortimer Adler's *How to Read a Book*, or Osgood's *The Voice of England*, or to standard book lists like the one familiar to all engineering freshman called *Good Reading*. Here one can offer only the merest hint of works which touch on needs, more or less sharply felt, in a new world. A sense of values, the life of the soldier, the American spirit, free world ideas might represent some of these.

What men die for

A sense of values means nothing more than the statement in a freshman theme: "Each man must have something to hold on to." It may be illustrated by a quotation from Anne Seghers' *Seventh Cross:*

> Every man who is faced with the possibility of a calamity inevitably plants himself upon the bedrock of his individual character. For one man this may be an idea; for another, his faith; for a third it may be love of family. Some there are who have no such bedrock, who find themselves standing on quicksand. The whole outer life, with all its terrors, may avalanche upon them, burying them inexorably.

Great plays, from Shaw's *Androcles and the Lion* and *St. Joan* to Shakespeare's *Romeo and Juliet* and *Hamlet* and those of the famous Greeks are peculiarly apt, since in Stevenson's words the drama exists on moral grounds, to answer such an interest. No one who has passed through the muddy confusion of the water of pacifism and Christianity in the thirties can miss the significance of action by both the little tailor Androcles and the muscular Christian Ferrovius in Shaw's farce, for example. More specific souls may prefer the recent biography of or selections from the great Justice, Oliver Wendell Holmes.

If, with chuckles, one thinks of the recent H. I. Phillips' *Private Papers of Private Purkey* and *See Here, Private Hargrove*, under the life of the soldier, there are greater experiences in the verse and short stories of Kipling, Shaw's *Arms and the Man*, Lawrence's *Revolt in the Desert* or *Seven Pillars of Wisdom*, Tolstoy's *War and Peace*, and in Rupert Brooke and other poets of World War I.

It is the irony of our age that one of the answers to seeking a purpose in life is the counterpoint, inescapable if we serve the spirit we are pledged to serve: What Men Die For. What American life can mean to a man faced with its ultimate possibility is expressed in the popular arts—the arts of the people of America—and in stray bits and bars and lines and images of more formal tradition which have been made the people's own by being taken into their hearts.

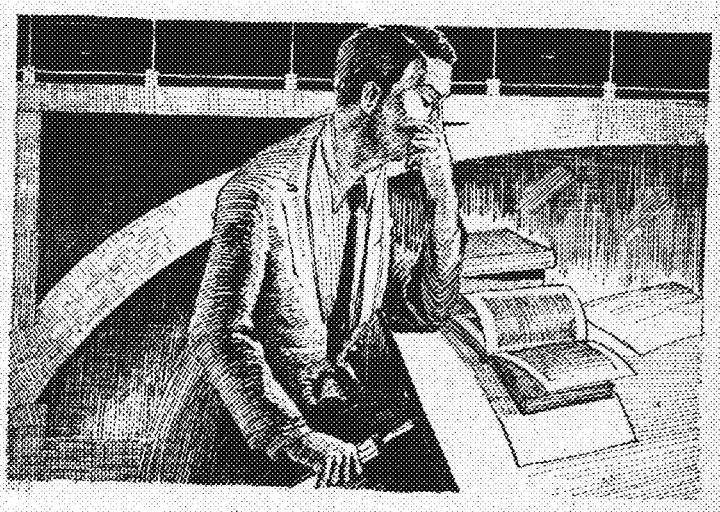
Ideas will win

The American spirit is in the lilting step and swinging tempo of *Turkey in the Straw, Turkey in the Hay*, in the children of *Old Man River;* inextricably mixed up with the stuff of the American continent in Ferd Grafé's and Mark Twain's Mississippi Suites—*Tom, Huck, Life on the Mississippi;* in the unashamed homesickness of John Howard Payne's song from *Clari, Home Sweet Home*, of *My Pretty Quadroon* or *Suwanee River*, in the American speech of a Will Rogers, a Ring Lardner, and in the words and phrases of the irrepressible unknowns in Mencken's *American Language*.

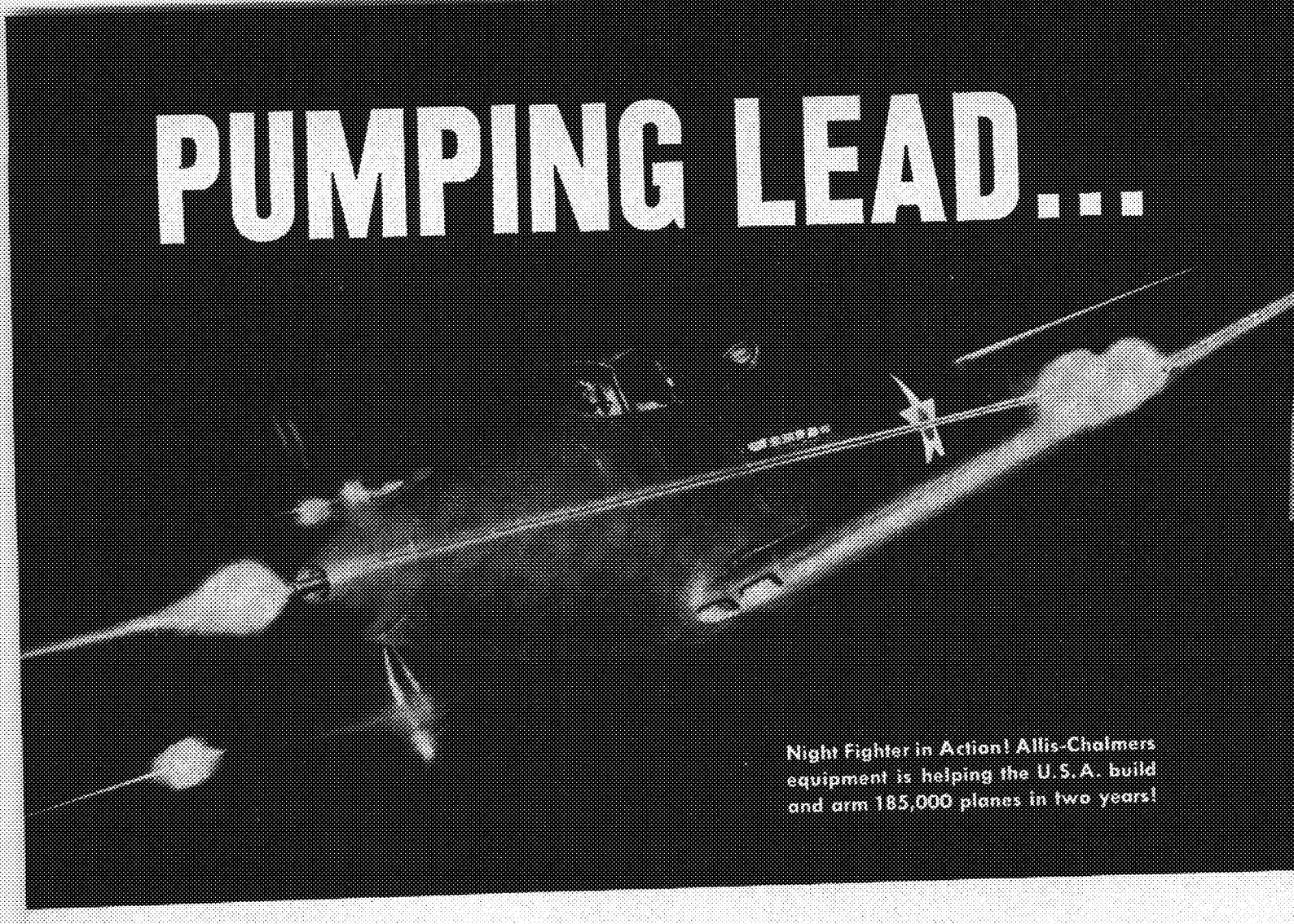
When one thinks of free-world ideas in recent books, President Conant of Harvard's *Our Fighting Faith*, H. M. Tomlinson's *The Wind Is Rising*, and Franz Alexander's *Our Age of Unreason* seem to be among the best. One thinks also of lives and ideas in the poems of Robert Burns and in Gray's *Elegy Written in a Country Churchyard*, of the great phrases in Milton's *Areopagitica* and in the voice of the enslaved represented in Markham's *The Man with the Hoe*.

True, these titles are merely indicative. But they indicate that there is an "answer behind the answer." And in times when such answers "had better be good," ideas are not only weapons, they are also plowshares, dynamos, the health of the family, of society. Peace as well as war is won on the psychological front.

The role of the engineer in the new—and small—world, as well as something of the shape of that world, will depend upon the engineer's reading and ideas.



PUMPING LEAD...



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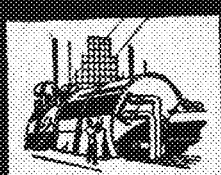

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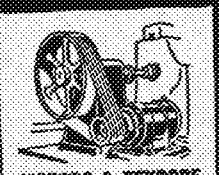
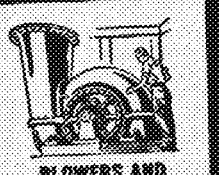
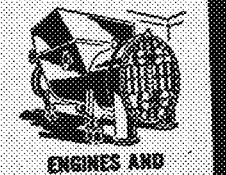


MOTORS & TEXROPE V-BELT DRIVES

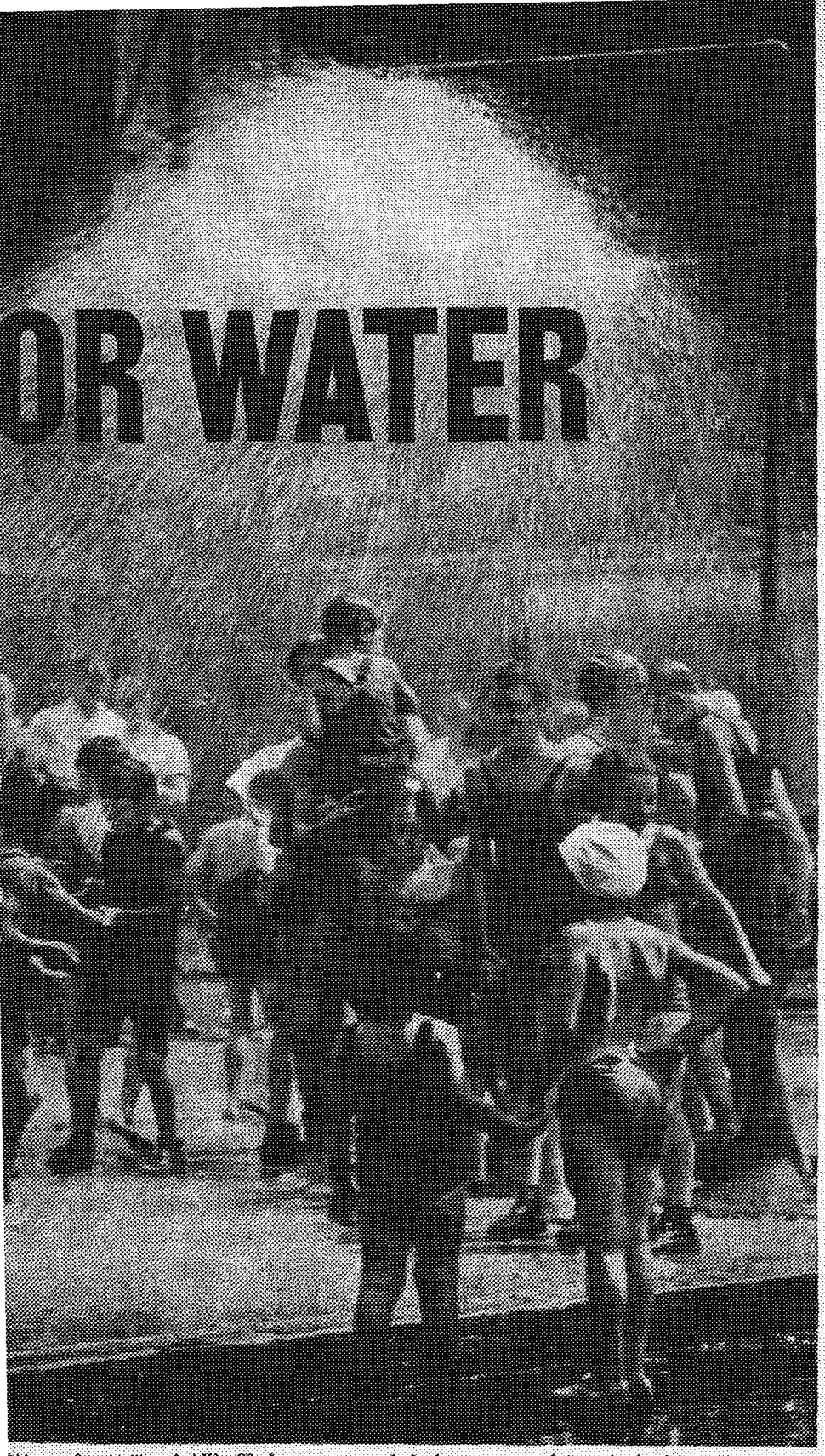


BLOWERS AND COMPRESSORS



ENGINES AND CONDENSERS

CENTRIFU PUMP

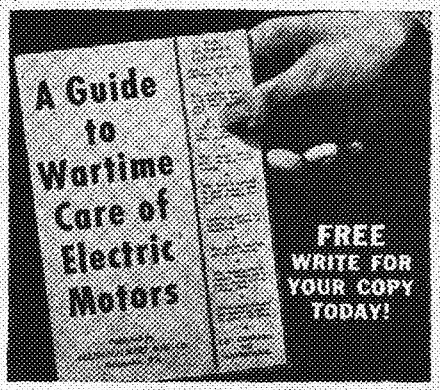


Water for Millions! Allis-Chalmers pumps help keep many of America's cities alive.

VICTORY NEWS

A New Fleet of Tugs is being built for the U. S. Navy. Their principle duty is long towing of disabled vessels in rough seas.

The most powerful of their kind in the world, most of the tugs will be driven by Allis-Chalmers electrical propulsion equipment. Their electrical equipment includes Allis-Chalmers motors, generators and control.



New Handbook on Care of Motors. With motors operating 168 hours a week instead of 40 hours as formerly, most books on motor care are seriously out-of-date.

A new handbook entitled "A Guide to Wartime Care of Electric Motors" has just been published by Allis-Chalmers. It takes a new slant at motor care and is of great value to war plant engineers and maintenance men, and particularly for training new men. *The book contains no advertising, and is available upon request.*

Rush A-C Tractors to World Battlefields. Thousands of gun-pulling Allis-Chalmers track-type tractors will soon see action in Russian and U.S. Forces overseas. These tractors differ from Allis-Chalmers regular commercial models only in additional equipment carried. The army version of this tractor is also speeded up somewhat over the commercial model.

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THIS WAS COLLEGE

By Roderick Wm. Siler

Back in 1900 college men had a lot of faith in the Greeks

WE OLDER men, when asked to tell of our college days as students, like to unwind to the effect that it was a marvelous world, and that the inhabitants thereof were of a species never since seen on the face of the earth. Yet each generation of students, making allowances for graybeard boasting, is to some extent interested in the generations of students preceding it. How those antiques ate, slept, dressed, danced, managed to pay tuition fees, and incidentally justified their existence for four years on a campus, is always diverting.

But the fact is that the great difficulty in describing the former life in college, if it preceded, say, 1910, is that it was, when closely inspected, so different from the present as to appear unbelievable. I do not mean that in superficial features it differed so greatly. True, a college town then was not, as a rule, remarkable for bustle. There were probably more trees and grass in sight. Also more mud. It was easier to distinguish the sex of students; even at a distance a female could be recognized by her skirt and long hair, and by the fact she was not smoking. There were more starched collars on students, more beards on professors. Yet even that last was but a superficial difference.

The real differences lie deeper, and are not at once visible to the naked eye. They are differences due to the attitude towards life and the future. That of thirty years and more ago was very much an age of certainty, and therefore of assurance. Whatever happened to individuals, men of that time felt sure that humanity was on the right track and would prosper. The truth is that in 1900 men in the world and in college were in much the same frame of mind as they had been since the days when the pyramids of Egypt were being built. They felt they were on their way. On their way to conquest and domination of the earth.

But in all this time, so busy were they in making the journey, that they considered very little what they would do when they reached their objective. At the end of the war of 1914-18 they began to realize they had arrived. Men had the earth to themselves. Nature was conquered—apparently. Thus I would say that the last thirty years stand apart in history from the thousands of years preceding them. Past generations of men and students have placed the world in the laps of the present, and then more or less gracefully passed off the scene before their successors had discovered they were nursing a bomb.

Having come up against an entirely new condition in the world, men now seemed inclined to cut away from the past in meeting it. Even as late as the century preceding this there was evident an effort to keep in touch with that past. For instance, there was then a good deal heard about an ancient civilization known as the Greek. The schools were still inclined to take the view that the Greeks were a pretty wise and competent lot, that their ideas were worth repeating, and that students should have some contact with them, even to the extent of taking courses in the Greek language. One wonders, therefore, what the schoolmen of Greece, presented with the present condition of the world as a theoretical situation to unravel, would have done with it.

I am inclined to think that the Greeks, asked if the building of a more satisfactory world depended simply on greater advances in science and technology, would have replied "Phooey!" In Greek, of course. Arguments to the effect that men would be as lambs when all had their bellies full, when they had gained more knowledge of the physical world, when they had found the missing links in their descent from the apes, would probably have left the Greeks cold. The Greeks would probably have insisted that the great incentive to violence on earth is not hunger for food, not hunger for knowledge, but hunger for power, desire to control the thinking as well as actions of other men. Technology, they might have insisted, is primarily but a potent instrument in this effort.

What, then, would the ancients have offered as a solution? I am inclined to think it might have run something like this:

As we are human beings, so we are individuals. As we are conscious of our existence and destiny as individuals, so we are beings apart from all other forms of life, including our cousins the monkeys. As we are such creatures, the great and proper object of each of us is the development of the mind. And if a mind is to develop and be free, so each must recognize that no mind is free which denies similar freedom to other minds, since the mind has the peculiar characteristic that it thrives on competition, and decays without it. All this, those ancient schoolmen might have insisted, constitutes the supreme justification of education, and indeed the only sound reason for it. And, they would have concluded, when and if such education became universal, when all men recognized the common predicament and possibilities of men on earth, then men would cease their bullying and abuse of each other.

I give the preceding for what it is worth. I admit that in a way it does seem ridiculous for us of 1943 to be looking back to the years B.C. for a cure for our difficulties. The ancient Greeks were so appallingly ignorant concerning some things. They even seem to have believed that the sun sailed round the earth. Still, they produced some pretty fair men. Plato, Aristotle, Socrates—there is quite a list of them. I suppose those fellows, realizing how little they knew about the sun, spent the more time in trying to find out something about themselves. And for a good many years after they were gone their theories and attitudes towards life tremendously influenced the schools.

Probably it was in suffering from this influence that Grandpa's campus differed most from the present one. Grandpa, looking back at the past, might have insisted that ancient wisdom rather than modern knowledge is the key to the future.

Editorial Comment

AS WE SEE IT

In the Spring

In the spring an engineer's fancy lightly turns to thoughts of the annual spring picnic—among other things, that is. In the past it has been the custom of the professional societies of each department to sponsor a picnic for the students and faculty of their department; the students and faculty of the department got together for an outing which featured food, baseball, games, and a general good time for all.

This year it has been suggested that a combined outing be held with all of the departments in the Institute of Technology taking part. Such a picnic would be jointly sponsored by the societies and the Tech Commission.

Facilities for such a picnic are available in the Twin Cities within a short distance of the University. The program for the picnic could include an inter-departmental diamondball tourney, touchball, tug of war, tennis, golf, and other popular sports, including eating.

It would be possible to bring the girl friend if you like, and we think it would be a fine idea to invite the Curtiss-Wright Cadettes. This would be a chance to get together with all of the rest of the engineers in the school for a good time.

How about it, boys? If you think the idea is good, talk to your Tech Commission representative and give him your ideas. After all, it'll be your picnic.

The Vulgarity of Engineers

Many people believe engineering to be a less noble profession than such professions as, say, law or so-called "pure science." Surely engineers are doing more good work for humanity than many of these higher professions, so what could be the explanation for this "low" classification?

The idea has become firmly fixed in the minds of men that anyone that gets his hands dirty working is inferior to that man who appears to be unencumbered with any such degrading task.

The farther a man's occupation is from ordinary life, the more elevated he is taken to be. Conversely, the more a man is concerned with the details of every-day life, the more he loses face in our eyes. Careful analysis will also show that the farther a man gets from the ordinary details of life, even though he be quite learned, the less is the chance that he will contribute anything of concrete value to society.

It may be seen that this all boils down to the strange tenet of society that the more useless the occupation in which a man succeeds, the more the man is to be admired.

We must recognize a new scale of values. We must rate men as to which of them is adding the most to the lot of mankind. On this new scale the mere dreamer and intellectual fiddler will descend; the engineer will rise among the highest, the place where he rightfully belongs.

Eliminate the Bull

One of the most important things with which an engineer is concerned is the preparation of reports. In order to be of value, they must contain all the information required for a qualified person to understand what has been done. The engineering student must learn how to prepare a good report, and this phase of his education is stressed throughout his college career.

