Spartan ENGINEER

School of
Engineering

Michigan
State
College

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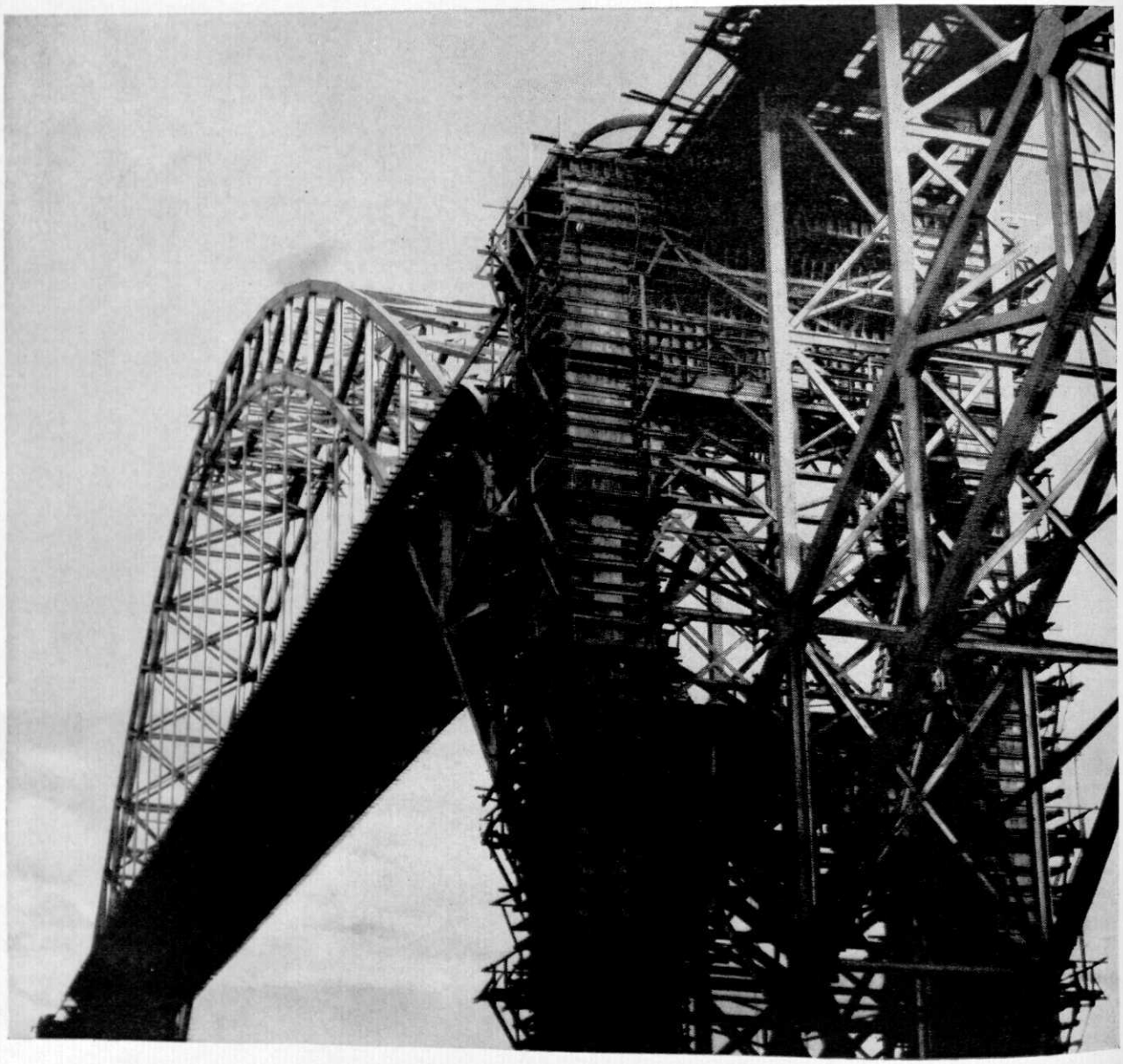
Cross a bridge and make a wish



NEXT time you cut ten or twenty or fifty miles off a weekend trip home by taking the short way over a bridge—give a thought to the days when the bridge wasn't there, when people *had* to take the long way around.