We have found, in discussing this subject, that a number of students agree that the present method could be greatly improved by reducing the unimportant repetitive clerical labor involved, particularly in preparing reports in collateral courses. They have suggested that it would be to the advantage of both students and staff to abridge these reports by eliminating purely mechanical details and permitting the presentation of condensed reports, and instead of requiring copies of tabular data, accepting original laboratory data sheets.

To illustrate, an electrical engineering student pursuing, in addition to his major laboratory work, two minor report courses, such as strength lab and heat engines, as a general rule must prepare about three reports each week; each of them demands from two to four hours' preparation, which aggregates perhaps eight to ten hours each week.

It is the concensus of numerous students that it would conserve much time if their suggestions were acceptable—if less time were required for reports in collateral subjects, it would allow more time for their major courses.

Insignia for Students

Minnesota colleges and universities may avert a morale problem among civilian male students by adopting a plan being worked out by the Case School of Applied Science at Cleveland.

President William E. Wickenden of the Case school notes that engineering students, draft-deferred because they are training for highly technical and most essential war jobs, feel conspicuous because of their civilian clothing when other men of their ages are burgeoning in uniforms all about them.

Wickenden's solution is a special insignia to be worn by the civilian engineering student at his school—something to show that, far from being a dodger, the wearer is preparing for critical occupations.

It is not enough to say that the public should know that any young man not in uniform is probably being deferred for good reason. If, in only a few cases, the distribution of such insignia to deferred students would lift their morale and enable them to tackle their studies with minds less troubled by the memory of questioning glances, the plan would be worth while.—*Minneapolis Times.*

TECH NEWS

EDITED BY BOB GIANTVALLEY, E.E. '44

WLB Loses Men

When the Enlisted Reserve reported for duty on April 9 out at Fort Snelling, the University radio station, WLB, lost some experienced engineers. Ron Schmidt and Don Smith took turns "riding gain" in the main control room in Eddy Hall for the last time as Burt Halmberg, chief engineer, tried to contact some new men.

The Federal Communication Commission requires that operation of the transmitter must be under the care of a licensed operator, and because so many of them have left for service with the armed forces it has become increasingly difficult for WLB to remain on the air. Electrical engineering students are the main supply of such operators but since so many of them who had licenses were in the ROTC and the Enlisted Reserve, few are left who are qualified to fill the vacant positions. Control room duties such as "riding gain" or in other words regulating the volume do not require the skill of a licensed operator, so several girls have been broken in to alleviate the manpower shortage. However, more licensed operators are needed to ease the burden on the few who are left so that they will have time for their studies.

WCAL, located at Northfield and operated by St. Olaf College, is assigned to the same frequency as WLB so the two stations share broadcasting time. Since WLB has found it more difficult to operate WCAL has taken over more on-the-air time and thereby eased the situation somewhat.

Aero's Stag a Great Success

The Institute of Aeronautical Sciences had a rip-roaring stag at the University Club on March 17. From all reports there were five instructors and about 40 students present. It is rumored that one instructor borrowed some money and proceeded to hit the jack pot on a slot machine. Also there was said to be some very smooth harmonizing which would have made the EE basement quartet green with envy.

Placement Bureau Has Good Record

The Placement Service can boast of practically 100 percent placement of seniors in the March graduating class and almost the same for the June class. All the graduate seniors were offered positions but some turned them down to go into the armed forces. Since all of these men have not been called or sworn in, an accurate count could not be obtained.

Interviews for seniors who will graduate in December of this year are planned to start summer quarter when representatives of different companies will come to the university.

ASME Members Enter Contest

The Minnesota student section of the ASME sent Lin Power and Bill Boyum down to Evanston with expenses paid for the national student prize paper contest held April 12-13. Lin Power talked on "Supercharged Diesels" and in case he should suddenly have become incapacitated Bill was ready to fill in as alternate with a discussion on "Gas Turbines." There are to be cash awards for the winners who have not been announced yet.

Both of the boys are outstanding in the ME department and know their subjects well. Lin will graduate this coming June with the class of '43 while Bill is finishing up with the class of '44.

Neophytes Take Society Offices

The ASME and AIEE had their elections and now at their respective heads are Bob Mueller and Buck Carter. Among the other officers of the ASME are Kurzeka, Gruditz, and Atwood; and in the AIEE are Kline and Proszek. Both organizations are looking forward to picnic time and are planning to make away with as much refreshments as possible.

All the societies are making plans for participation in the intramural diamondball contest as has been evidenced by the appearance of softballs during fifth hour.

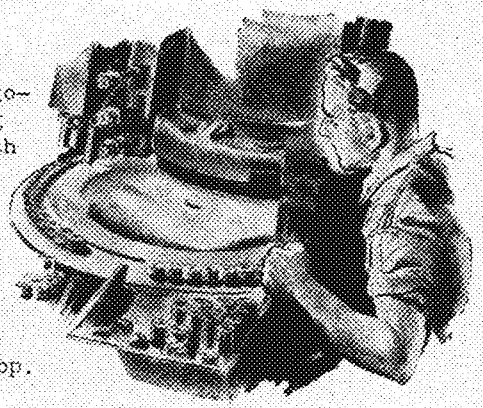
The Tech Commission also recently elected new officers for the coming year. Miles Olson is the new president.

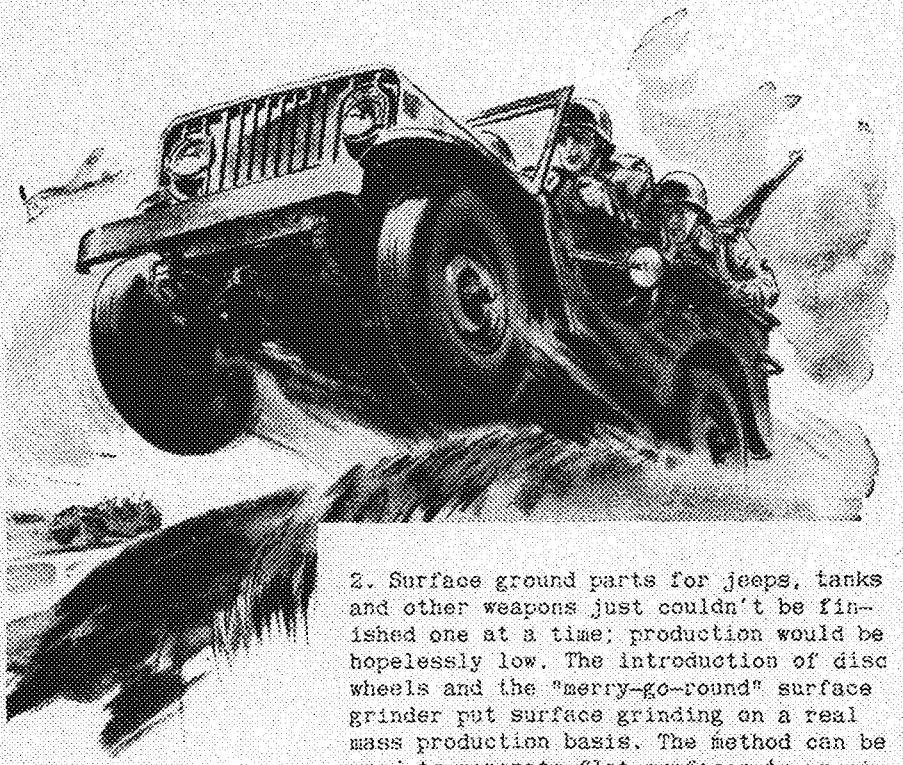
ME Building Has Face Lifted

The mechanical engineering department is having its face lifted. In order to take care of the expanding work carried on in the ME building remodeling of the office for more efficient use of space was necessary. It won't be long until the work is completed and the office is ready for business.

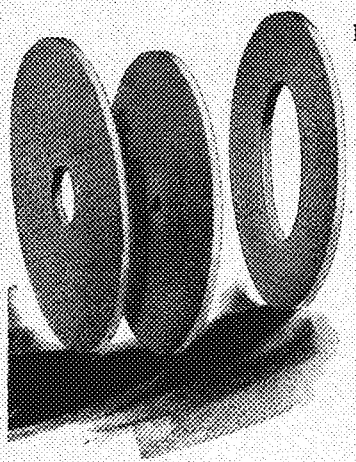
This Merry-go-round has gone to war!

1. It takes a lot of parts to make a Jeep. And this "merry-go-round" has the job of grinding some of those parts (those with flat surfaces)...in a hurry! By rotating a large number of pieces beneath a Carborundum made disc wheel, it surface grinds them in a fraction of the time required by older methods. This process is one which Carborundum helped develop.





2. Surface ground parts for jeeps, tanks and other weapons just couldn't be finished one at a time; production would be hopelessly low. The introduction of disc wheels and the "merry-go-round" surface grinder put surface grinding on a real mass production basis. The method can be used to generate flat surfaces to precision tolerances, on smallest pieces or on massive forgings and castings. It speeds production of many vital war items from valve springs to connecting rods, from piston rings to clutch plates!



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Where they're Working-

WINTER GRADS

The Alum Notes page departs from its usual form this issue in order to tell you where our graduates of this winter are located.

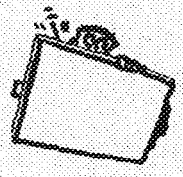
AEROS

Bevier, Joe H., Mpls., Naval Ensign
Champine, Robert, Mpls., Naval Ensign
Chase, Thomas, Warroad, Naval Ensign
Fleming, Robert, Mpls., Air Corps (Eng.)
Fraser, Everett, Mpls., Naval Ensign
Hanson, Walter, St. Paul, Coast Artillery
Hansen, Warren, Mpls., Coast Artillery
Holdahl, Robert, Roseau, Minn., Bell Aircraft
Johnson, Richard A., St. Paul, Coast Artillery
Keller, Tom, St. Paul, National Advisory Committee on Aeronautics
William Kepple, Albert Lea, Minn., National Advisory Committee on Aeronautics
Larson, Donald C., Coleraine, Minn., General Motors
Livingston, Robert, Mound, Minn., Pan American
Martenson, Carroll, Maynard, Minn., Naval Ensign
Mellir, Malcolm, Mpls., Coast Artillery
Miller, Curtis, Redwood Falls, Minn., Douglas Aircraft
Mitchell, Klein, Rochester, Minn, Pan American
Oestreich, Robert, Coleraine, Minn., Pan American
Ogren, Heimer, Duluth, Minn., Boeing Aircraft
Pengal, Joseph, Ely, Minn., National Advisory Committee on Aeronautics
Rasmussen, Leonard I., St. Paul, Naval Ensign
Ringius, Wesley, St. Paul, Naval Ensign
Saari, Martin, Keewatin, Minn., National Advisory Committee on Aeronautics
Schei, Donald, Mpls., Naval Ensign
Smerda, Jerry, Chicago, Ill., Bell Aircraft
Sorenson, Joseph, Mpls., N. W. Airlines
Stewart, Robert, Mpls., Coast Artillery
Bohdan, Wandzura, Mpls., N. A. Aviation
Wild, Clarence, Mpls., Bell Aircraft
Wilson, Vernon, Mpls., N. A. Aviation
Zwar, Frederic, St. Paul, Air Corps (Eng.)

AGGIES

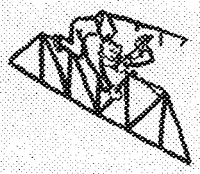
Anderson, Harlan, Gowrie, Iowa, Mpls., Honeywell
Holden, Douglas, Mpls., Air Corps (Eng.)
Larson, Curtis, Cottonwood, Minn., Allis-Chalmers

ARCHITECTS



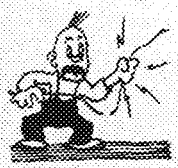
Stone, Henry, Mpls., Naval Ensign
Stordand, Wilbert, Mpls., Naval Ensign

CIVILS



Benert, Robert, St. Paul, Coast Artillery Corps
Lindsey, Raymond, Mpls., Dravo Corps.
Reina, William, Mpls., Goodyear Corp.
Sailor, Sidney, Blue Earth, Minn., Consolidated Aircraft
Sall, Harry, St. Paul, Coast Artillery Corps
Schnarr, Richard, Isle, Minn., Naval Ensign
Souba, Wiley, Mpls., Air Corps (Eng.)

ELECTRICALS



Birchard, Bruce, Mpls., Radiation Lab. M.I.T.
Debel, Charles, St. Paul, Naval Reserve
Fiegal, Richard, Pine Island, Minn., Mpls. Honeywell
Fernald, George, St. Paul, Puget Sound Navy Yard
Franke, Donald, Anoka, Minn., General Electric
Guttman, Norman, Mpls., Research Project at U. of Minn.
Hagg, Herber, Clarkfield, Minn., Naval Ensign
Helms, Clifford, St. Paul, Radio Corporation of America
Jansen, Donald, St. Paul, Signal Corps
Huettner, Oscar, Mpls., Signal Corps
Keye, William, St. Paul, Nat'l Defense Research Council
Knight, Robert, Randall, Minn., Signal Corps
Leef, Robert G., Mpls., Federal Telephone & Radio
Leighton, Alexander H., Mpls., Westinghouse
Leland, Wallace, Bloomer, Wis., Naval Research Committee
Leslie, Charles, Mpls., Naval Ordnance Labs
Mooers, Howard, Mpls., Mpls. Honeywell
Muska, William, Hastings, Minn., Signal Corps
Nelson, Edward A., St. Paul, Bremerton Navy Yard
Nordlin, Henry, St. Paul, Federal Telephone & Radio
Olson, Robert L., Mpls., Mpls. Honeywell
Sandstrom, Paul, International Falls, Mpls. Honeywell
Schmitt, Donald W., Austin, Minn., Westinghouse
Sheldon, Donald F., Mpls., Mpls. Honeywell
Sovick, Victor, Fosston, Minn., Naval Ensign
Templin, Arthur, Plato, Minn., Allis-Chalmers
Tomash, Ervin, St. Paul, Signal Corps
Underwood, Orville, Wabasha, Minn., Mpls. Honeywell
Wasley, Robert, Mpls., U. S. Navy
Warner, Richard, Chicago, Ill., Allis-Chalmers
Wicklund, Edward, Duluth, Minn., North American Aviation

CHEMS

Bateman, Richard M., Duluth, Minn., Goodrich
Berg, Robert, Duluth, Minn., Goodrich

(Continued on Page 210)

(Continued from Page 208)

Braunstein, Mpls., Boeing Aircraft
Christensen, Orville, Mpls., U. S. Civil Service Commission
Drukey, Donald, St. Paul, Office of Scientific Research Development
Eakins, Lyle, Mpls., General Mills
Ferguson, Russel, St. Paul, Westinghouse
Geankoplis, Christie, Mpls., Atlantic Refinery Co.
Helvig, Robert, Mpls., U. S. Rubber
Jacobs, Louis, Motley, Minn., Minnesota Mining
Johnson, Harry G., Mpls., Goodyear
Johnson, Joel, St. Paul, Bremerton Navy Yards
Kenis, Ivan, Mpls., Lockheed Aircraft
Losie, Lawrence, Mpls., General Chemical
Marcellus, Manley, Duluth, Minn., Westvac Chlorine
Naegle, Robert, Mpls., U. S. Rubber
Nelson, Clarence, St. Paul, Carbide & Carbon Corp.
Nutter, Donald, Mpls., Bremerton Navy Yard
O'Rourke, Neil, White Bear, Minn., Lockheed Aircraft
Penrault, Howard, Monticello, Minn., U. S. Rubber
Peterson, Seth, Mpls., Minnesota Linseed Oil Co.
Rice, Robert, St. Paul, Air Corps (Eng.)
Sanders, Earl, St. Paul, Naval Ensign
Surine, Oakley, Duluth, Minn., Civil Service Geological Survey
Taylor, Terry, Mpls., General Mills
Tomlinson, Lee, Mpls., Presto-O-Lite Co.
Wright, Roy, Manitowoc, Wis., General Mills
John Zingsheim, Mpls., Coast Artillery

MECHANICALS

Abbott, Thomson, St. Paul, Allis-Chalmers
Aberwald, Richard, Rochester, Minn., Air Corps (Eng.)
Adamson, Marvin, Cooley, Minn., Goodyear
Anderson, George, Mpls., Allis-Chalmers
Anderson, Vincent, Mpls., Coast Artillery
Bakke, George, Mpls., Bremerton Navy Yard
Byerkan, Theodore, Osakis, Minn., Air Corps (Eng.)
Block, Stanley, Mpls., Coast Artillery Corps
Bootz, Ernest, Mpls., Coast Artillery Corps
Bredvold, Glenn, Miles City, Montana, Curtis-Wright
Broback, John, Mpls., Air Corps (Eng.)
Dahl, Lawrence, Mpls., Bremerton Navy Yard
Desnick, Mandel, Mpls., Boeing Aircraft
Ernst, John P., St. Paul, Moore Drydock
Galbraith, Frank, St. Paul, General Mills
Goodfriend, Nathan, Duluth, Minn., A. C. Spark Plug Div. of General Motors
Greenman, Thomas, St. Paul, Sperry Gyroscope
Hamm, John, Rochester, Minn., U. S. Army
Hanson, Emery P., Leominster, Mass., Allis-Chalmers
Johnson, Eugene H., Duluth, Minn., Linde Air Products
Johnson, Irving, Cloquet, Minn., Pratt & Whitney
Kollitz, Robert, Ortonville, Minn., Firestone
Ladner, Karl, St. Cloud, Minn., Eastman Kodak
Lampert, Leonard, St. Paul, Douglas Aircraft
Lindquist, Robert M., Mpls., Goodyear
Loucks, William, Austin, Minn., Pan American
MacGillivray, Robert, Mpls., Coast Artillery
McCarthy, Thomas, Chisholm, Minn., Diesel Div. General Motors
McConaghy, Keys, Beaver Dam, Wis., Coast Artillery
Meicher, Robert, Mpls., Pratt and Whitney
Manson, Donald, Mpls., Pratt and Whitney
Nordstrom, Fielder, Duluth, Minn., General Motors
Phillips, David, Virginia, Minn., Ingersoll Rand
Pindzola, Mike, Chisholm, Minn., Pratt and Whitney
Quest, Edward L., Mpls., Eastman Kodak
Rottschaefer, William, Mpls., Army Air Corps (Eng.)
Rounds, James, Mpls., Naval Ensign
Schiavone, Daniel, Mpls., Linde Air Products
Severson, Henry, Mpls., McQuay Air Conditioning
Shaffer, George, Mpls., Coast Artillery
Svoboda, George, Hopkins, Minn., Coast Artillery
Uppgren, John, White Bear, Minn., Westinghouse
Welch, Leslie G., Duluth, Minn., Westinghouse
Zoubeck, Phillip, St. Paul, Minneapolis Honeywell

The Goblin that works for America

THE INQUISITIVE alchemists of the Middle Ages were looking for silver. Repeatedly, they smelted certain ores and got a silvery-looking metal. But it was only *silvery-looking*. It never turned out to be silver. So the alchemists thought that a malicious spirit was thwarting them, and they called the strange metal Kobold, meaning goblin.

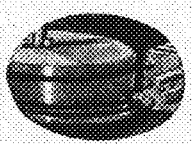
Today that same goblin, known in America as cobalt, has become one of this country's great fighting elements. Cobalt is alloyed with chromium and tungsten to make "Haynes Stellite" alloys which have the property of "red hardness." Metal-cutting tools made of these alloys keep on cutting even when red hot! Cobalt improves red hardness and toughness in other kinds of metal-cutting tools. Thus, cobalt has contributed greatly to the tremendous output of planes, tanks, guns, and other war materials.

Cobalt is also used to produce improved magnet steels. Permanent magnets of cobalt-tungsten steel are more powerful, and last longer. Permanent magnets are necessary in much electrical equipment.

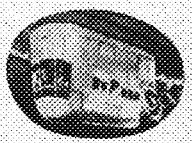
This country's cobalt formerly came from Belgium, where it was refined from African ores found in the Belgian Congo.

As war clouds loomed, and as accelerated American industry made rapid inroads on the stockpiles shipped out of Belgium during 1938 and 1939, ELECTRO METALLURGICAL COMPANY, a unit of UCC, designed and built facilities in this country for the Belgians. ELECTROMET now operates these facilities so that HAYNES STELLITE COMPANY, another Unit of UCC, and other American companies can have the cobalt they need for essential war work. Operations began in 1941. Today, these facilities annually produce more cobalt than was ever imported in any year previously.

BUY UNITED STATES WAR BONDS AND STAMPS



RED HOT... STILL CUTTING! Faster production of metal equipment of all kinds is made possible by high-speed metal-cutting tools containing cobalt.



SIGHTED SUB! Better radio transmitting tubes and improved electrical equipment are assured by cobalt.

CALLING HEADQUARTERS! Telephones and other electrical equipment require permanent magnets. The better magnet alloys contain cobalt.

WEAR-FIGHTER! Planes fly farther with fewer repairs, thanks to exhaust valves protected with "Haynes Stellite" cobalt-chromium-tungsten alloys.

UNION CARBIDE AND CARBON CORPORATION

30 East 42nd Street UCC New York, N. Y.

Principal Products and Units in the United States

ALLOYS AND METALS
Electro Metallurgical Company
Haynes Stellite Company
United States Vanadium Corporation

CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

Late to bed and early to rise
Keeps the fellows from wearing your ties.

• • •

I used to be the cream of her life,
But now she just skims me over.

• • •

Buying a car is just like getting married.
Once you get the license you can go as far as you like.

• • •

Once upon a time there were three coeds who were very timid and wished to go to bed. So they went to their room.

Suddenly:

"Someone's been sleeping in my bed," said the great big girl in a great big voice.

"Someone's been sleeping in my bed," said the medium sized girl in a medium sized voice.

"Good night, girls," said the little coed in a little bit of a voice.

• • •

Question of the week:

If the big horses say "Nay, Nay," where do all the little horses come from?

• • •

Although any man can have a wife, only the ice man has his pick.

• • •

Have you heard about the Egyptian girl who didn't know right from wrong? No? Well, she's a mummy.

• • •

For the coming quarter—

Slide Rule Rules

1. Always carry your slide rule with you. This informs the layman that you are a true engineer with constructive intent.

2. Always sit in the front row, and if the professor has any calculations, be the first one to take out your slide rule and "slip it off." This will show the professor that you are an eager, intelligent observer and are not to be trifled with.

3. Pay no attention to the instruction booklet which comes with your slide rule—this is merely an advertising medium. You are bound to make a certain number of mistakes before you learn to use your slide rule anyway.

4. Don't bother about the slide adjustments on your "slipstick"—the errors will compensate for themselves.

5. If you are in doubt about the accuracy of your calculations in a quiz, just write "slide rule accuracy" by the solution. When the professor sees this he will immediately make allowance for your inaccuracy.

6. Sit on your slide rule whenever possible. For working out calculations on curves, a curved slide rule is best.

• • •

Library sign: "Only low talk permitted here."

• • •

Second question of the week:

What would the speed of lightning be if it didn't have to zig-zag?

• • •

Don't kick a man when he's down—he may get up.

• • •

"Go and never dampen my door again," said the old lady to the little pup.

• • •

Pardon me, Mrs. Astor, but that never would have happened if you hadn't stepped between me and the cuspidor.

• • •

A bug is energy gone to waist.

• • •

Daniel Moth says that his girl friend never took mechanics but she certainly knows a lot about resisting moments.

TROUBLE SHOOTERS

(Continued from Page 193)

useful and productive workers in a relatively short period of time. The War Manpower Commission has recognized the value of such instruction and is sponsoring several courses in Job Instructor Training and Job Methods Training through its Training Within Industry program. These courses are given to persons in all kinds of supervisory positions, and have been enthusiastically received. Since this sort of training is similar to the methods analysis work of industrial engineers, they are often called upon to use their knowledge as advisers and instructors. This is only one example of new demands made of the work involved in industrial engineering.

More true in this branch than in others of the engineering profession, theory must be tempered with actual experience and results, especially since the work deals with the unpredictable human being. Industry in general is several steps ahead of the engineering schools since it must solve the many current problems as they arise in order to attain satisfactory production. The broad term production control implies dynamic problems and their solution makes industrial engineering also a dynamic, interesting field.

MIGHTY MESABI

(Continued from Page 194)

operators to curtail production of open pit ore.

Chief offender is the ad valorem tax levied by the state of Minnesota which taxes operators each year for the amount of ore *in the ground*. Over a period of fifteen years, this tax with interest adds up to about forty cents per ton, thus making it advantageous to the operators to mine the ore, even to sell it, at comparatively low prices.

Also many leases made forty or fifty years ago are now expiring, and since owners double or triple the royalties, operators tend to mine the ore at the low royalty and throw it on the market as "distress ore" before the lease expires.

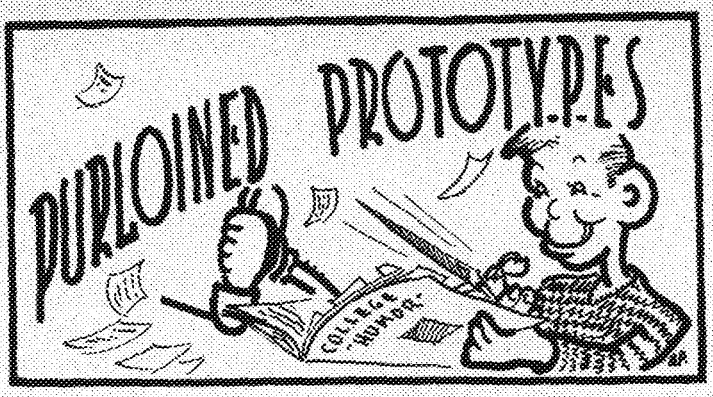
Conclusions to be drawn are as follows:

1. Open pit direct shipping ore is in the nature of a stockpile, and should be thought of as such.

2. The United States government should do everything in its power to establish a magnetic taconite concentration industry both to provide an almost inexhaustible supply of iron ore and to conserve the reserve of open pit ore for emergency use.

3. The government of the state of Minnesota should modify the ad valorem tax to correct its adverse effect on the production of open pit ore and take steps to modify the leases under which the mines are operated so that pressure is not brought to bear on the industry that is disadvantageous to the interests of the public.

The importance of the iron mining industry both to the U. S. as a whole and to the state of Minnesota can hardly be overestimated. We might quite possibly be left on a limb in the future with a shortage of steel. Unbelievable as it may sound and just because it won't happen tomorrow or next year is no reason to forget the matter. The time to act is now!



BY BILL SANFORD, M.E., '44, AND GENE WHITACRE, M.E., '43

Since Uppgren and Souba have been graduated, "Purloined Prototypes" has been left without its usual fall guys. As we are faithful to the Log to the nth degree, we have grabbed up the torch and carry on their great work. We have spared no effort in getting our readers the best humor available. Any complaints which anyone has to make should be written in Sanskrit on 200-lb. bond paper and thrown down the nearest sewer.

Sincerely,
WHIT AND BILL.

• • •

The village fair was all agog over its annual spelling bee. One by one the contestants dropped out until only two remained, the town lawyer and an English stableman.

Everyone waited breathlessly for the word which would decide the match. It came:

"How do you spell 'auspice'?"

The stableman lost.

• • •

Judge: "Sorry, but I can't issue a license to your grandchild; she's only 15 and too young."

Old Granny: "Lawdy, mistah judge, wat we gwina do; she's ol' nuf to do wat she's done did."

• • •

The Preacher: "I had a very enjoyable trip to the Adirondacks. The first day I shot two bucks."

The Sport (absently): "Win anything, parson?"

• • •

No doubt the saying "come across" was originated shortly after the invention of twin beds.

• • •

Greatly agitated, a woman carrying an infant dashed into drugstore.

"My baby has swallowed a bullet!" she cried. "What shall I do?"

"Give him this bottle of castor oil," replied the druggist calmly, "but be sure you don't point him at anyone."

• • •

"That girl you've been going around with is on her way to the doctor's office!"

"Well, I'll be blamed!"

• • •

POME

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

• • •

Doctor: "How is the little boy who swallowed the half-dollar?"

Nurse: "No change yet."

• • •

She was the type that could best be described as having a beautiful profile all the way down.

• • •

Sentry: "Who goes there?"

Major: "Major Jones."

Sentry: "I can't let you proceed without the password, sir."

Major: "Drat it man, I've forgotten it. You know me well enough."

Sentry: "Must have the password."

Voice from guardhouse: "Don't stand there arguing all night, shoot 'im."

Director: "Have you ever had any stage experience?"
Coed: "Well, I had my leg in a cast once."

* * *

Our TECHNOLOG fashion expert informs us that the women are finding that short skirts make one look longer.

* * *

Every man likes to see a broad smile—especially when she smiles at him.

* * *

And then there's the one about the absent-minded druggist who, when asked if he had a wife, replied, "No, but I have something just as good!"

* * *

It's all right to tell a girl she has pretty ankles, but don't compliment her too highly.

* * *

Chairman of the Dance Committee: "Can't you stretch the music a little—just a dance or two more?"
Orchestra Leader: "Sorry, this isn't a rubber band!"

* * *

Girdles are like the Japs—both creep up on you and it takes a Yank to get them down.

* * *

Speaker: "I have lived in this town all my life. By actual count there are fifty-five tap-rooms and saloons in this town, and I am proud to say I have never been in one of them."
Voice: "Which one is that?"

* * *

Two cats were watching the tennis matches at Forest Hills, Long Island. One cat said to the other little kitty, "My Mother is in that racket."

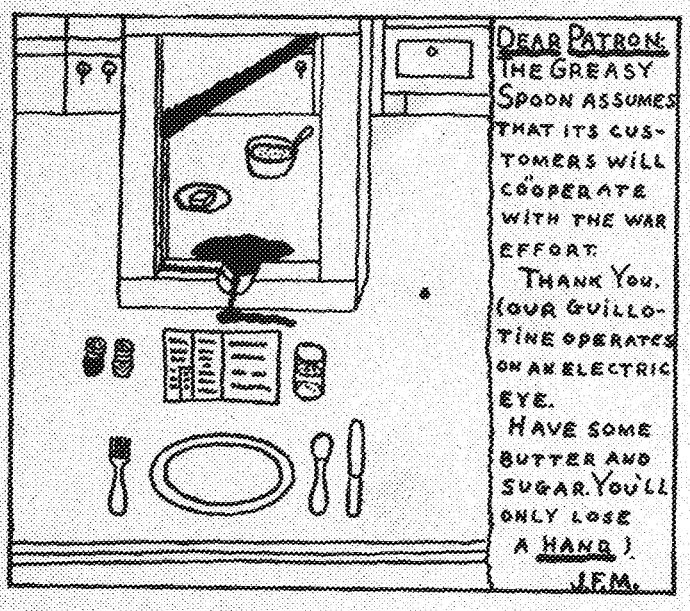
* * *

Herman, the campus cop: "Say, you can't sleep out here on the Knoll."
He and She: "Who's sleeping?"

* * *

Parson: "Does your daughter trust in God, Brother Jones?"
Brother Jones: "She must, judging by the company she keeps."

* * *



Fan Dancer: "Doctor, I want you to vaccinate me where it won't show."
Doc: "Okay. Stick out your tongue."

* * *

Clerk in Bookstore: "This book will do half of your work for you."
Student: "Fine; I'll take two."

* * *

It takes a mother twenty-one years to make a man of her son.
It takes another woman just one night to make a fool out of him.

* * *

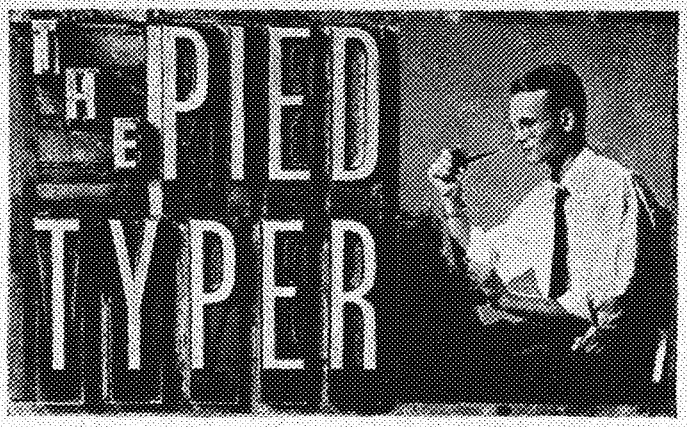
He: "I'm not feeling myself tonight."
She: "You're telling me!"

* * *

Perhaps Adam didn't have a funny bone, but we know he had lots of fun with a spare rib.

* * *

Heard on campus:
"It must be getting on toward spring! All the engineers are flirting with strange girls."
Go on! All girls are strange.



SPRING HAS COME AT LAST. From the standpoint of the editor, this has certain advantages. The chief one being that he always knows just where he can find his staff. All that is necessary is to go down to the river bank and yell for them. There are, of course, certain drawbacks. As you can well imagine the thoughts of reading copy, writing articles, or pasting pages are not much of a temptation to a fellow who is sitting on the river bank drinking in the beauties of nature.

* * *

WE HAVE INSIDE INFORMATION that one of our more prominent staff members is being pursued by an agent from Minsky's who wants to sign him up for a personal appearance. As recently as a week and a half ago six of the boys on the staff got together for a hike up the Apple River. They started early in the morning and the air was decidedly on the chilly side. This staff member which we have reference to realized the value of his health and consequently dressed very sensibly even including a pair of long undies. However, as the day progressed the sun beat down hotter and hotter until by the time they got to the place where they were to eat lunch our hero was literally sweltering. Being a good engineer, he immediately concluded that the remedy for the situation would be to take off his woollies. This he quickly proceeded to do—but not so quickly that John Uppgren didn't have time to whip out his trusty 2A Brownie and get a picture of the fellow desperately clutching at his britches with one hand while trying to disentangle himself from his long underwear with the other. Doubtless scouts from all the major burlesque circuits have seen the picture by this time and are feverishly bidding for his services. How about it, Andy?

* * *

THE BOYS around the Tech campus are bemoaning the fact that the fire in the electrical engineering building couldn't have started in mechanical. Rumor has it that the fire was started by two of those high-voltage gremlins doing some sparking in the ventilator shaft.

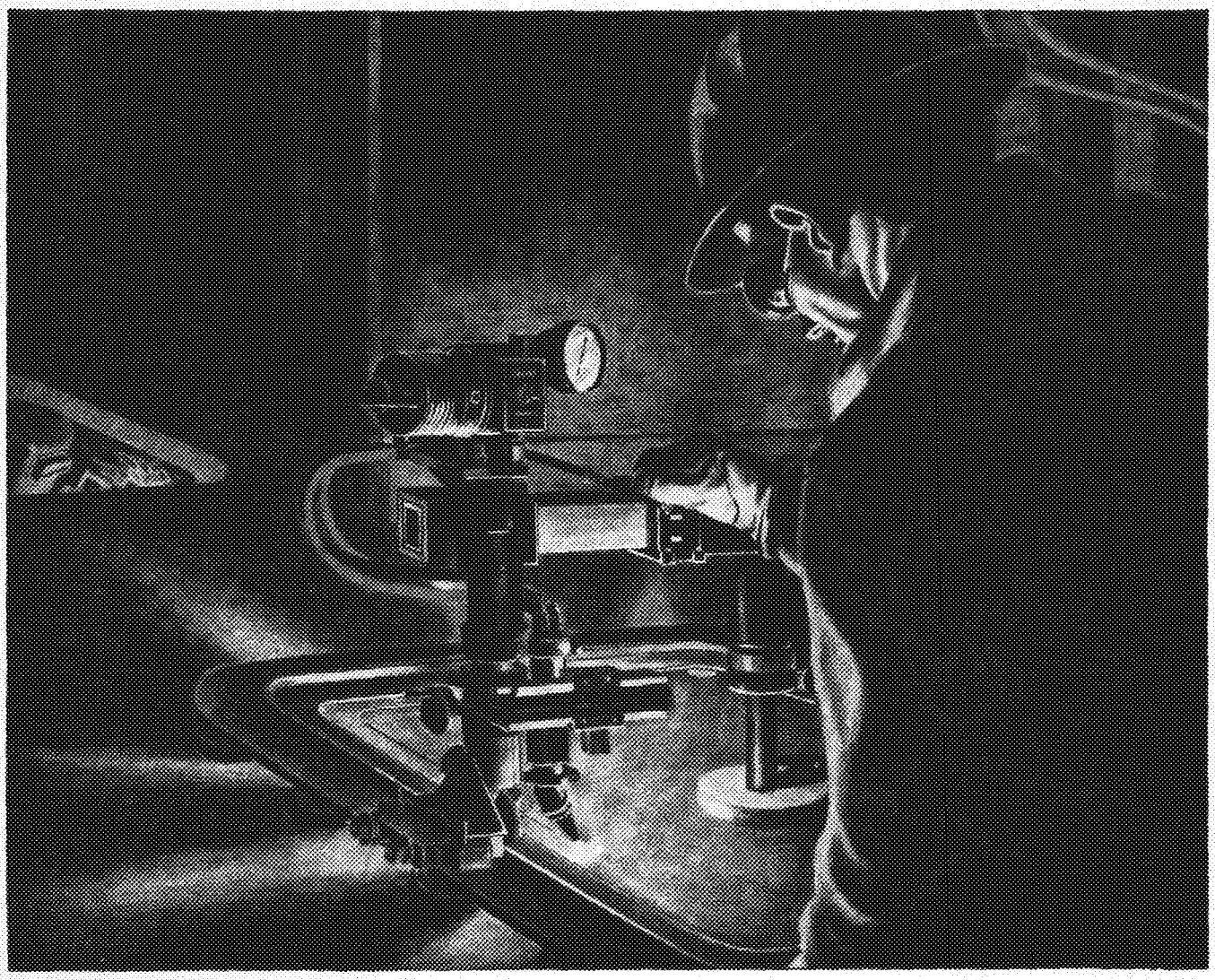
* * *

WE WOULD LIKE to commend the Curtiss-Wright cadettes for getting right into the old engineering spirit so soon. Your humble correspondent had the privilege of observing the girls in action when he took the pictures for the picture spread in this issue. It seems that a group picture was scheduled for right after lunch on the steps of Northrop Auditorium, and the girls turned out 100 strong for the picture. Just as they had been properly draped on the steps for the picture, a lonesome soldier chanced to walk in front of the group on his way to class. He seemed to be in quite a hurry to get where he was going because he didn't even take time to look at the girls. Perhaps this was a blow to their ego, or perhaps it was just because they have been associating with engineers for so long; but at any rate the girls puckered up and gave forth with a lusty whistle such as heretofore has been heard coming forth only from the windows of Main Engineering when a pretty girl passes by. Now who can dare to say that these girls won't make good engineers?

* * *

AFTER PROPER OGGLING of the picture spread on pages 196 and 197, we are sure that our readers will feel that the TECHNOLOG is not doing its duty if we do not include the phone number of Shevlin Hall. In case you don't already know it's Main 8177, Extension 187. Please file for future reference.

J. R.



SLICING DAYS OFF SHIPBUILDING SCHEDULES...

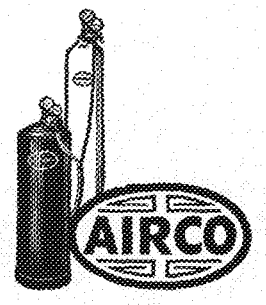
UNTIL recently, cutting hatchway openings out of heavy deck plating was a bottleneck in the construction of certain types of ships. It was a slow, costly job requiring many laborious machining operations.

Could the oxyacetylene flame eliminate this bottleneck? This was the problem presented to Airco's research engineers by one of its customers. The problem was solved by an entirely new gas cutting machine, designed and constructed specifically to handle this job.

With this machine it is possible to cut beveled openings, rounded at the corners, out of thick steel plate—all in a single continuous operation! The finished cut is smooth and clean, and more important, the openings are cut in 1/120th the time required by the former method. Today this machine—the Airco Polygraph—has become standard equipment in shipyards and many other war production plants throughout the country.

This development is typical of the achievements resulting from the teamwork of Airco engineers and its customers—each contributing their specialized knowledge towards one common objective.

If you want to keep posted on some of the most recent developments and applications of oxyacetylene flame and electric arc processes, write for a free copy of the illustrated booklet, "Airco in the News." Please address your requests to Air Reduction, Room 1656, 60 East 42nd Street, New York.



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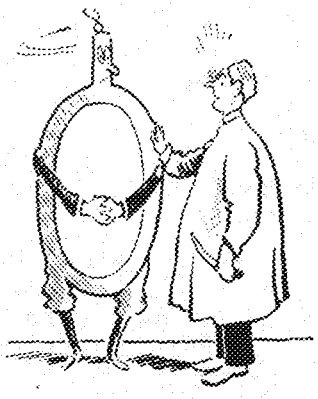
General Offices: HOUSTON, TEXAS
OFFICES IN ALL PRINCIPAL CITIES

ANYTHING AND EVERYTHING FOR GAS WELDING OR CUTTING AND ARC WELDING

G-E Campus News



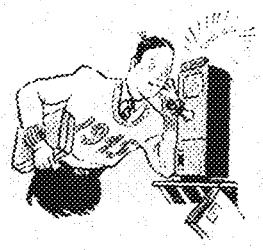
PLASTIC SURGERY

MISTER FIVE BY FIVE had nothing on radio antenna enclosures until the "doctors" of the G-E Plastics Laboratory (PhD's, not MD's) went to work on the problem of streamlining. The result was a plastic housing that a plane hardly knows it's carrying.

That's just one wartime activity of the Laboratory chemists. They're also concocting plastics for fuse caps on mortar shells and for a vast variety of parts for battleships, tanks, and what-have-you's.

The name "plastics" covers a lot of different materials. These G-E chemists are applying the most precise and ingenious chemical techniques to increase that variety. So, if a special job requires a material with combined properties that no existing material has, they go to work to cook up an entirely new plastic to fill the bill.

The whole story can't begin to be told yet. But when it can, you'll be amazed at how far plastics have gone in wartime, and how many new peacetime jobs they'll be ready to tackle afterward.

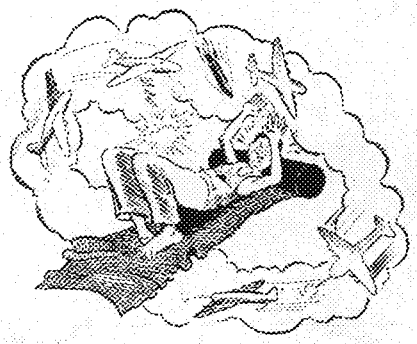


PUT A NICKEL IN IT

NICKEL'S gone to war. But that doesn't mean that the juke box and pay telephone will soon be operating on a diet of "wooden nickels" and slugs. For every self-respecting coin-operated machine has a magnet attachment that refuses to accept all coins that do not have the magnetic properties of genuine ones.