Right then would be a good time to make your wish . . . a wish that you will soon be able to put your engineering knowledge to work in helping to plan and build the things that make America great.

The steel industry offers hundreds of possibilities in this direction. From the mining of raw ore to the fabrication of the finished product, steel-making is directed by technically-trained men. Specialists in every phase of engineering play a vital role in the many and varied steps in making steel. Thousands of other engineers supervise the transformation of finished steel into structures like this mighty bridge.

United States Steel recognizes the need for carefully-trained specialists and pays particular attention in its educational program to the development of college graduates and other technically-trained men. This program has as fundamental objectives providing employees a sound foundation for advancement and assuring them opportunity for maximum personal development.

The training program in United States Steel has become the "bridge" to successful careers for hundreds of capable young men.

USS

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UNITED STATES STEEL

VISION...

Vital Ingredient of a Name

What is vision? An inspired revelation? Or . . . the faculty or sense of sight?

Pick your own definition. They're both important in your future. With Westinghouse, they are both important, too.

Even before the time George Westinghouse dramatically proved the superiority of a-c power distribution, climaxed by his daring demonstration at the Columbian Exposition in 1893, the vision (inspired revelation) of Westinghouse had been repeatedly demonstrated. It's a vision that's burned brightly through the years.

In this bold challenge to status quo, Westinghouse staked his name and future on a conviction that better, cheaper power could be delivered with alternating current.

The same spirit of enterprise by the Westinghouse organization has repeatedly broadened the usefulness and diverse application of electric lighting.

For example, the quartz tube filled with Krypton with a brilliance nine times greater than the sun; the bacteria-killing Sterilamp; fluorescent and mercury-vapor sun lamps; talking lamps; heat lamps; lamps to produce black light . . . and on and on through the 10,000 different types and sizes . . . plus a multitude of electronic tubes with equally versatile and vital applications.

Yes, vision is essential in winning a name but it is doubly important in protecting it, especially a name whose reputation is staked on the commitment . . .

G-10072

YOU CAN BE SURE . . IF IT'S Westinghouse

Hmmmm-*mmm!* Southern fried chicken, golden-brown and crispy. Man, oh, man . . . what a treat!

Well, mister, you can thank Methionine, an essential amino acid, for helping to bring better quality and less expensive poultry to the family table.

Chemistry and southern fried ???????

That's right, for today, chemistry plays an indispensable role in nutrition. For several years biochemists have recognized the nutritional importance of amino acids, the building block of proteins. Several of these amino acids are essential to the diet, for without them man and animal cannot grow or maintain life. Methionine is one of these essential amino acids.

Dow's continuing research, along with that of other investigators, has proved that critical deficiencies of Methionine can be corrected by supplementing chicken feed with this amino acid, produced synthetically. Chickens fed fortified diets grew ten per cent faster and consumed less feed for every pound gained. Such new developments make it possible for poultry raisers to market better quality birds more frequently and more economically.

Experiments with amino acids and their importance in the nutrition of man and animal, are but a small part of the continuing research program in many fields which is carried on by Dow—in the interest of producing more "Chemicals Indispensable to Industry and Agriculture."