So, when a new formula for the five-cent piece was needed in order to save nickel and copper for war service, it had to have magnetic properties close to those of the old-fashioned nickel. A number of metallurgical experts were asked for their advice.

Your guess is as good as the next as to whose advice was finally followed, but the formula submitted by the metallurgical section of the G-E Research Laboratory was pretty close to the one picked. The new "nickel" doesn't *have* any nickel in it, and has lost 19 per cent of its copper—and the metals saved are on their way to hit the Jap-pot.



JAP NAP

ONE night Hirohito had a nightmare. He dreamt that Shangri Las were springing up all over and planes were swarming over him like flies.

Perhaps that nightmare is nearer reality than his Imperial Nibs knows. For now, in practically no time at all, any open field, even though the ground is soft, can be transformed into a hard runway for American bombers starting off to make hay of enemy objectives.

To turn the trick, flexible steel mats are laid along the field. By means of resistance-welding machines guided by G-E electronic tubes, steel bars are automatically joined together to form these mats. The speed far exceeds that of a crew of hand welders.

On some dark night, in some deserted spot, our army engineers will swiftly unload these steel mats, joining them into a smooth, solid runway. And presto! Hirohito's nightmare will become a grim reality. General Electric Co., Schenectady, N. Y.

• • •

Listen to the "Hour of Charm" 10 p.m. EWT Sundays on NBC and the G-E news with Frazier Hunt 6 p.m. EWT Tuesdays, Thursdays, and Saturdays on CBS and American (F-M) networks.

GENERAL ELECTRIC

MINNESOTA TECHNIC

IN THIS ISSUE

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UNIVERSAL LANGUAGE
ARMY ENGINEERS
ENGINEERING EDUCATION

MAY • 1943

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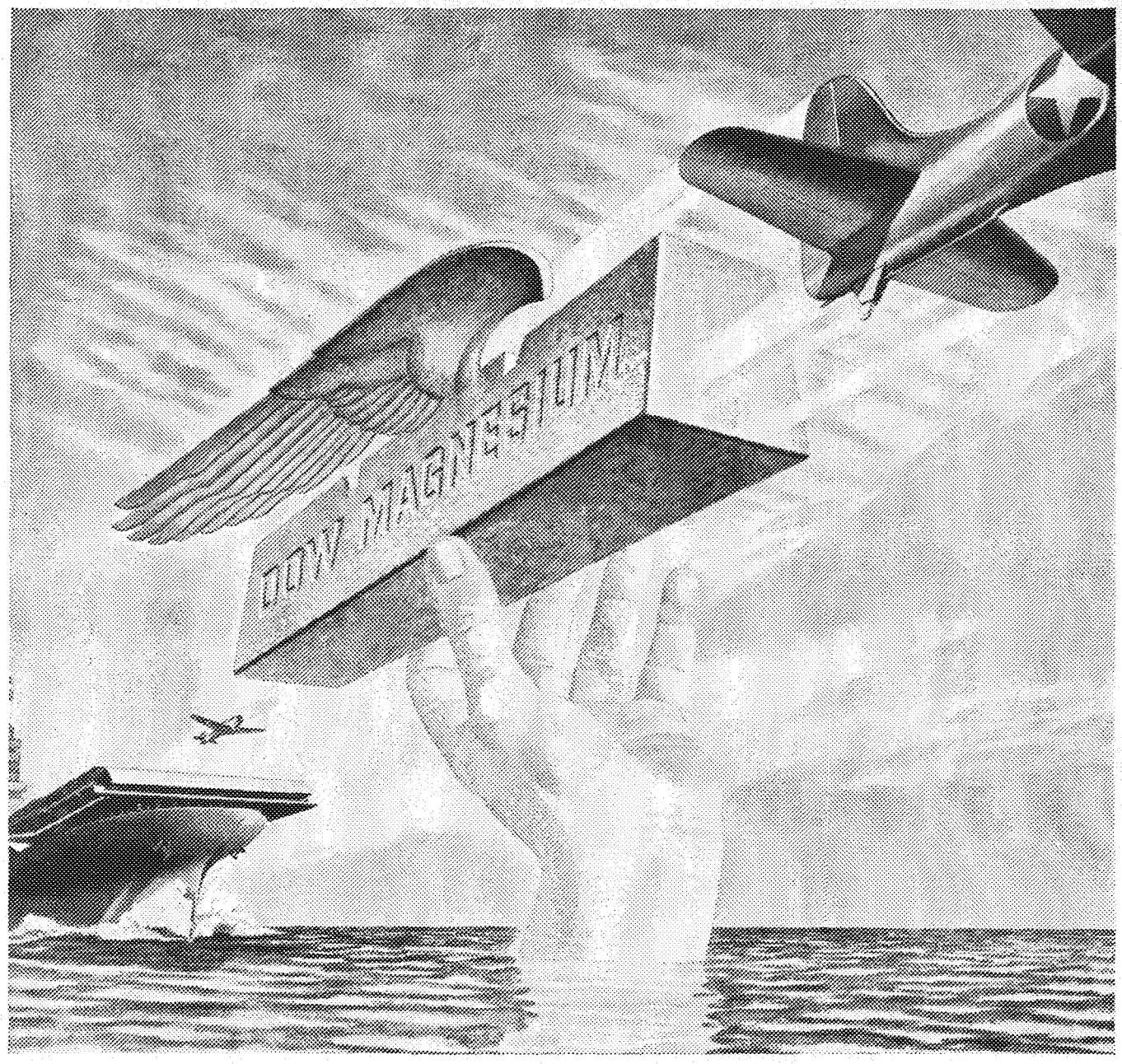
STITUTE OF TECHNOLOGY UNIVERSITY OF MINNESOTA



THE WINGED INGOT is a symbol of freedom. It is a graphic expression of Dow's recovery of magnesium, lightest of the light metals, from sea water to release our airplanes from hampering weight.

Also, it is a symbol of things to come. When peace returns the freedom of American enterprise will permit the full use of Dow's vast magnesium production to speed transportation of passengers and freight by air and lighten tasks in industry, business and the home.

Millions of pounds of Dow magnesium, extracted from the inexhaustible sources of the sea and from Michigan brine—as well as Dow facilities already established for the fabrication of Dowmetal castings and wrought products—will then be available to give this symbol of freedom—the flying ingot—its fullest significance.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York—St. Louis—Chicago—Houston—San Francisco—Los Angeles—Seattle

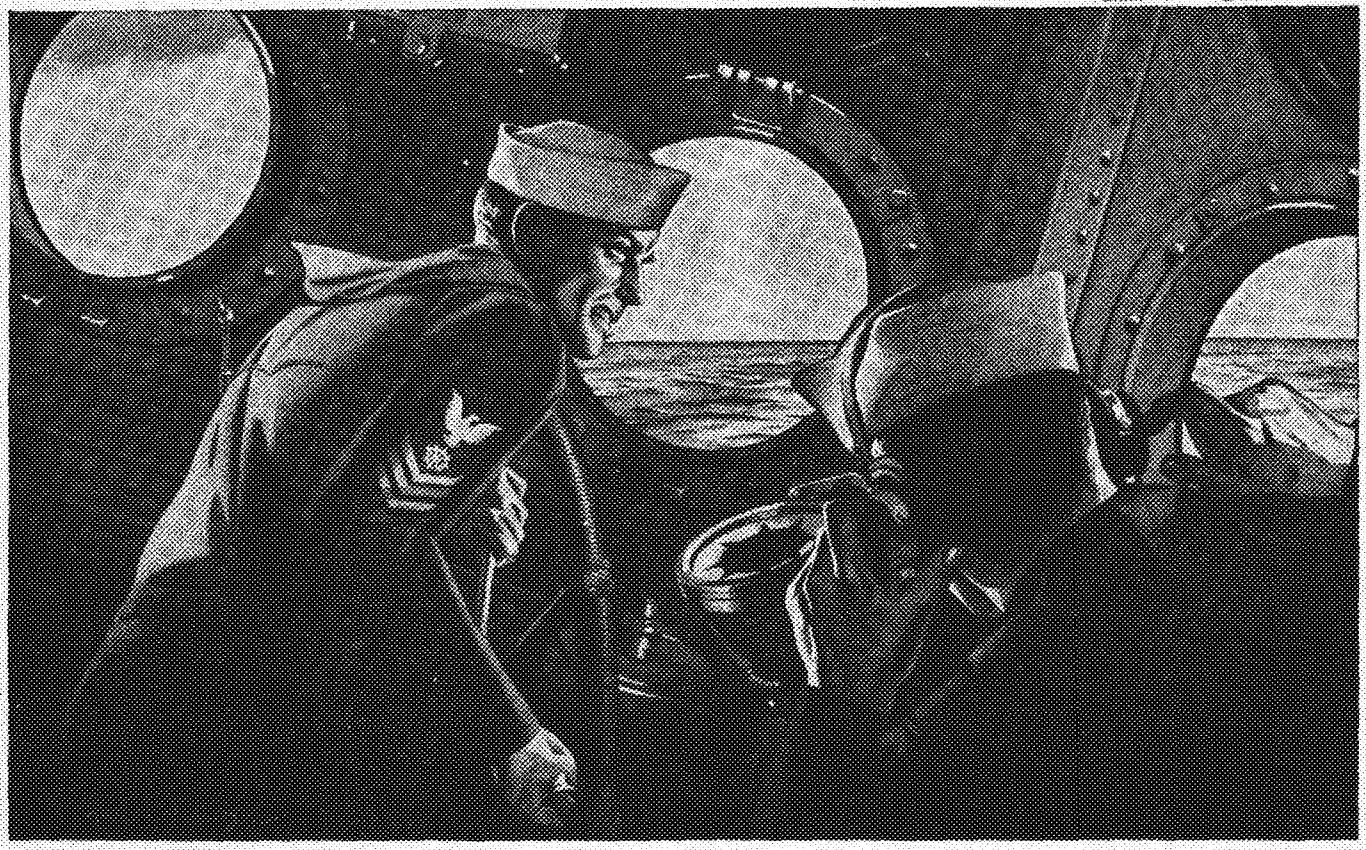
MAGNESIUM

PRODUCER SINCE 1916

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

"PERISCOPE ON THE STARBOARD QUARTER!"



IN SUBMARINE-infested waters, a speeding destroyer must be able to change its course in a split-second—to drop its deadly ashcans on enemy U-boats.

The secret of the destroyer's great *speed* and *maneuverability* is the tremendous power of its turbines, operating at steam temperatures *high enough to make the turbine blades glow!*

This introduces a difficult problem in turbine construction. The highly heated metal parts "creep" under stress. The metallic grains slowly slide over each other. The metal tends to *flow* out of shape.

Excessive "creep" would quickly destroy the turbine—due to collision between the blades and other parts of the turbine, which are spaced only *a fraction of an inch apart* for maximum power.

Westinghouse first introduced the steam turbine in the United States and has built thousands during the past 45 years.

And much of the success of Westinghouse steam turbines is due to the intensive studies of "creep"—similar to those conducted by Dr. A. Nadai, P. G. McVetty, and M. J. Manjoine, in the Westinghouse Research Laboratories.

As a result of this research, the "creep" in some turbine metals has been reduced to 1/10,000th of an inch per inch per year—less than 1/64th inch per inch in 100 years.

This has guided the development of metals capable of operating at greatly increased temperatures and speeds—and secured *more power per pound of turbine*, a vital necessity in a destroyer!

* * *

Research Engineer Manjoine, in collaboration with Dr. Nadai, is fighting a deadly battle against the submarine menace—by improving metals that make possible *faster, more maneuverable* ships for our Navy.

Manjoine is typical of the many young engineering graduates who are putting Westinghouse skill and "know how" to work for victory—and for a better kind of civilization when peace returns.

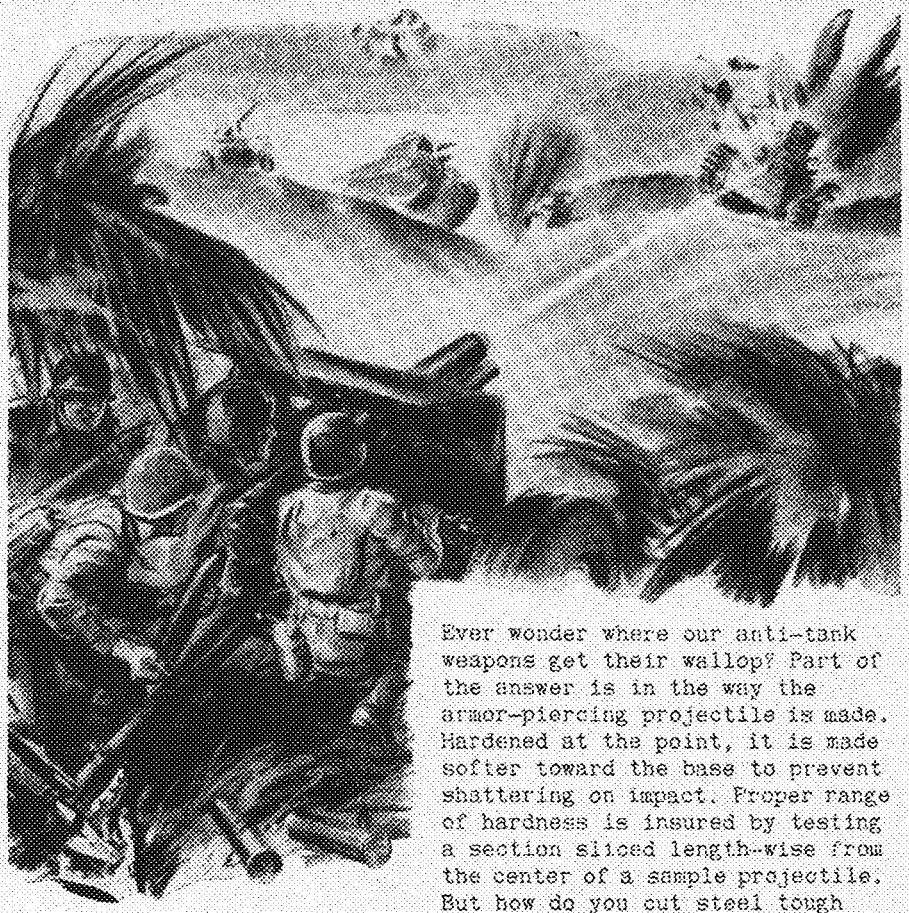
Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

Slower "creep" means faster ships—Research Engineer Manjoine studies "creep" of test samples to develop turbine metals that will deliver more horsepower per pound—making our destroyers speedier and deadlier. Manjoine received his B. S. from Iowa State College, before joining Westinghouse in 1937.

Westinghouse

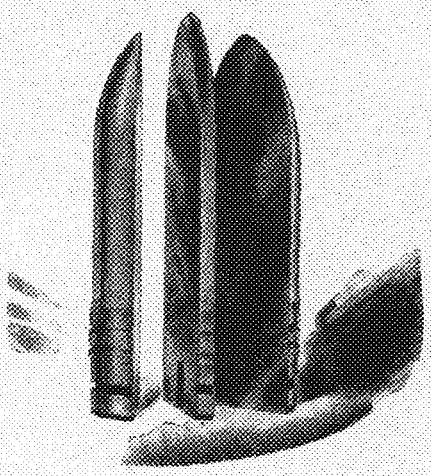
PLANTS IN 25 CITIES OFFICES EVERYWHERE

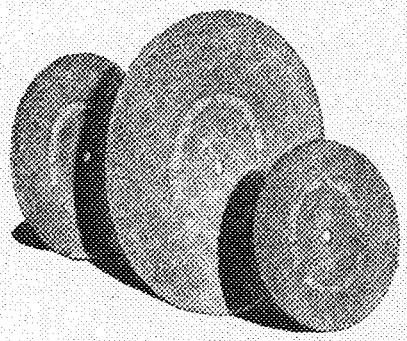
Set 'em up in the other alley!



Ever wonder where our anti-tank weapons get their wallop? Part of the answer is in the way the armor-piercing projectile is made. Hardened at the point, it is made softer toward the base to prevent shattering on impact. Proper range of hardness is insured by testing a section sliced length-wise from the center of a sample projectile. But how do you cut steel tough enough to pierce a tank? With a cutting off wheel such as made by Carborundum!

Cutting off wheels are abrasive discs that are amazingly tough and often extremely thin. They do the work in a fraction of the time required by ordinary methods. Their high precision adapts them to the most delicate operations such as slotting pen points. Such wheels are now used to cut plastics, glass, brick, tile, steel and non-ferrous metals in plate and bar stock. Frequently further finishing is unnecessary.





When you take your place in the war industries, keep Carborundum in mind. We will always be ready to help you with problems where the use of abrasive products is involved. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

This Month . . .

BY MARJORIE PEARSON, C.E. '46

JOHN LINSLEY, '46, writes his first article for the TECHNOLOG this month. Out of a clear sky, the feature editor called him and asked him to have the two-thousand-word article on Esperanto ready in two weeks—and he did it! However, he didn't agree with the feature editor's idea that he could read up on the subject and then just dash off an article in a couple of evenings. Evidently it took a little more effort than that.

LADY-KILLER

John is a typical engineer and is quite capable of holding his own among a bunch of women. He is one of the two bass singers, who, along with seven tenors, comprise the masculine part of the sixty-two-voice University chorus. It's probably his moustache that enables him to cope with fifty-three girls at one time.

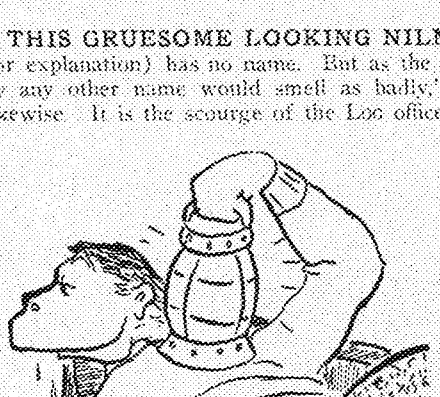
He graduated from Roosevelt high school in Minneapolis in 1942, and is studying physics now at the University on an accelerated program. He says he'd like to thank Mr. Thompson of the Institute's English department for the advice and assistance he gave while the Esperanto article was being written.

GO-GETTER

THE MODEST ARCHITECT who wrote the article about the house of tomorrow in this issue of the TECHNOLOG is **Maurice Breslaw,** '44. A person who gets things done once he starts them, he spends most of his time while at school either in the Log office or in the architects' drafting room on the fourth floor of the Engineering building.

Maury is a St. Paulite, and he graduated from Mechanic Arts high school in 1940. His hobbies are drawing and music, and besides playing the clarinet and saxophone, he collects records "when he can get 'em." Even though serious drawing is his forte, he is no mean cartoonist. As a Log staff artist he has drawn cartoons for the Alum notes, and he did some of the illustrating for the Engineers' Day issue.

THIS GRUESOME LOOKING NILMERG (see last page for explanation) has no name. But as the saying goes, "a stinker by any other name would smell as badly," so the nilmerg does likewise. It is the scourge of the Log office. The drawing shows something to do that will be extremely annoying. It is the one that pushes typewriters off tables, drinks the rubber cement, hides the typewriter erasers, gouges holes into cuts, turns the lights on and unlocks the door after somebody has gone home, clutters up the tops of desks and tables and generally manages to get the office messed up. Traps have been set for it but it is too smart. Someone saw it momentarily one evening and managed to tell what it looked like. That is why we have a drawing of it.



OFFICE JINX

ARMY TEACHER

LT. RUDOLPH WEISBRICH, U. S. Army, definitely believes in keeping secret any information pertaining to things military, especially Lieutenant Weisbrich. Being a modest person he is very unwilling to talk about himself. However, when dispensing uncensored information about the Army in general—and the Army engineers in particular—he is not so uncommunicative. His article in this issue of THE TECHNOLOG gives all the facts about the Army Engineers stationed on the campus; it is authentic, interesting, and strictly G.I.

Lieutenant Weisbrich graduated from Texas A. and M. University with a degree in electrical engineering. He received his army commission in 1922, and his present post is at the Armory. Before coming to the University of Minnesota, the Lieutenant was at the Signal Corps Officers Candidate School at Fort Monmouth, New Jersey. He was transferred to the University Armory in November, 1942, to replace Major Carl Jacobson. He taught the Signal Corps unit of the R.O.T.C. until that unit went on active duty. He is now listed as an R.O.T.C. instructor and his duties are—CENSORED.

The editorial policy of the TECHNOLOG is to present material f technology students which it is hoped will strike a happy medium betwe the superficial and the highly specialized.

The MINNESOTA TECHNOLOG is published monthly, Octob through May, by the students in the Institute of Technology of t University of Minnesota.

The purpose of the TECHNOLOG is two-fold: first, to put in t hands of TECHNOLOG subscribers highly worth-while and interesti reading material; second, to offer technology students an invaluable opp tunity to get writing, selling, and working-with-others experience.

MINNESOTA TECHNOLOG

THE COVER picture is an official U. S. Navy photograph.

FRONTISPIECE—

Funnels, not for ships but for solvents; these vessels recover volatile fluids used in processing Micarta, from which are made helmets, airplane pulleys, and other plastic forms. Courtesy Westinghouse Electric & Mfg. Co.

STAFF

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MEMBERS OF ENGINEERING COLLEGE MAGAZINES ASSOCIATED

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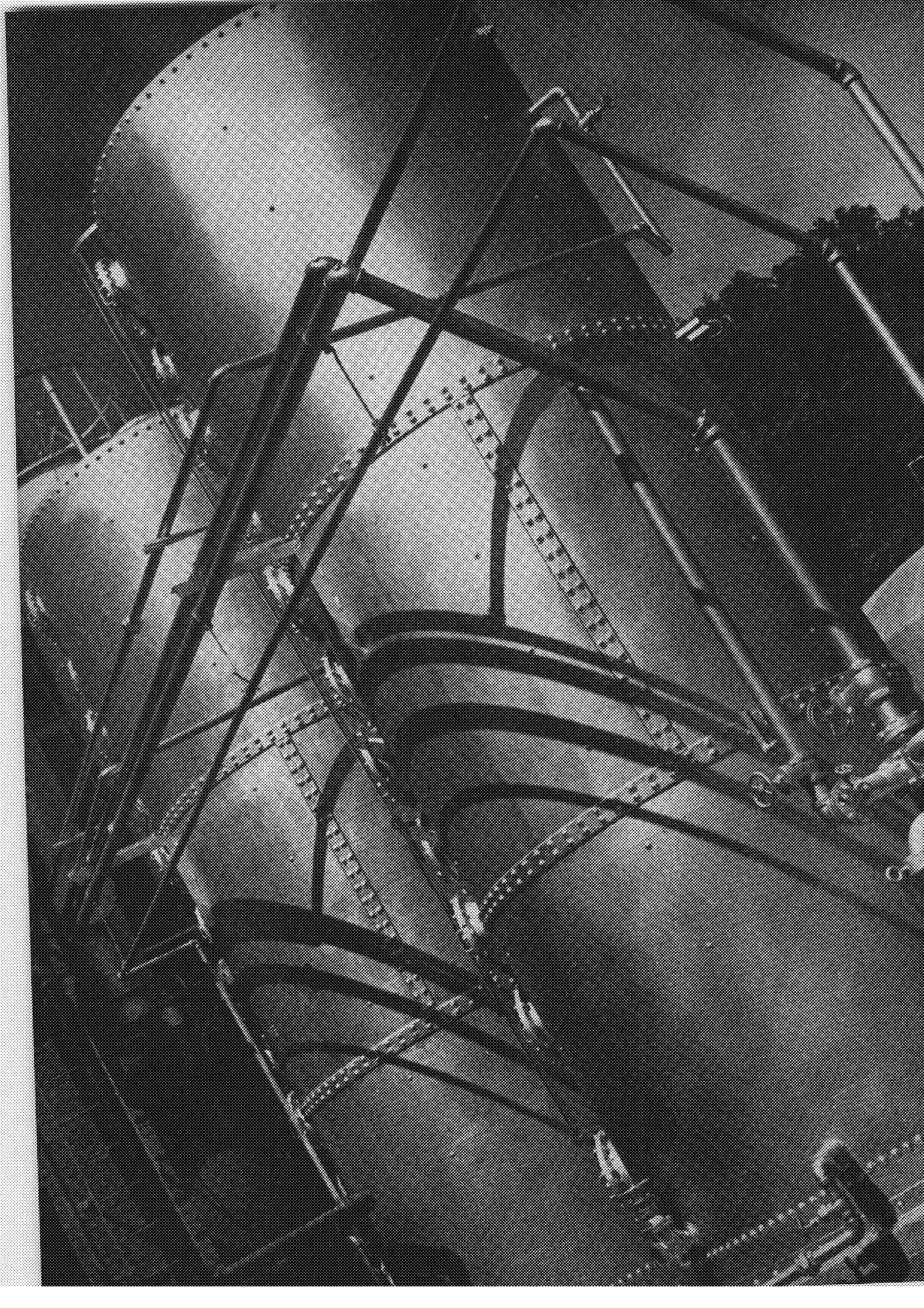


An Engineer Looks at

ENGINEERING EDUCATION

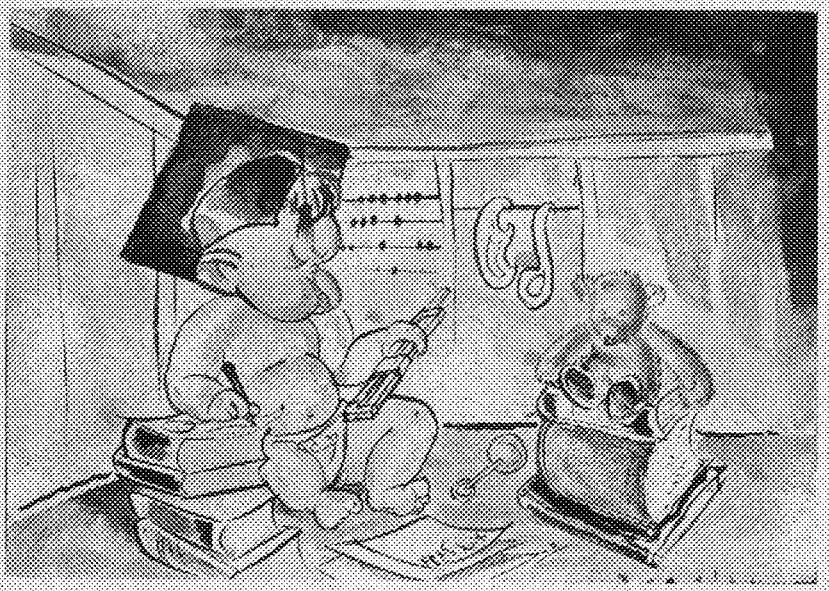
BY D. B. STEINMAN
CONSULTING ENGINEER

Condensed from *The Journal of Engineering Education*, September, 1940.

An interesting and authoritative discussion of engineering education by a practicing engineer

SINCE every man's philosophy is the product of his experiences, permit me to use, as an introductory documentation, a few brief sketches of actual, recent contacts with engineering education and its end-products.

I recently visited a Senior class in one of the accredited engineering schools, and was shocked to find that the individual students, shortly before graduation, were unable to answer my simplest questions on the work they were doing, although it was in their major subject. They were apparently producing a finished design by a routinized set of instructions, and their minds were a blank on the elementary, essential concepts underlying their work. Yet in two months these young men were going to be turned out upon the world as having completed an "*engineering education.*"



MAURICE ERESLAW

A young candidate for a professional engineer's license was recently questioned by the New York State Board of Examiners concerning his past involvement in a matter of questionable professional relations. He was surprised to learn that the things he had done were violations of all the published Codes of Ethics of the profession, and he told us that he had never heard of professional ethics at college and had never seen a Code of Ethics before or after graduation!

Higher Entrance Standards

A prominent engineering educator—a past president of S.P.E.E., was proudly telling me that he was finally going to start a system of student selection at his school. I was thinking of the high standards of the medical schools, in which it is practically impossible for a young man to secure admission unless he stood in the top quarter of his class in his pre-medical college courses; and it was therefore quite a let-down when this engineering educator outlined his plan for selective enrollment: Any high school graduate who stood in the *bottom* quarter of his class at high school would be required *to present a letter from his high school principal!*

Commenting on the low level at which most engineering schools start their curricula, with algebra and trigonometry taught in the freshman year, I recently suggested to an engineering educator that, as a first step of progress, completion of high school mathematics should be made a prerequisite for enrollment in engineering. He shuddered at the thought. He would be willing to go along with me, he said, to the extent of viewing such requirement as a long-range, ultimate objective, but any thought of taking early steps toward that objective would be vigorously protested!

If the foregoing vignettes of actual personal experiences and contacts were unique or isolated, you might say that they prove nothing; but they can be multiplied indefinitely. I have selected but a few that reflect directly on some of the facets of the problem of engineering education. To me they are significant and revealing. I believe they raise some serious questions, to stir our complacency with the present picture of engineering education.

Are the engineering schools properly fulfilling the high trust reposed in them by the public and by the profession? Are they maintaining adequately high standards of selection and guidance of students, of true education, and of full preparation for a professional career? Are they progressively raising these standards to meet the increasing requirements of educational equipment for professional lifework? Are the engineering educators using their best energies for the advancement of these standards, or are they instead using their energies and resourcefulness in rationalizing and justifying compromises and evasions that prevent or retard progress?

Shall the program of education for the engineering profession continue to be geared to the lowest standards of high-school graduation, or shall it be geared to a desired end-result in terms of professional education and preparation? Must the engineering schools accept every high-school graduate who applies, however ill-qualified or ill-prepared?

Is there something sacrosanct about a four-year period of education after high-school graduation to which the engineering schools must cling at all odds regardless of overcrowding of curricula, inadequacy of scope, and serious limitations and shortcomings of the end-result?

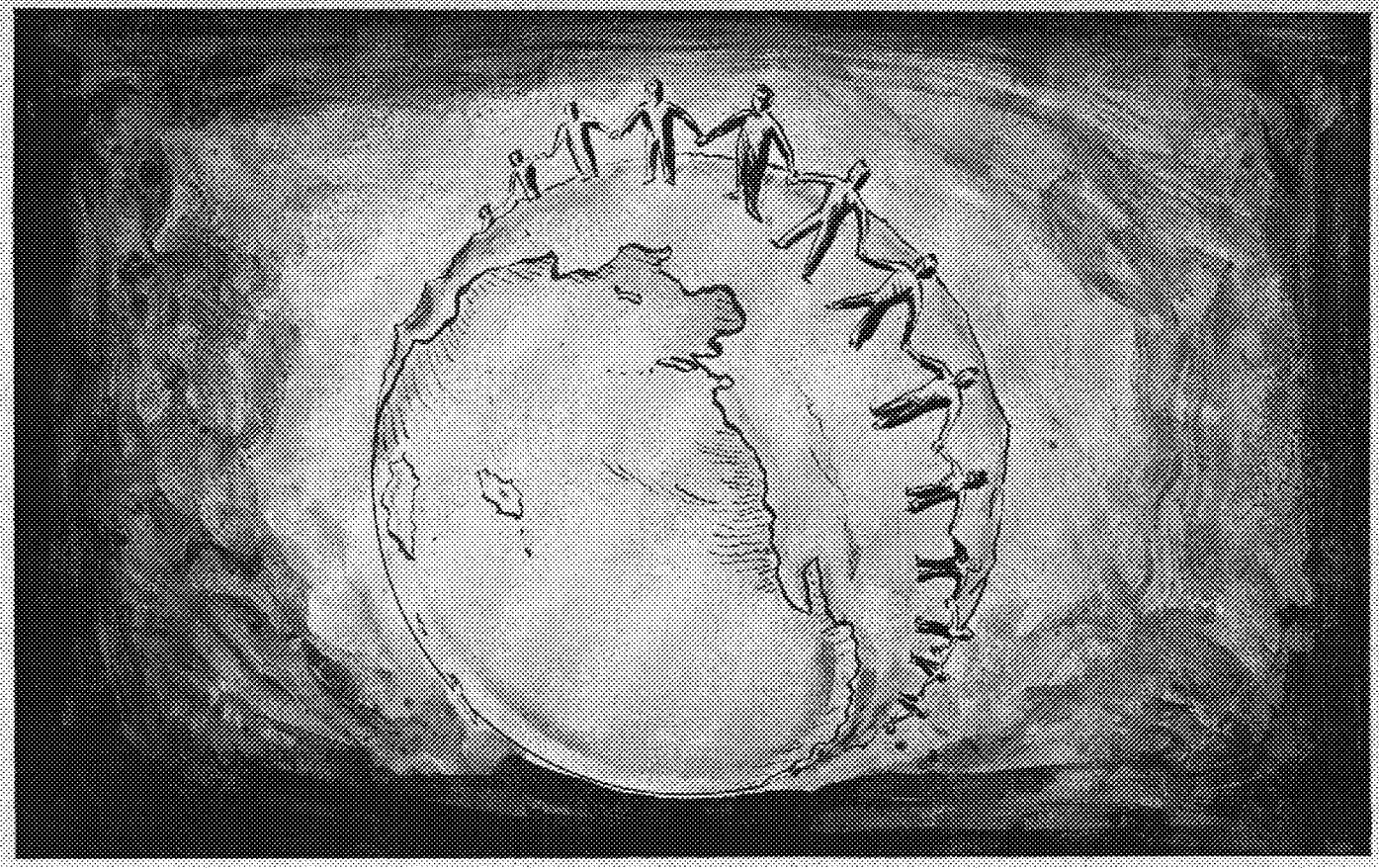
I believe that there is too much inbreeding in our engineering schools. The natural tendency for a school to select teachers from its own immediate graduates should be resisted and discouraged.

Teachers With Experience

An associated evil is the engagement or continued retaining of teachers who have had little or no real outside experience in professional practice. The students are thus deprived of necessary elements of professional education—the practical application, the engineering approach, the training of engineering judgment, the background of experience, the inspiration of achievement, and the professional viewpoint.

How many of the teachers in our engineering schools really know how to teach? How many of our engineering teachers know how to inspire the students, to teach them to think, to make them grasp and retain fundamental concepts, to train their

(Continued on Page 236)



ESPERANTO

"An International Auxiliary Language"

BY JOHN LINDSLEY, PHYSICS, '46

IN isolated pre-war America the language difficulty from which Europeans have suffered for decades was only beginning to be felt. We had begun to see that our ignorance of Spanish was a continual barrier to Pan-American trade, for so long as South Americans were forced to use our language in dealing with us they preferred to deal with us as little as they could. To improve our relations with them we had begun to learn Spanish.

But after the present war Americans, and especially American technicians, will be working in all lands. We will be dealing with every people in the world, and to deal with them we will have to communicate with them. Learning to speak Russian, Greek, Polish, Chinese, Lithuanian, and the multitude of other languages is a job not preferred by engineers.

The problem of communicating with these peoples must be solved in another way than by learning all their languages. One solution is to employ interpreters in speaking with them and translators in reading their literature. Europeans have been getting by for a long time by doing this sort of thing.

But speaking through an interpreter can never be as satisfactory as speaking directly, and translating a book into a great many languages is prohibitively expensive unless the book is very popular. There must be a better solution to the problem than that.

A Common Language

If only there were one language common to all people interpreters would be unnecessary; one translation of a book would immediately make it available to the world. Such a language could not replace existing languages, but it could complement them. It would have to be neutral and international, but chiefly it would have to be simple.

For three centuries philosophers have dreamed of such a language. One of the first was Descartes, who discussed the problem in a letter dated 1629. Since that time hundreds of languages have been invented or suggested. Many of them have used both numbers and letters in their vocabulary. Not all aimed at simplification. One invented in 1653 by an Englishman, Sir Thomas Urquhart, boasts 11 cases, 11 genders, 4 numbers, 11 tenses, 7 moods, and 4 voices! The first artificial language to gain any popularity was Volapük, but its fall was as swift as its rise. The principal objections to it were that it was too arbitrary in construction, and not international enough in vocabulary. Idiom Neutral, an offspring of Volapük, was an improvement over it but was still not satisfactory. The real solution to the problem came with Esperanto, the invention of a Pole, Dr. Zamenhof. Dr. Zamenhof became interested in the language problem early, invented an artificial language to solve the difficulty when he was in preparatory school, worked on his project while at college, and spent the rest of his life perfecting it.

Esperanto, the result of his labor, fills all the requirements for a universal auxiliary language. It is neutral and international because its words, or rather the roots of its words, are borrowed from all the major European languages. For Esperanto, while it is artificial in the sense that it was invented by a single man, in another sense, is not artificial at all. Besides its vocabulary, its pronunciation and grammar are adaptations of those of existing languages. As for idiom, it has none. In many ways Esperanto is what any modern language would be if it were stripped of its irregularities, idioms, and surplus vocabulary.

The vocabulary of Esperanto is ingeniously constructed. The entire vocabulary is built from a comparatively small number of root words (about 900) by combining with a handful of prefixes, suffixes, and special endings. To illustrate how this is

(Continued on Page 228)

COURTESY RECRUITING PUBLICITY BUREAU

Future Officers Now

SOLDIERS IN COLLEGE

The Army Specialized Training Program

BY LT. RUDOLPH WEISBRICH

DURING the past few weeks all who have been on the University of Minnesota campus have seen many men in Army uniform marching smartly from building to building or seriously engaged in work in various class rooms. These men are pursuing courses under the Army Specialized Training Program; they are soldiers in college—not college boys in uniform.

A modern war such as the one we are engaged in requires many highly trained men, for every branch of the Army today is equipped with highly specialized equipment. Engineering problems of various kinds constantly arise and must be accurately and promptly solved.

The Army Specialized Training Program was established to supply the needs of the Army for specially trained men. The objective of the program is to give specialized technical training to soldiers on active duty for certain Army tasks for which its own training facilities are insufficient in extent or character. To that end the Army has contracted with selected colleges and universities, such as the University of Minnesota, for the use of their facilities and faculties in effecting such training of selected soldiers in courses prescribed by the Army.

The Army Specialized Training Program includes basic and advanced levels. Men are assigned to the highest program level for which they are qualified.

The objective of the basic program is to train men in work generally preparing them for their tasks in the arms and services, through the study of subjects such as basic mathematics, physics, and chemistry and is open to men who are not more than 22 years old. On the completion of this program, or so much of it as is deemed necessary and advisable, men will be recommended on the basis of their qualifications for assignment to an Officer Candidate School, for immediate service with combat troops, or to an advanced Army Specialized Training Program.

The advanced Army Specialized Training Program is open to men 18 years old or more who have completed the basic program, or who have had one or more years of approved college work, and whose aptitudes, as shown by test scores, and qualifications, as determined through interview by selection boards, are sufficiently high to warrant advanced Army specialized training. Advanced programs are a series of 12-week terms which vary in number according to military requirements and include work in such fields as the following: pre-medical and medical, pre-dental and dental, pre-veterinary and veterinary; all branches of engineering; and special programs in mathematics, physics, chemistry, rare languages, military government, and personnel psychology. All such programs are directed to training for particular military tasks in the various branches of the service.

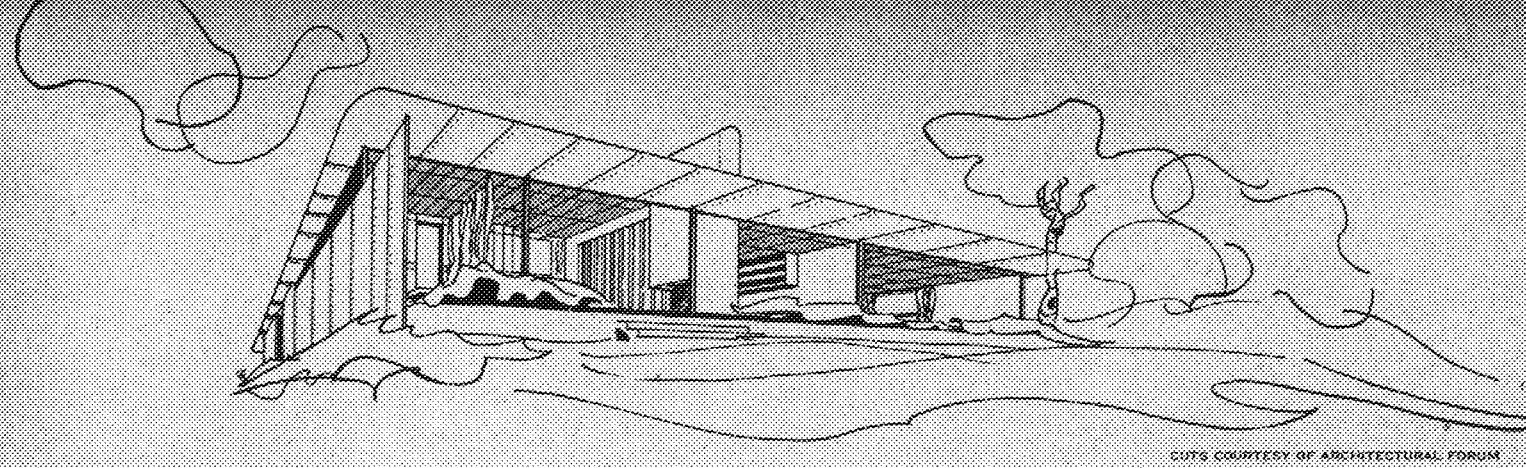
In order for a soldier to be selected for the Army Specialized Training he must first pass the Army General Classification Test with a score of 115 or better. This examination consists of 150 questions (including numerous problems) principally covering mathematics, chemistry, and physics. Those who do pass the examination go before a board for an interview.

Upon his arrival at the appointed university the soldier is assigned to a class in a course he seems best fitted to pursue. These courses cover regular university work and university standards are strictly maintained. The average Army Specialized Training Program student is taking the equivalent of 19 credits of work.

At the University of Minnesota the soldiers follow a rigid schedule. First call is at 5:40 in the morning, breakfast at 6:30, first class 8:30, dinner at 11:30 or 12:30, last class at 5:30 and supper at 5:45 o'clock.

From supper until 7:30 is free time. Supervised study begins at 7:30 and continues until 10:00, during which time instructors are available at Sanford hall to help those who have questions. Taps is at 10:30 o'clock. On Saturdays there is some military exercise, such as a parade, inspection, etc., between 7:30 and 8:30 in the morning and classes end at 3:30 in the afternoon. The men are at liberty from then until 6:30 Sunday evening and may obtain passes to leave the campus during that time.

Successful graduates of the program will be immediately available to attend Officer Candidate Schools and technical schools of all the arms and services. The Army Specialized Training Program is not earmarked for any particular arm, service or component. Graduates will be assigned according to need in the same manner newly inducted men entering the Army are classified and assigned, primarily on the basis of pre-induction skills or professions. The program is Army-wide in scope.



CUTS COURTESY OF ARCHITECTURAL FORUM

A Peek At

THE POST-WAR HOUSE

BY MAURICE BRESLAW, ARCH., '44

TOMORROW'S house will be a dwelling far superior to its pre-war predecessor. How long it will take for it to overcome outmoded practices, hamstringing restrictions, and sentimentality is problematical. However, great strides in prefabrication, development of lightweight metals, and durable plastics are a few of the stimuli that should hasten its universal availability.

The house must no longer be a rigid box with holes punched in it here and there that grudgingly admit some light and air. Instead it will be a spacious, flexible shelter, yielding to the manifold and variable needs of its occupants. Its location will be carefully planned to admit an optimum of light, breeze, and view.

Rooms will be arranged to save steps and eliminate necessity of cutting through one room to get to another. For example, as the accompanying plan indicates, kitchen and laundry are combined into one uninterrupted area. A step or two through the service door lies a conveniently located drying yard. The kitchen is near the main entrance so that door answering becomes less of a nuisance. Supplies can be brought directly into this service area no matter which entrance is used. The dining space is situated just off the kitchen, minimizing the serving distance. A curtain, separating it from the rest of the living room, can be withdrawn, and the dining space becomes a part of the living room. Since this dining area is used only during a small percentage of the entire day, it can well become an extension of the living room or serve as an auxiliary work space or play area for small children. Similarly, at the other end of the living room is the combination room or den which can be closed off by a telescoping door. The long exterior wall of the living room is glass and opens onto a terrace, presenting a closer indoor-outdoor relationship.

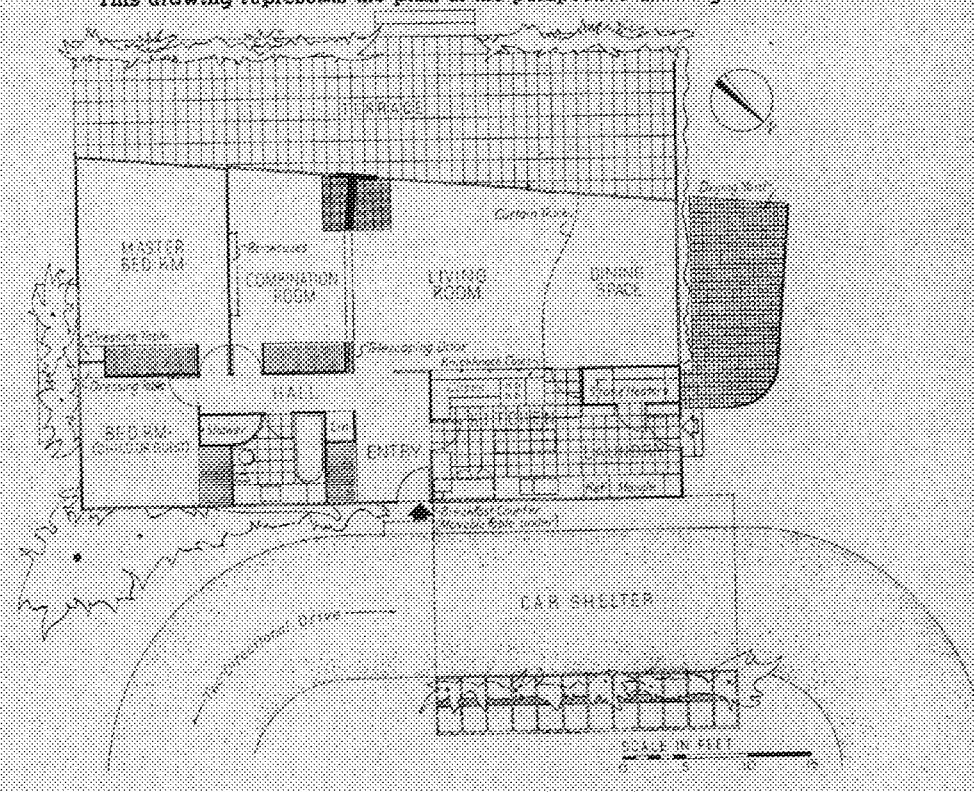
On entering this house you can go directly to bedroom, kitchen, or bath without passing through a living room that may be filled with guests. The bathroom is so situated that it relates primarily to the bedrooms and can be reached from either of them without the need of crossing the main line of entry.

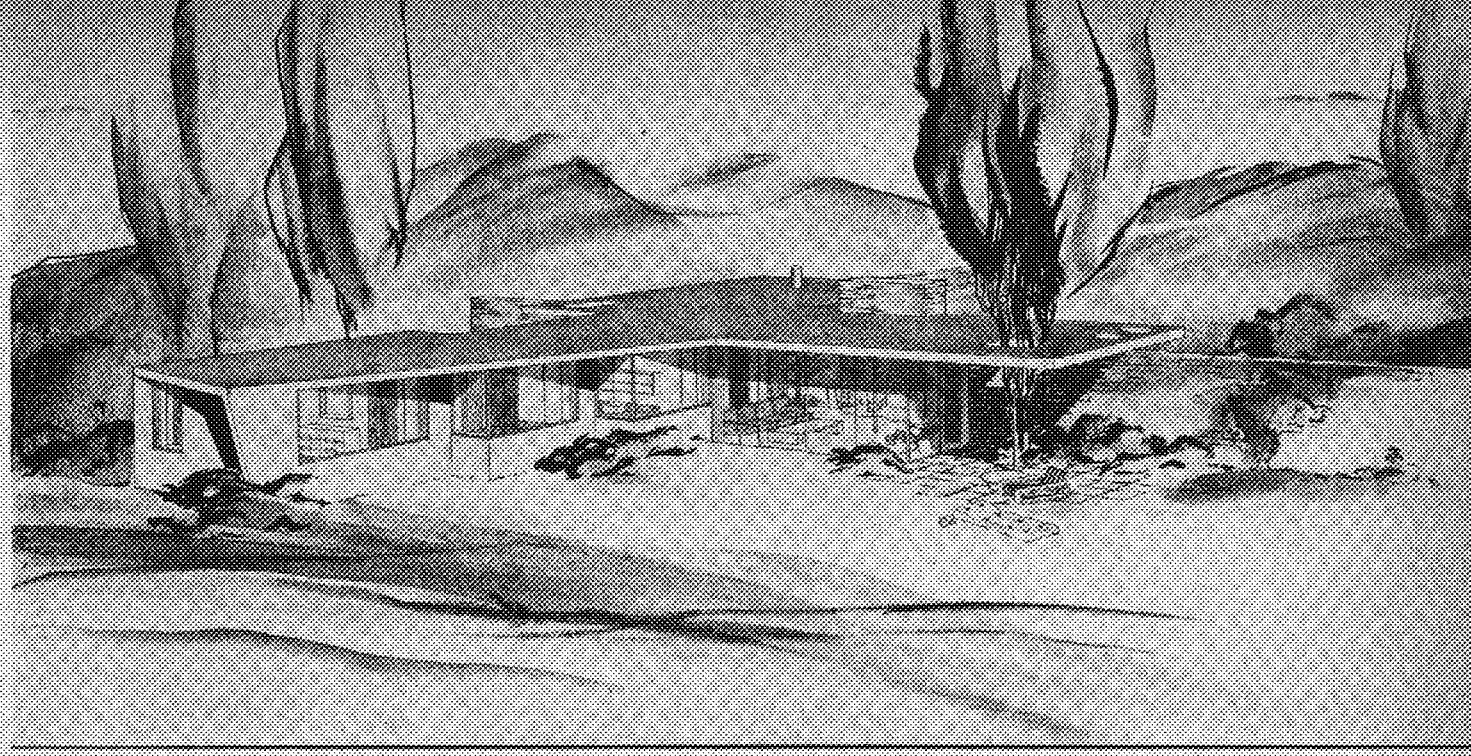
Basements and attics are done away with as the number of storage spaces increases, and they are more conveniently located.

Interior furnishings and mechanical equipment will be designed to obviate many present-day shortcomings. The kitchen stove, for example, will have its oven located at some rational height and with a transparent door, in sharp contrast to the "beautiful, but dumb" stoop, squat, and squint models of recent years. Similarly, refrigerators will be "lifted" and will not be nearly so deep as at present. Separate compartments operate at different temperatures for frozen foods and thawed or dehydrated foods. Special ice cube compartments can be removed from the outside so the doors need not be opened and cold air wastefully emptied in the process. Sinks will wash, sterilize, and dry dishes, over and above handling refuse. The kitchen will combine with the laundry to form a single work area, but whether this area gains or diminishes in importance depends upon the extent private enterprises take over its functions and the degree of improvement in home appliances.

Stability of water temperatures in the

This drawing represents the plan of the perspective drawing shown above.





shower will be one of the more welcome bathroom improvements. A clear, condensation-free mirror (accomplished with heating coils that warm the glass) is another. There will be roomier medicine cabinets and shower stalls, as well as walls which will be of plastic or glass. For the ladies, a drying cabinet for personal laundry, multiple mirrors, adjustable to many angles, a wash basin large enough to bathe a baby, make-up counter for cosmetics, a flexible hose spray for rinsing after shampoos, sterilizing lamps and a built-in sunlamp. Standardization of bathroom units will result in careful study and development of details and accessories which may or may not be installed, much the same as standard equipment on differently-priced cars.

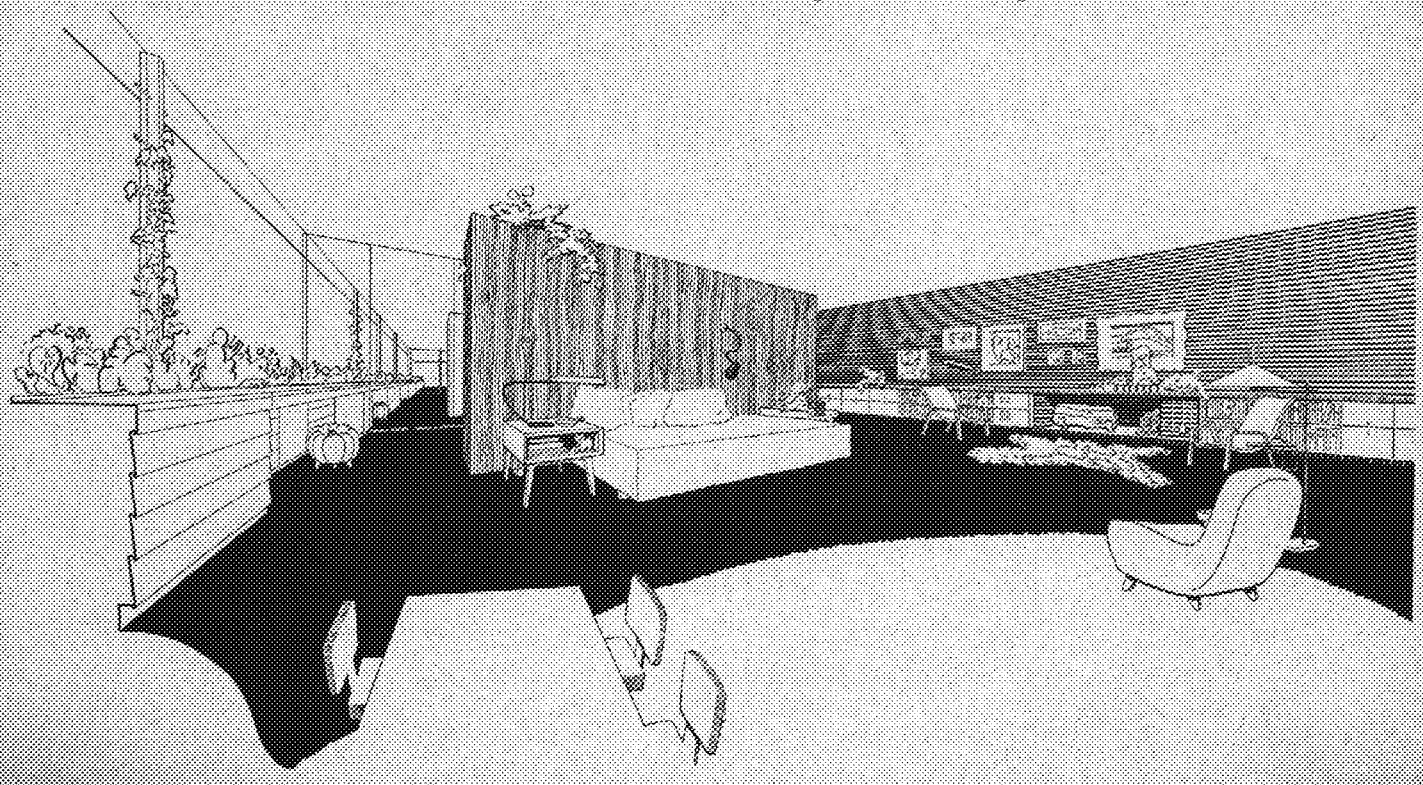
The bedroom closet designed as a movable storage unit, will have raised floors and rounded corners to facilitate cleaning, moth-repellent linings, built-in drawers, specialized clothes hangers, suitcase racks, proper lighting. Other indoor storage units will provide space for toys and games, cleaning equipment, linen and blankets. There will be places for card tables, room for parking the baby carriage, and "dead" storage space for trunks. On the outside, or within easy reach of it, will be space for gardening equipment, bicycles, and similar items.

Sliding doors and windows of the living room define areas that alternate as rooms and porches. Sound-deadening materials will be used to segregate portions of the living room for study or leisure reading and writing. It follows then that a noise-absorbent living room makes for quieter bedrooms. In addition, non-parallel walls, sloping ceilings, or curved surfaces can acoustically correct rooms for listening to radio music. Bookshelves, cabinets, and lighting fixtures will be supported by the walls. Lighting is, of course, indirect.

Features like air conditioning, constant heat and humidity control, and radiant heating systems will come to be expected specifications.

Simplified, mass-produced, prefabricated building elements will be the greatest single factor affecting the house. These will not merely be structural parts, such as walls and floors, but complete kitchen and bathroom units that can be varied within modular limits. Standardized prefabrication will effect construction segments, rather than complete houses. Its purpose is to permit a diversity of possibilities not to produce banal repetition. Liberally, it might be considered as a sort of an architectural tinker toy. Good examples of recent advances in prefabrication appear in the April, 1943, *Pencil Points* and the September, 1942, *Architectural Forum*. Wartime housing exigencies have dovetailed with prefabrication principles so that many developments have been realized of late.

The improvements described here are a comparative few of the suggested possibilities. None of them is astounding or even novel. In fact, many have long been considered and often employed by the architect, but it is only under a standardized system of mass production that the full benefits of their ultimate development can avail the greatest number.



ESPERANTO

(Continued from Page 224)

done, consider the root *fort-*. By adding the noun ending *-o* it becomes *forto* meaning "strength"; by adding the adjective ending *-a* it becomes *forta*, "strong"; by adding the suffix *-ig-* which denotes causative action and the ending *-i* it becomes the verb *fortigi*, "to strengthen"; and so on. Incidentally, the root *fort-* plainly has the same base as our "fortitude" and "enforce." The device of forming scores of words from every root decreases tremendously the number of words that must be memorized in learning the language. The fact that most of the roots are already familiar reduces the labor still further.

The pronunciation of Esperanto is based on the principle "one letter, one sound." An advantage of this is that you can spell any of its words you can pronounce. The vowels are pronounced as in Italian. "A" is pronounced *ah*, "e" is pronounced *ay*, "i" is pronounced *ee*. "U" is pronounced like *oo*, and "o" is given the long sound. The consonants are pronounced as in English with a few exceptions. The most important thing about the pronunciation of Esperanto is that there are in it none of the unfamiliar sounds that make the pronunciation of French or German difficult for most Americans. The accent in Esperanto is always the same, falling on the next to the last syllable. The pronunciation of Esperanto and the construction of its words have been arranged so that the language sounds natural and pleasing when spoken, and when written looks like words and not jumbled letters. "*Patro nia, kiu estatis en la cielo, sankta estu via nomo;* ..." looks and sounds like any modern language.

One Page Grammar

The complete grammar of Esperanto fills about one typewritten page—contrast that with English grammar. Different endings distinguish the tense of verbs. For instance, "give" is *don-as*, "gave" is *don-is*, and "will give" is *don-os*. There is no difference, however, between the endings of verbs with singular subjects and those of verbs with plural subjects, and the verb ends the same whether its subject is in the first, second, and third person. That is, the same verb *donas* would be used in "I give," "we give," and "they give." The theory of this is that the subject is no reason for the verb retelling that information. Nouns in Esperanto have a different ending, *-on*, in the objective case than in the nominative case, which ends in *-o*. This may seem an unnecessary complication, but the result of having these endings different is that the words of a sentence can be put in any order desired without changing their meaning. For example, *La patro amas sian filon* and *sian filon amas la patro* mean the same thing, "the father loves his son." If you try to put the English sentence in the same order as the second Esperanto example you have, "his son loves the father," which has quite a different meaning. Being able to arrange the words of a sentence in any order desired is very useful in placing the emphasis where it is wanted. Moreover, the possession of an objective case makes Esperanto much easier to learn for many peoples whose native tongues have several cases.

With so many simplifications of vocabulary, pronunciation, and grammar—and with no irregularities at all—Esperanto should not be hard to learn. It isn't. An American technician could learn enough Esperanto in six weeks' spare time study to converse quite freely with a French or Russian Esperantist. To learn enough French to do as well in that language would ordinarily take a year or two; to learn enough Russian would take God-knows-how-long.

Simple Yet Adequate

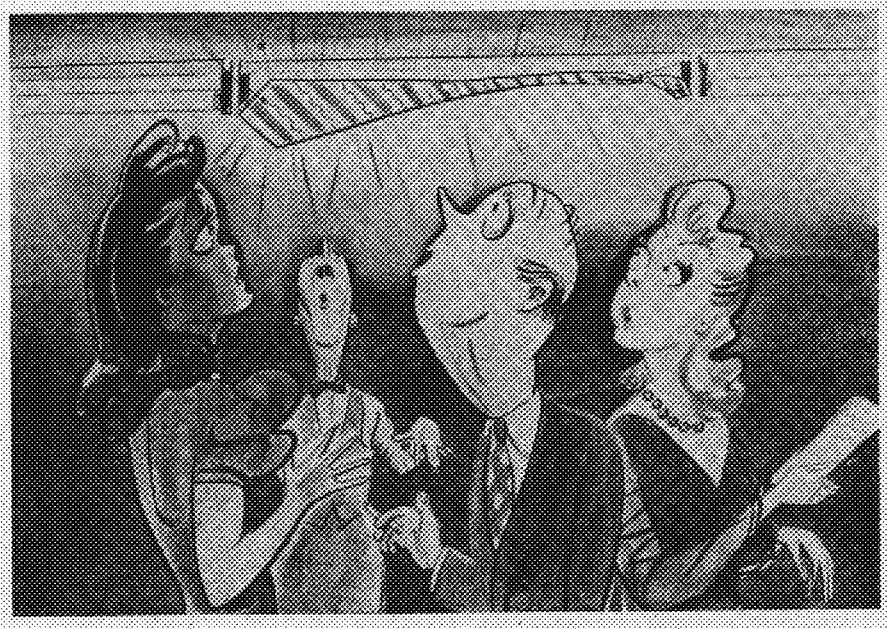
It is important to realize that the simplification that makes Esperanto so easy to learn has not cost it adequacy of expression. Esperanto is completely adequate as a means of expressing thought. Simplification did cost Esperanto the large and varied vocabulary and abundance of synonyms which a language must have to express emotions. But Esperanto was never intended to be a literary language; there are plenty of them already. Esperanto is easy to learn and a completely adequate means of expressing thought. An enormous amount of time and money would undoubtedly be saved if it were universally spoken. Then why hasn't it been adopted?

Selling Esperanto is like selling telephones; no one will buy either unless he thinks a lot of other people will do the same. Dr. Zamenhof tried for two years to interest people in Esperanto and could not so much as get his work published until he financed the publication himself. Progress, toward adopting his invention has become little easier since. As far as the United States is concerned, we have not yet encountered the language problem to any extent, but in Europe considerable progress has been made toward the adoption of Esperanto, especially in pre-war France. There it was taught in many of the schools, often as a preparation for difficult languages such as Latin and Greek. Less progress has been made in Germany. It seems the Germans have a plan of their own for solving the language problem. Before the coming of the Nazis, however, several influential Germans had advocated the adoption of Esperanto. Among them was Professor Ostwald, of Leipzig. The British resistance to change has prevented Esperanto from making very much headway in England, although it has made some. The English fancy their own tongue as an international one, and it must be admitted that at present it comes closer to being that than any other language. But national pride among the peoples of the world is too great to permit the acceptance of any national language as a universal one.

Isolationism is dead, or we hope it is. After this war there will be more international trade than the world has ever known before; trade will be carried on not only in commodities, but also in ideas, knowledge and philosophy. We see that distance can no longer separate peoples; the next question is, how much longer can difference of language separate them? The answering of that question must be left to history. Only this can be said now:

For Practical People

In spite of its worth, it is not likely that Esperanto will ever be adopted if the job is left to philosophers and academicians. To see the broad practical value of an international auxiliary language and then to do something about adopting it takes the open mind and progressive spirit of the scientist, businessman, and engineer. Such an adoption would most directly benefit those classes: it would help the scientist by enabling him to follow more easily the progress of foreign research; the businessman, by enabling him to keep in closer touch with foreign markets; and most of all the engineer abroad, by enabling him to speak directly to his subordinates and to correspond with his superiors in a common language.



"When that fluorescent light burned out, Smithers put up the tie his wife gave him for Christmas."

Saved! Tons of tin!

For years telephone cables have been spliced in a very satisfactory way. But the solder joint contained 40 per cent war-vital tin.

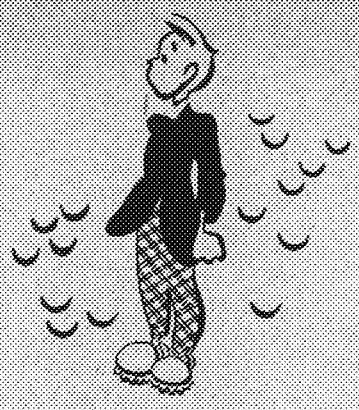
So Bell System men devised a new type of joint which saves up to 80 per cent of the solder. A "Victory Joint" they called it.

The new technique has been adopted throughout the System with the result that 600,000 pounds of tin and an even greater amount of lead can be saved in a normal year's construction.

This is another example of the nation-wide cooperation of Bell System people in fulfilling their ideal —service to the nation in peace or war.

Editorial Comment

AS WE SEE IT



A Question of Fees

Another summer is on the way, and with it another accelerated program for I.T. men—this time compulsory. A good many of those abstract and worried looks being worn by engineering students are undoubtedly caused by the struggle to try to figure out where the necessary $61.60 for summer quarter fees is coming from. This represents an increase of $20.20 over the cost of a regular quarter's tuition and incidental fee.

A Techsnolog survey made in November, 1941, indicated that the average Institute of Technology student earned slightly better than 60 per cent of the total cost of his college education through employment through the summer months. Naturally, this source of income will be considerably curtailed by a full-time schedule of classes. Last summer an optional accelerated program was put into effect and was attended by a fairly large number of students. Two features of this program left a very bad taste in the mouths of most of the students who attended. (1) The fees were about twenty dollars higher than those of a regular quarter, and (2) in some departments there was a definite shortage of capable instructors. The shortage of instructors was probably due to the fact that the attendance of the summer quarter was greater than anticipated. However, no steps were taken to correct this deficiency. We can only hope that this will not occur again.

The higher fees charged during the summer quarter are again going to be necessary this year because the summer session must be self-supporting. It receives no appropriation from the state to cover part of the cost of the session. Whether or not the university tried to secure such an appropriation, we are not in a position to say. We can say with certainty, however, that the higher fees are going to work a definite hardship on most of the students, and that they do not like it. We are sure that the last is unanimous.

A Parting Shot

Now that the last Techsnolog for the expiring school year is in your hands we of the staff want to tell you that we have enjoyed producing a magazine that we hope has been of interest to you. To those of you who are no longer associated with the University but are either in the armed forces or industry we hope that the Log has carried that spirit of the Institute which makes every Minnesota engineer feel that his school is the very best.

This year because of the war and the resulting accelerated program the normal course of the Techsnolog has been interrupted. Many have left for service and others have finished their courses early; all of this has added to the work and responsibility of those who remain. It is up to us to continue as we have in the past so that the Techsnolog will not be another of the war casualties. This is imperative since the Techsnolog does much to promote unity in the Institute.

Almost everyone has heard that active participation in some extracurricular activity is a valuable part of any university education. The Techsnolog has provided many students with just such an activity and has developed in them the valuable social asset of being able to cooperate with others. It also has furnished an outlet for imagination and creative ability that might otherwise go unnoticed.

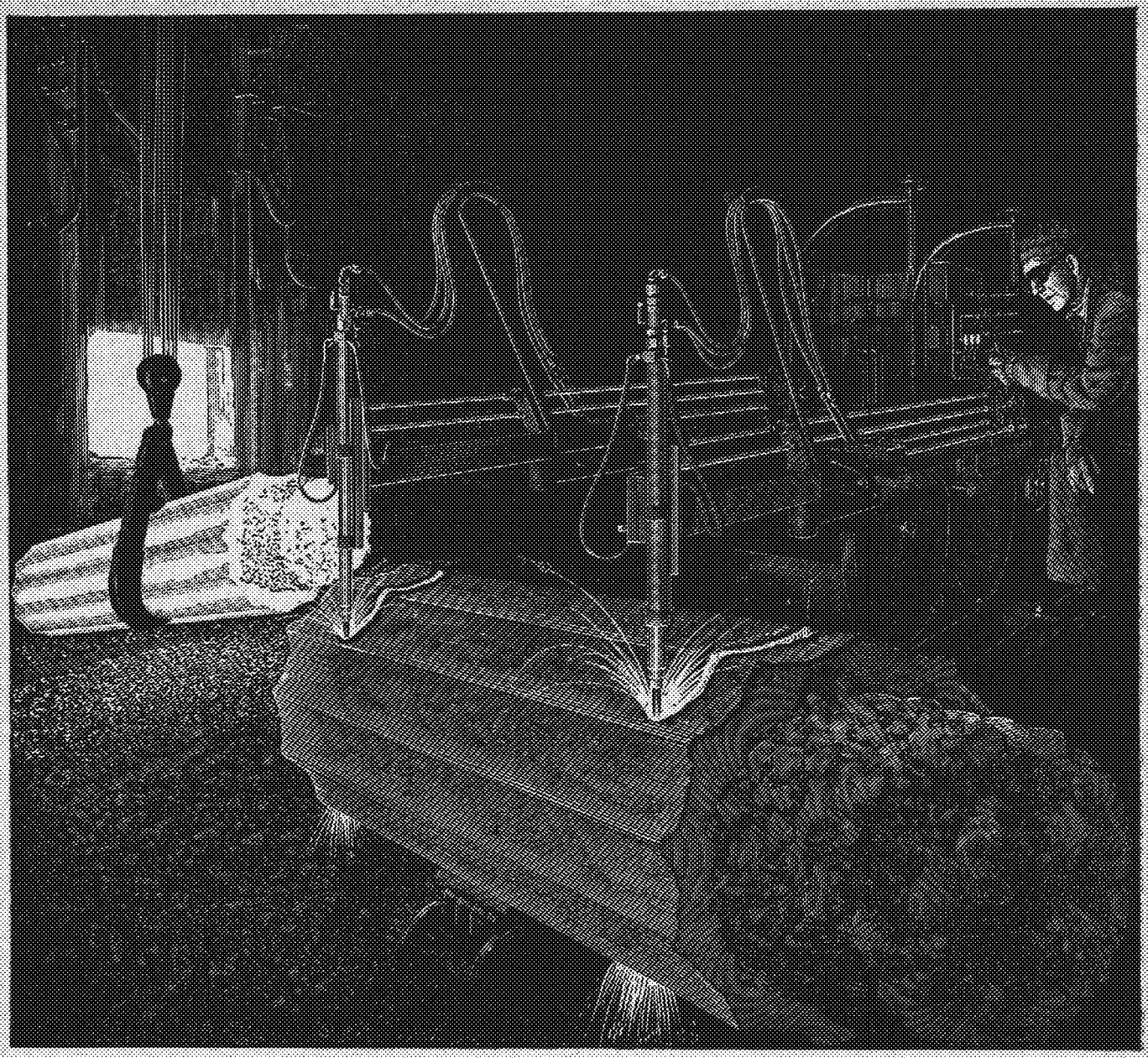
You may think that because you have never had experience in publication work or because you don't know anyone working on the Techsnolog you could not get on the staff. This is not true, since all that is required is the desire to learn. And if you have some ideas for the improvement of the magazine it is your privilege and duty to see that the necessary changes are made. The best way to realize these changes is to get on the staff. So be sure to make use of the staff interest blank.

Are You A Softie?

The majority of the students in the Institute of Technology are soft physically. Very few take part in any active sport either in school or out during the entire year. Now under the accelerated program when there is no opportunity to harden up on a summer job as in the past it is important that a substitute be found since good physical condition usually means better health.

Intramural sports offer a partial solution to the problem, but everyone cannot participate under such a plan. Compulsory physical education for those who are not engaged in some physical activity is probably the best solution. Some of the many students who have to work to stay in school say that such a program would interfere with their education. These students probably have several vacant hours during the course of a week which they do not utilize for any particular purpose. It is possible that if they used these several hours for physical training they would be less subject to fatigue and consequently could accomplish more in the remaining time. In addition they would not only find themselves feeling better but would be engaged in an activity with their fellow students.

It is essential that everyone keeps himself in the best possible health so that he may contribute to the war effort in his fullest extent. And it is through physical training that we can attain the best possible health.



A quick trim for a metal giant

MAMMOTH ingots of steel for war weapons must be "cropped" or trimmed at the ends before forging. Formerly this job was done slowly and laboriously on a heavy press, but today the huge ingots are sliced neatly and quickly by the oxyacetylene flame.

Using a new heavy cutting technique developed by Airco Research Engineers and cutting through metal as thick as 36", the oxyacetylene flame trims off both ends of this ingot at once in approximately 11 minutes, compared to several hours required by other methods. The new ingot cutting machine designed and built by Airco engineers especially for this job guides the movement of the oxyacetylene cutting torches in an arc corresponding to the ingot contour.

This new flame cutting application typifies the ever-expanding usefulness of the oxyacetylene flame in American industry. Spurred by the need for swifter war production, industries are finding more and more ways to accelerate manufacturing with oxyacetylene flame and electric arc processes.

If you want to keep posted on some of the most recent developments and applications of oxyacetylene flame and electric arc processes, write for a free copy of the illustrated booklet, "Airco in the News." Please address your requests to Air Reduction, Room 1656, 60 East 42nd Street, New York.

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ALUM NOTES

EDITED BY STAN GENDLER, M.E. '44

DIES IN BOMBER CRASH

Lt. Leslie E. Reece, I.T., '42, was killed in the Latin-American area April 22, according to a notice from the War Department received by his mother, Mrs. Ingrid Reece, 3120 Stevens Ave., Minneapolis. With six members of his crew he was killed in the crash of an Army bomber just four days after his twenty-third birthday.

EXECUTIVE OFFICER

Major Paul A. Teyereisen, E.E., '39, was recently appointed Executive Officer of the Signal Corps School by Brig. Gen. Henry L. King, the commandant of Camp Crowder, Missouri. Major Teyereisen recently graduated from the Command and General Staff School at Fort Leavenworth, Kansas. His parents, Mr. and Mrs. J. P. Teyereisen, live at 201 Ninth St., Moorhead, Minn.

MAJOR AT FT. SHAFFER, HONOLULU

Weston M. Potter, E.E., '40, son of Prof. O. W. Potter of the Drawing Department, was recently commissioned major in the Signal Corps of the U. S. Army. He is at present stationed at Fort Shaffer, Honolulu, T. H. He reports that for the week after December 7 they were on duty 24 hours a day and hardly had their clothes off in that time.

KILLED IN ACTION IN NORTH AFRICA

One of the most popular of recent Minnesota student leaders, Lt. Robert J. Lund, Ch.E., '41, was killed in action on March 30 in the North African theater. He was the son of Mr. and Mrs. Bert O. Lund of Stillwater. During his four years on campus he was a member of the S.A.E. fraternity, the A.I.Ch.E., Iron Wedge, and the Inter-Fraternity Council. He entered the Army in October, 1941.

EXECUTIVE OFFICER AT TEXAS AIR BASE

Major Helmer A. Holmstrøm, C.E., '32 is Executive Officer at Childress Army Air Base, Texas. Since going on active duty March 4, 1941, Major Holmstrom graduated from the Adjutant Generals School and the Command and General Staff School. He was Post Adjutant at Brooks Field, San Antonio, Texas, for more than a year.

WING SIGNAL OFFICER AT FLORIDA BASE

Lt. Col. Steve Galler, E.E., '32, reports that he has had the pleasure of meeting Minnesota men in every branch of the service. He is Wing Signal Officer attached to the Army Air Force School of Applied Tactics at Orlando, Florida. In December, 1941, he had a date to have Christmas dinner in Manila with a classmate, Lawrence Hendrickson, E.E., '32, who is now a prisoner of war in the Philippines. He missed the date and also the chance of capture by the Japanese by a matter of a few days.

RETURNS FROM SOUTH AMERICA

A. R. Krefting, M.E., '39, Mrs. Krefting and their two children arrived in Minneapolis the latter part of March after a 45-day boat and train trip from Lima, Peru. The Kreftings lived in South America for three years—first in Bolivia and then in Moraroches near Lima—while Mr. Krefting, a mining engineer, was employed by the Cerro de Pasco Mine interests.

AIDE TO GENERAL RIDER

Col. Norman E. Hendrickson, E., '16, is Chief of Staff with General Rider who commanded the assault troops in taking over Algiers. Weeks before that Colonel Hendrickson had assisted with the plans in London. Mrs. Hendrickson is wearing a beautiful filigree bracelet, a memento from Algiers, and is looking forward to her husband's report about his visit to the holy city in the mountains as the guest of an Arab chieftain, El Said.

DESIGNER FOR CURTISS-WRIGHT

Henry P. Huff, Jr., Aero.E., '42, of El Paso, Texas, is in the Aerodynamics Department of the Curtiss-Wright Corporation, St. Louis, Missouri. His address is 5332 Gladstone Place, Hunt Village, Normandy, Missouri.

COMMISSIONED ENSIGN IN SEABEES

James Lindsey, C.E., '39, has been commissioned an ensign in the civil engineering battalion. Ensign Lindsey, now in Norfolk, Virginia, for training, was formerly with the United States Bureau of Reclamation, Denver, Colorado.

ANTI-AIRCRAFT COMMANDER

Captain John Goettl, C.E., '36, has been stationed in Iceland the past year as commander of an anti-aircraft unit in the Coast Artillery. His unit was the first in Iceland to subscribe 100 per cent to the 1943 war bond drive.

WITH UNITED AIRLINES AT SEATTLE

Wallace W. Wilcox, Aero.E. and B., '40, has been transferred to Seattle, Washington, for an indefinite period in connection with his work in the engineering department of the United Airlines at Boeing Field.

IN CHARGE OF CONSTRUCTION

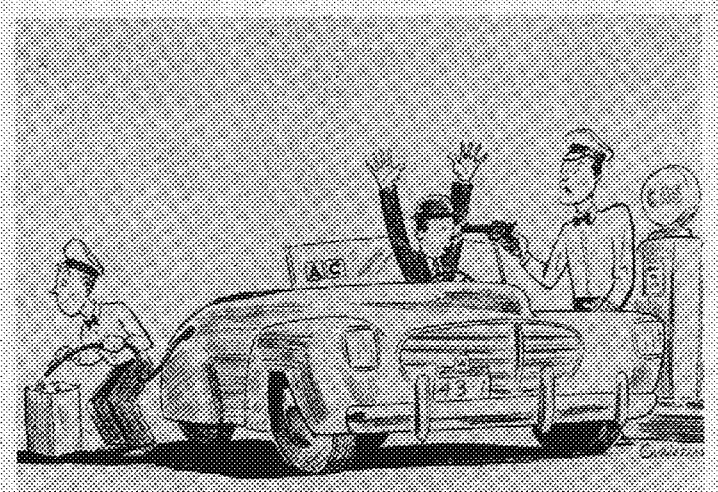
John E. Davidson, Arch., '28, is now chief engineer for the McWilliams Dredging Company of Chicago and is in charge of all construction work on the island of Greenland. His parents are Mr. and Mrs. J. R. Davidson, 1841 Sargent Ave., St. Paul.

RETURNS FROM SERVICE IN ALASKA

Lt. James O. Glorvig, Ch.E., '40, 3715 Emerson Ave. North, Minneapolis, was recently home on leave after two years in Alaska. Stationed at Anchorage, Lt. Glorvig reports that the Matanuska valley was much like Minnesota in climate. American soldiers like southern Alaska so well that many are buying property with intentions of remaining there.

PROMOTED WITH PAN-AMERICAN AIRWAYS

Don Q. Lampland, Aero.E., '38, has been named assistant to the division engineer of the Atlantic Division of Pan-American Airways with headquarters in New York. He joined the staff of Pan-American in December, 1939, as an apprentice engineer and recently has been serving as a junior engineer in charge of weight control and liaison work with the Civil Aeronautics Authority. He was president of the class of 1939.



Molecular Keys To A New World

VAST NEW SOURCES of raw materials . . . the equivalent of those which might be found in a great new continent . . . opened to America when CARBIDE AND CARBON CHEMICALS CORPORATION, a Unit of UCC, started building synthetic chemicals from water, salt, air, and hydrocarbons.

These chemicals are usually water-white liquids, although some are gases or solids. Basically, they are compounds of carbon and hydrogen—united with oxygen or with chlorine to build up an endless series of chemicals. The models of those molecules of chemicals shown here are many millions of times actual size.

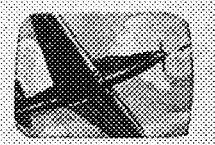
These chemicals are the raw materials for fabulous plastics . . . amazing textile fibers . . . life-saving drugs . . . vitamins by the carload . . . synthetic rubber . . . more things and better things than were possible before their existence.

Since these chemical wonders are obtained from abundant domestic sources, their use has contributed materially to the nation's self-sufficiency. Through research, American ingenuity, and patient development, scarce natural products have been duplicated or improved upon. Great new industries and great new materials that contribute to the nation's strength have come into being. And America has become a leader in a field as native as its own soil.

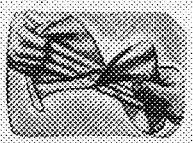
Broadly speaking, the uses of many of the synthetic organic chemicals developed by CARBIDE AND CARBON CHEMICALS CORPORATION are just beginning. The already established uses are indicative of their vast future values to mankind.

BUY UNITED STATES WAR BONDS AND STAMPS

BETTER MEDICINES! Amazing medicines like the sulfa drugs, synthetic vitamins, powerful insect repellents, and anti-malarial drugs depend upon synthetic organic chemistry.



COLD PROOF! Coolant for liquid-cooled aircraft engines and base for anti-freeze in military cars and trucks is ethylene glycol, an important synthetic chemical.



MAGIC PLASTICS! Wonderful plastics that look like glass, stretch like rubber, and which are proof against water, sunlight, oils, and many chemicals are made from VINYLITE synthetic resins.

MAN-MADE! All types of synthetic rubber require synthetic organic chemicals for their manufacture. Here's hope for tires for you in the future.

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Principal Products and Units in the United States

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CHEMICALS
Carbide and Carbon Chemicals Corporation

ELECTRODES, CARBONS AND BATTERIES
National Carbon Company, Inc.

INDUSTRIAL GASES AND CARBIDE
The Linde Air Products Company
The Oxweld Railroad Service Company
The Prest-O-Lite Company, Inc.

PLASTICS
Bakelite Corporation
Plastics Division of Carbide and Carbon Chemicals Corporation

THE ? MARK

SLIPSTICK PHILOSOPHY BY MELVIN MARK, M.E., '44

A young couple about to be married were looking over a house in the country. After satisfying themselves that it was suitable, they made their way home.

During the return journey the young lady was very thoughtful, and when asked the reason for her silence replied, "Did you notice whether or not there was a W.C.?" (W.C. meaning water closet.) He not having seen any, proceeded to write to the landlord inquiring about the matter. The landlord did not understand what W.C. meant, but after thinking for some time, he came to the conclusion that it meant Wesleyan Church. So he answered the letter as follows:

Dear Sir:

I regret the delay in the matter, but now take pleasure in informing you that the W.C. is situated about nine miles from the house and is capable of seating 1,250 people. This is very unfortunate if you are in the habit of going regularly, but no doubt you will be interested to know that many people take their lunch with them and take the day off. Others who cannot spare the time go by car and arrive on time but generally are in too much of a hurry to wait.

The last time my wife and I went was about six years ago, and we had to stand all the time. It may interest you to know that the management is going to hold a bazaar to raise funds to furnish the W.C. with plush seats and members feel that it is a long-felt want. I mention that it pains us very much not to be able to go more frequently.

• • •

LOVE COMES TO YOUNG MODULUS

Professor Plusorminus One was amiable picking dandylines of force in a magnetic field in the vicinity of the Physics Building. He was silently humming to himself "Who's Asquared of the Big Bad Root?" as he gently nursed atomic ache. His assistant, young Modulus, stepped down into the room as in a transformer. "Why insulate?" queried the Professor.

"Am insolate? Don't torque," answered Modulus. "I was out last night to a density and got into a hell of a mass."

"It's the thermal story again," answered the Professor, becoming heated. "You're just a little PV running around in cycles."

"Magnerts," young Modulus cried. "My sweetheart is coming to the city and I was centimeter. She hasn't derived yet. When she comes I'll be king Faraday."

"Are you marrying for harmonic?" asked the Professor. "And, by the way, when is the wedding?"

"I'll oscillator," came back his answer.

"Vibrate?" the professor demanded. "Do it now!"

"I spectra any minute." Suddenly the door opened and dynamic young Equilibria breezed into the room.

"I'm solenoid at you," she cried to her sweetheart. "You've driven me to diffraction!"

"Who is dispersion?" Professor One asked.

"I trouble you to be more polite inductance to my sweetheart!" Modulus cried.

"Is this effect?" the professor retorted. "I happen to know about it through Voltage Vinchell. I hear you're expecting a blessed momentum!"

"Yes, I went shopping for baby clothes yesterday," she replied.

"I kinetics physics per cent less at Macy's" Modulus told her. "But, sweetheart, I haven't seen you for so long. Take me by force of gravity!"

"I can never B.T.U. more than a sister," she said.

"However that may be," concluded Modulus, "you're still my mechanical equivalent of heat."

"The most fascinating business in America"

The unlocking of the treasure house that lies sealed in a lump of coal has been called the most fascinating business in America. It touches every industry. That is why Koppers has been called the industry that serves all industry. Here are some materials which Koppers supplies to the chemical industry . . . . which is only one of dozens of industries it serves in comparable manner. Koppers Company and Affiliates, Pittsburgh, Pa.

KOPPERS

THE INDUSTRY THAT SERVES ALL INDUSTRY

ENGINEERING EDUCATION

(Continued from Page 223)

engineering judgment, to stimulate their originality and resourcefulness, to give them the professional viewpoint, and to inspire them with high ideals and a love for the profession?

Until all these things are considered in the selection of teachers, and not merely undergraduate proficiency or graduate degrees, engineering education will be found wanting.

There is little hope of raising the standards of engineering education as long as the schools obstinately cling to their belief that it is their duty to admit any graduate of any high school, however lacking in aptitude, preparation, or capacity. It may be true that some of the "Land Grant" colleges are under statutory requirement to accept any high school graduate, but that does not necessarily mean direct admission into the engineering school of the university, nor does it mean that all other engineering schools are under similar compulsion to keep their standards down.

The enrollment of any student lacking in aptitude, preparation, or capacity is an injustice to the student, to his classmates, to the school, to the profession, and to society.

Proposed Entrance Standards

It is not my intention to be critical save for constructive objectives. With this thought, and with a full realization of the limitations of any individual approach to the problem, I offer as a basis for further consideration a rough outline of a possible program for the progressive raising of the standards of admission to our engineering schools. With each upward step in the preadmission requirements, there would be a corresponding raising of the curricular and educational level within the engineering school. In such a program, the following standards and prerequisites for enrollment might *successively* be adopted:

1. Standing in the upper half of the class in high school.
2. Completion of high school mathematics, including trigonometry.
3. Completion of high school physics.
4. Completion of high school chemistry.
5. Standing in the top quarter of the class in high school mathematics and high school physics (or chemistry).
6. Passing of college entrance examinations in high school English, mathematics, physics, and chemistry.
7. Satisfactory completion of one year of pre-engineering study in the scientific course of a college of liberal arts and sciences, including successful completion of such specified subjects as analytical geometry.
8. Satisfactory completion of two years of pre-engineering study in the scientific course of a college of liberal arts and sciences, including successful completion of college physics, college chemistry, and calculus.

This tentative outline is, of course, subject to modification and improvement, and alternatives may be suggested. At the present indicated rate of progress, it may take many years or many generations to reach the goal I have set out. When it is reached, engineering education will still be far behind the standard now already attained by medical education.

In justice to the prospective students and to the entire educational picture, what is needed is an objective and factual picture of the qualifications for a professional career and of what is in store for the prospective engineering graduate.

Who Shouldn't Study Engineering

I believe that guidance literature should contain clear and emphatic paragraphs on "Who Should *Not* Study Engineering." This phase is now conspicuous by its absence.

I believe that guidance literature should scrupulously avoid allurement by misleading pictures of prospective monetary returns. I tell young men that no student should choose engineering as a career unless he knows in his heart that engineering is the only calling for him, despite the prospects of inadequate and uncertain material rewards.

I believe that the spectacular and the romantic should be avoided in presentations to prospective students and that instead they

should be led to make their decision with their eyes open to reality.

I believe that those lacking in aptitude, capacity, preparation, ambition, determination, and strength of purpose should be diverted to other callings and other educational programs.

Because I am opposing enrollment propaganda and am advocating the diversion of the unqualified, I have been attacked and assailed by the engineering schools.

One educator attacks the idea of "plowing under" future engineers. The surplus of engineering graduates are not future engineers. They are now "ploughed under," after graduation, by ruthless economic forces. It would have been elementary human charity to let them face the hard fact before enrollment instead of after graduation and to divert them to other callings before they devoted four of the best years of their lives to study for a profession which they will never practice.

Sixty Per Cent Do Not Survive

Sixty per cent of the students who enter our engineering colleges fail to graduate. Is not this equally a "plowing under" of future engineers? One educator admits: "A number of poor students manage to struggle along in classes of capable students and finally pull through and are offered to the world as engineers." Then is selective guidance a heresy and are the acceptance and graduation of the incapable a virtue?

Another educator eloquently declares that "No boy with a God-given desire and ability to become an Engineer should be denied the opportunity." No one is proposing that any boy thus qualified should be kept out. Any boy with a "God-given desire" will find his way in, despite any hurdles that may be set up; that type does not need any proselytizing or "vocational guidance" to induce him to apply for engineering school enrollment. And any boy with the "God-given ability" will not be kept out by any entrance examinations or aptitude tests that the educators will plan and conduct. It is the opposite type, without engineering ambition and aptitude, who should be diverted to other callings—as the best thing for these young men, their fellow students, and the profession as a whole.

Curricula Must Advance With Progress

The present curricula of most engineering schools are, to me, a source of keen disappointment. Not only have these curricula failed to advance in line with increasing demands upon the educational equipment of the engineer, but in some respects there has been retrogression. Substitution, juggling, and shuffling of courses do not and cannot solve the problem so long as the schools cling to their low admission standards and to the arbitary limitation of a four-year course of study after high school.

It should be accepted as axiomatic that the members of a profession should be truly educated men.

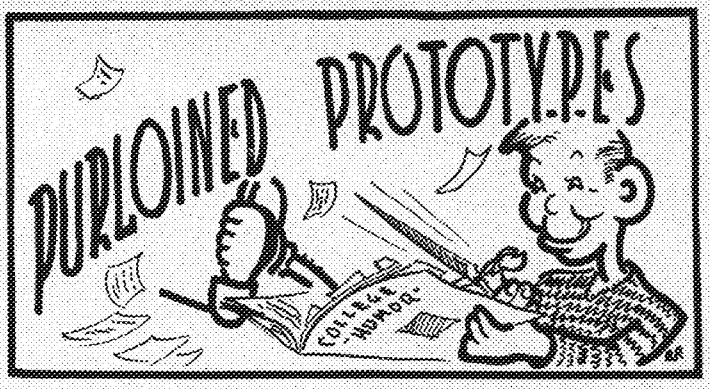
If the engineering profession is to be a profession in the highest sense of the word—a profession of planners and leaders and not of mere technicians—we need education, and not merely technical training.

I believe that *education*, in its foundation essentials, should precede training; and that *general education and training* should precede *specialization*.

Breadth, Soundness, and Stability

My picture of professional preparation is that of the pyramid—for breadth, soundness, and enduring stability—*First, as a broad base, the education that all educated men should have; then the basic courses that all engineers should have; and finally the more specialized and intensive training for the major branch of engineering selected.* **(Mr. Steinman goes on to outline a suggested curriculum for the engineering student to follow. Space limitations prevent us from reprinting it here.—Ed.)**

All that has been said in the foregoing is intended as sincere constructive criticism. It is presented with all due respect for the many educators who have exemplified, in their lives and in their work, the highest qualities of self-sacrifice, vision, and leadership in genuine coöperation with the ideals and the aspirations of the engineering profession.



BY BILL SANFORD, M.E., '44, AND HERB ROCHEN, A.E., '44

In this issue, we shall try to limit our humor to that type which will be agreeable to all—all engineers.

• • •

A boy was walking down the street wheeling two bikes when he met his pal.

"Where'd you get the two bikes?"

"My girl and I were out for a ride," said the boy, "and we stopped to rest under a tree. After a little while I kissed her. 'That's nice,' she said. Then I put my arm around her waist and asked her how that was. She said it was great. So, then I kissed her on the cheek and winked at her, and she said, 'Oh boy, you can have anything I've got!' So natcherly I took her bike."—Editor's note—"Natcherly!"

• • •

The Bible says, "Eat, drink, and be merry," but it doesn't say over-eat, over-drink, or over-marry.

• • •

Mandy surrounded by her bread was talking to a spinster settlement worker. "Yes'm, birth control am all right for you all, but me, ah's married, an doan need it."

• • •

There are to me two kinds of guys,
And the only two that I despise;
The first I'd really like to slam,
The one who copies my exam;
The other is a dirty skunk,
Who covers his and lets me flunk.

• • •

Little Willie had gone to bring the kittens in. His father, hearing a shrill meowing, called out:

"Don't hurt the kittens, Willie!"

"Oh, no," said Willie, "I'm carrying them very carefully by the stems."

• • •

Then there's the African who was a social failure because he couldn't get a head.

• • •

"I hear the prof is flunking you."
"Yeah, I don't know math from a hole in the ground!"

• • •

Definition of a bachelor: A man with no children to speak of.

• • •

"The traps on the course are very annoying."
"Yeah! Will you kindly close yours?"

• • •

Girls: Take care of your figure in high school and when you get to college the boys will watch it for you.

Advice for the Month

One-armed driver: You can't apply your brakes right when your mind is on your clutch.

• • •

Coed: "You're awfully bashful, aren't you? Now look out, cause I'm going to scare you."
She kissed him.
"Now you try to scare me."
Engineer: "Boo!"

• • •

"I know a good joke about crude oil."
"Spring it."
"It's not refined."

• • •

"How are you this evening, honey?"
"All right, but lonely."
"Good an' lonely?"
"No, just lonely."
"I'll be right over."

• • •

My girl is suave and smooth and subtle,
But this is beyond detection
While some hold hands as token of love
Mine does it as a means of protection.

• • •

He gazed admiringly at the beautiful but extremely revealing dress of the leading chorine in a rather risqué show:
"Who made her dress?" he asked his companion.
"I'm not sure, but I think it was the police."

• • •

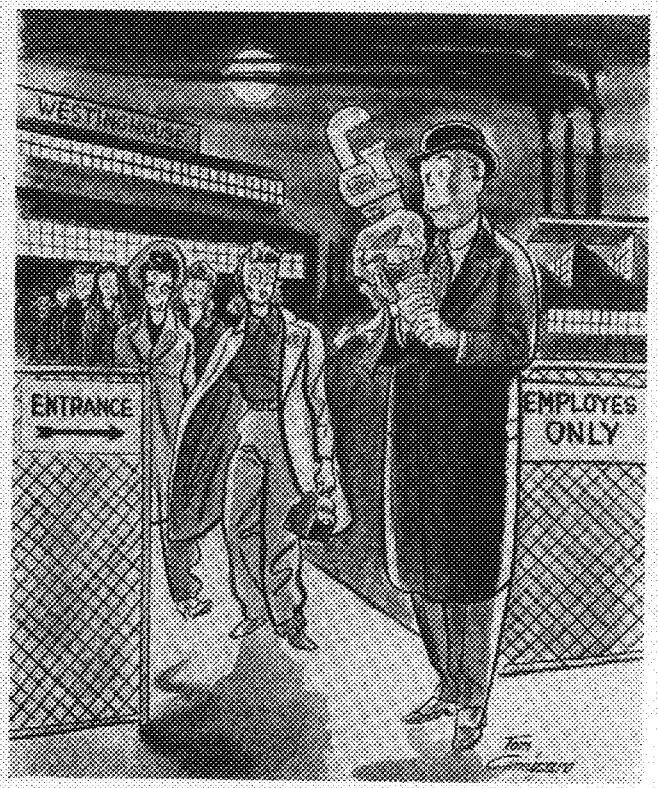
A beauty, by name Henrietta,
Dearly loved to wear a tight sweater.
Three reasons she had:
To keep warm wasn't bad,
But the other two reasons were better.

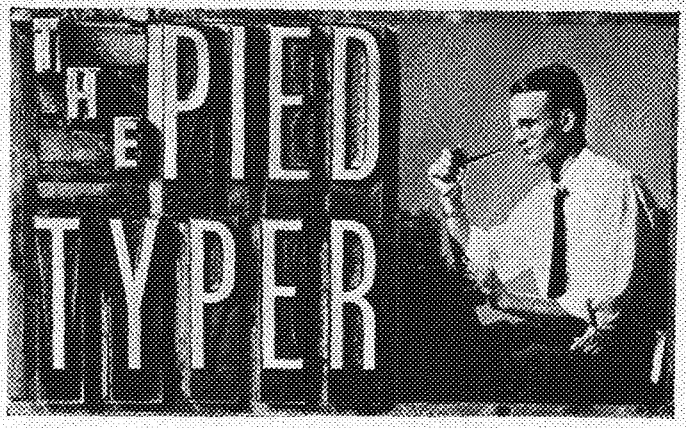
• • •

There was an old maid that insisted that her mamma cat never leave the house at night. Last winter she took a Southern cruise and wrote home, "I'm having more darn fun . . . met a swell gentleman on the boat. P. S. Let the cat out tonight."

• • •

He—"May I take you home?"
She—"Sure. Where do you live?"





Taking over this spot for the next issue, and with it the editorship of THE TECHNOLOG, will be none other than Jerome Roberts Giantvalley—better known as Geevee. As well as being an able writer and editor, Bob is an ardent research man. In this capacity, he has spent a considerable amount of his spare time the last two quarters in making an exhaustive study of the habits and habitat of the Curtiss-Wright Cadettes—all for the good of science, of course. In spite of being a hard working double E, Geevee claims that he is broad-minded. We agree.

• • •

Aiding and abetting Geevee as business manager of the Loo will be Richard Engdahl, demon advertising manager of this year. The title of demon is a slight bit misleading since Dick is really just the opposite. It seems that he moved over on the campus after being elected so that he could do a more thorough job on this rag. We personally think that there is another angle that might bear looking into, however. He is known to haunt the TECHNOLOG office after everybody else has gone home so you can draw your own conclusions. We have drawn ours.

• • •

Not long ago one of the office typewriters was the loser when it and the floor came to blows. A few ball bearings rolled out and the carriage just wouldn't seem to move. After it had reposed for about a week in its incapacitated state while waiting to be repaired one of the staff decided to do something about it. When he had finished the typewriter worked but one of the vital parts had been damaged and now the machine sticks in the middle of the line. This fatal accident was attributed to the office nilmerg (gremlin spelled backward since he is a very backward fellow if you can call him or it a fellow). It's picture and character sketch are to be found in the "This Month" section of this issue so don't be scared when you see it.

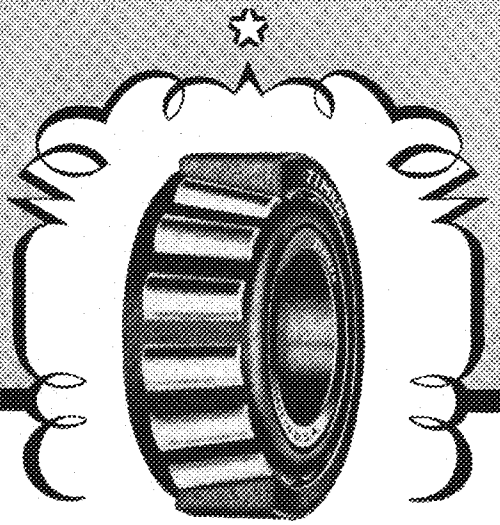
• • •

As we sit here trying to think up something good the office phone comes into view. And it brings with it a story that must be told. It seems that every once in a while a staff member gets the urge to call up one of the opposite sex. When he gets the party he is calling bedlam usually lets loose. Somebody starts out by yelling, "Two beers." From then on anything is likely to happen. One of the quips that is particularly annoying is accompanied with the proper sound effects and usually proves very disconcerting. We think that we will have to install a phone booth for next year's staff.

• • •

We want to express our sincere thanks to Ralph Stanley and all those at Bruce Publishing Company who had to put up with the TECHNOLOG bunch. It must have been quite an ordeal to be so patient.

KNOWING YOUR BEARINGS GETS RESULTS



The war production program is a good example of the value of "knowing your bearings". For many years before the war, engineers were putting Timken Tapered Roller Bearings into industrial machinery of all kinds. They discovered long ago that these bearings possessed every quality needed to meet any type of service—friction elimination; radial, thrust and combined load capacity; and the ability to hold moving parts in correct and constant alignment.

Thus, when America was faced with the most tremendous production job ever known, industry had one big advantage —namely, production machines with the speed, precision and endurance to do it; machines that could out-produce any others in the world.

Now the results are beginning to tell on the world's battle fronts—where Timken Bearing Equipped fighting machines turned out by Timken Bearing Equipped production machines are steadily turning the tide of war in our favor.

When Victory has been won and industry calls you to help in the work of reconstruction, you'll find a thorough knowledge of Timken Bearings one of your most valuable assets. Begin to get it now.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

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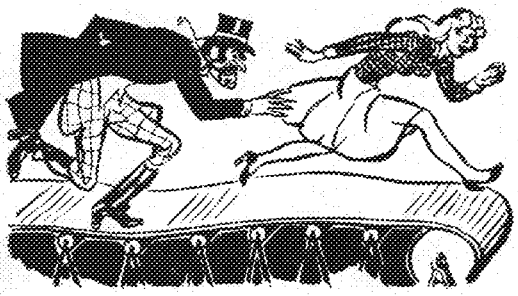
TAPERED ROLLER BEARINGS

G-E Campus News

RESEARCH AND ENGINEERING KEEP GENERAL ELECTRIC YEARS AHEAD

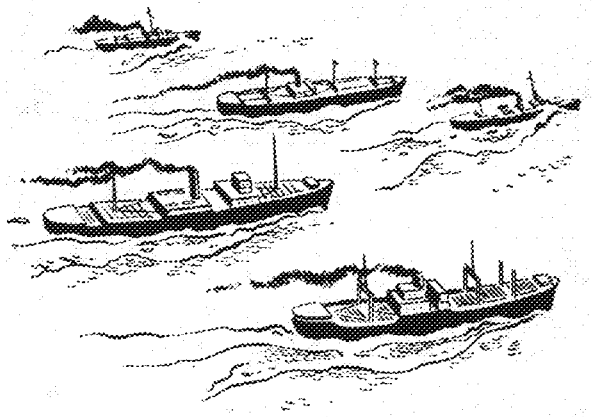


FOILED!

WHEN in a movie "the villain pursues and pursues her," he's not really getting anywhere at all.

To keep the players within camera range while they are constantly on the move—going nowhere—the Metro-Goldwyn-Mayer studios are now using a sound-insulated treadmill, powered by General Electric.

An even motion was required through all the action shots, from a slow walk to a race. Now, in 30 seconds, the treadmill can be accelerated smoothly from zero to full speed in either direction, by means of a G-E motor-generator set.

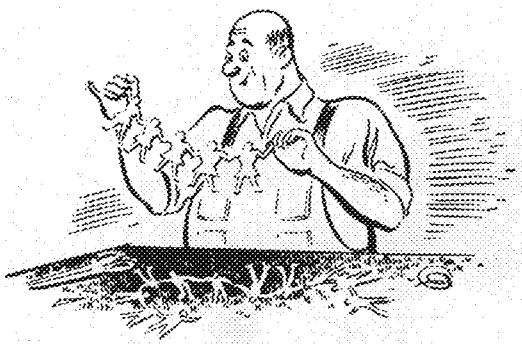


LEND-LEASE IN REVERSE

USUALLY we think of the United States as the arsenal and machine shop of democracy, but actually the Atlantic is a two-way ocean. And General Electric recently announced that since early in 1942 the Company has been using five giant English metal-working machines in the production of vital ship-propulsion equipment.

The machines were sent from England in separate ships on different dates, to forestall their destruction by German submarines. One of the ships was attacked during the crossing and was damaged but made its American port safely.

The arrival of the machines was really *two* strikes against the Nazis, for had they remained over there they might not now be producing for the United Nations. One of them had been installed in a plant in Sheffield, and another was destined to go there—and that city was later bombed by the Axis.



"PAPER DOLLS"

RIGHT out of the kindergarten is the latest metal-saving technique in General Electric. Many thousands of complexly designed parts are required for intricate electric apparatus—and all must be cut from flat sections of scarce metals.

So, just like patterns for paper dolls, the planners draw the parts to scale on paper, cut them out, and shift them around till they mesh together in a manner very similar to a jigsaw puzzle.

Frequently it is possible to redesign the parts when it is found that slight changes in the length, width, or thickness will allow more parts to be cut from the same layout.

Photographs of this technique may be obtained free by writing Campus News, General Electric Company, Schenectady, N. Y.

Listen to the "Hunt of Charm" at 10:00 p. m. EWT, Sundays, on the NBC network, and the G-E news program with Frazier Hunt at 6:00 p. m. EWT, Tuesdays, Thursdays, and Saturdays on the CBS and American (FM) networks.

GENERAL ELECTRIC