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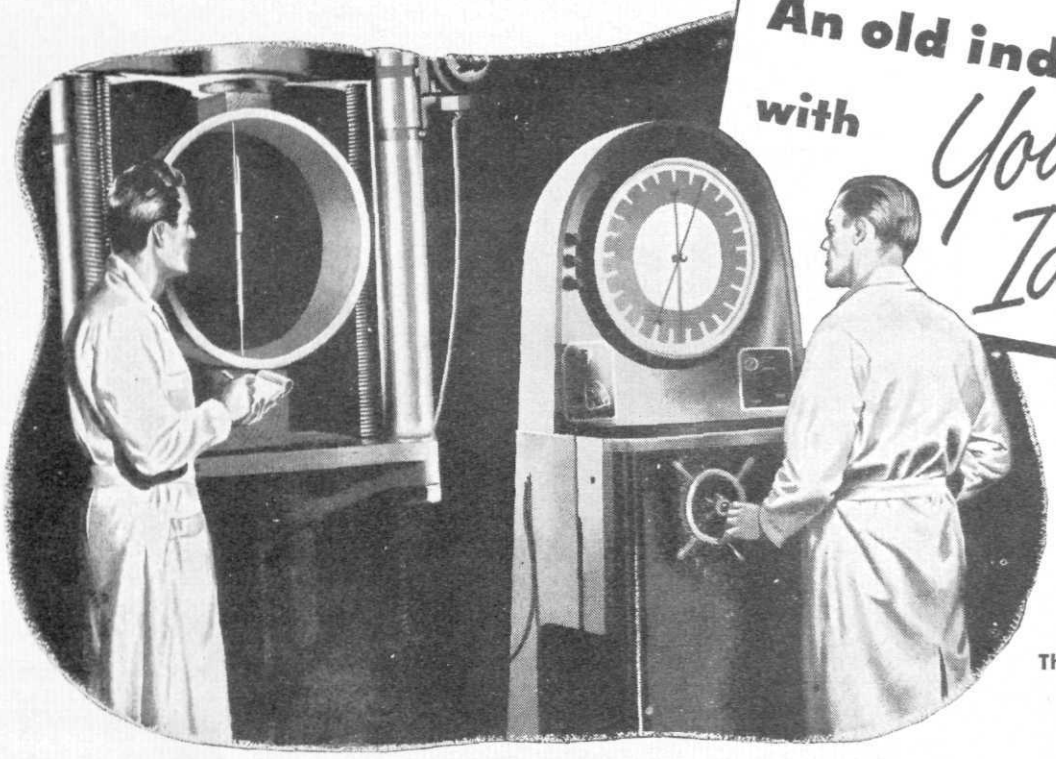
CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

An old industry with *Young Ideas*



The Ring Test

The ring test, shown above, is a scientific method for determining the modulus of rupture of pipe. It is not a required acceptance test but one of the additional tests made by cast iron pipe manufacturers to ensure that the quality of the pipe meets or exceeds standard specifications.

A ring, cut from random pipe, is subjected to progressively increased crushing load until failure occurs. Standard 6-inch cast iron pipe, for example, withstands a crushing weight of more than 14,000 lbs. *per foot*. Such pipe meets severe service requirements with an ample margin of safety.

Scientific progress in the laboratories of our members has resulted in higher attainable standards of quality in the production processes. By metallurgical controls and tests of materials, cast iron pipe is produced today with precise knowledge of the physical characteristics of the iron before it is poured into the mold. Constant control of cupola operation is maintained by metal analysis. Rigid tests of the finished product, both acceptance tests and routine tests, complete the quality control cycle. But with all the remarkable improvements in cast iron pipe production, we do not forget the achievements of the early pipe founders as evidenced by the photograph below of cast iron pipe installed in 1664 to supply the town and fountains of Versailles, France and still in service. Cast iron pipe is the standard material for water and gas mains and is widely used in sewage works construction. Send for booklet, "Facts About Cast Iron Pipe." Address Dept. C., Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 So. Michigan Ave., Chicago 3, Illinois.

Section of 285-year-old cast iron water main still serving the town and fountains of Versailles. France.

CAST IRON PIPE SERVES FOR CENTURIES

Spartan ENGINEER

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Cover: Photo courtesy Michigan State Highway Dept. This bridge spans the Cut river in the upper peninsula.

Frontispiece: Photo courtesy General Electric.

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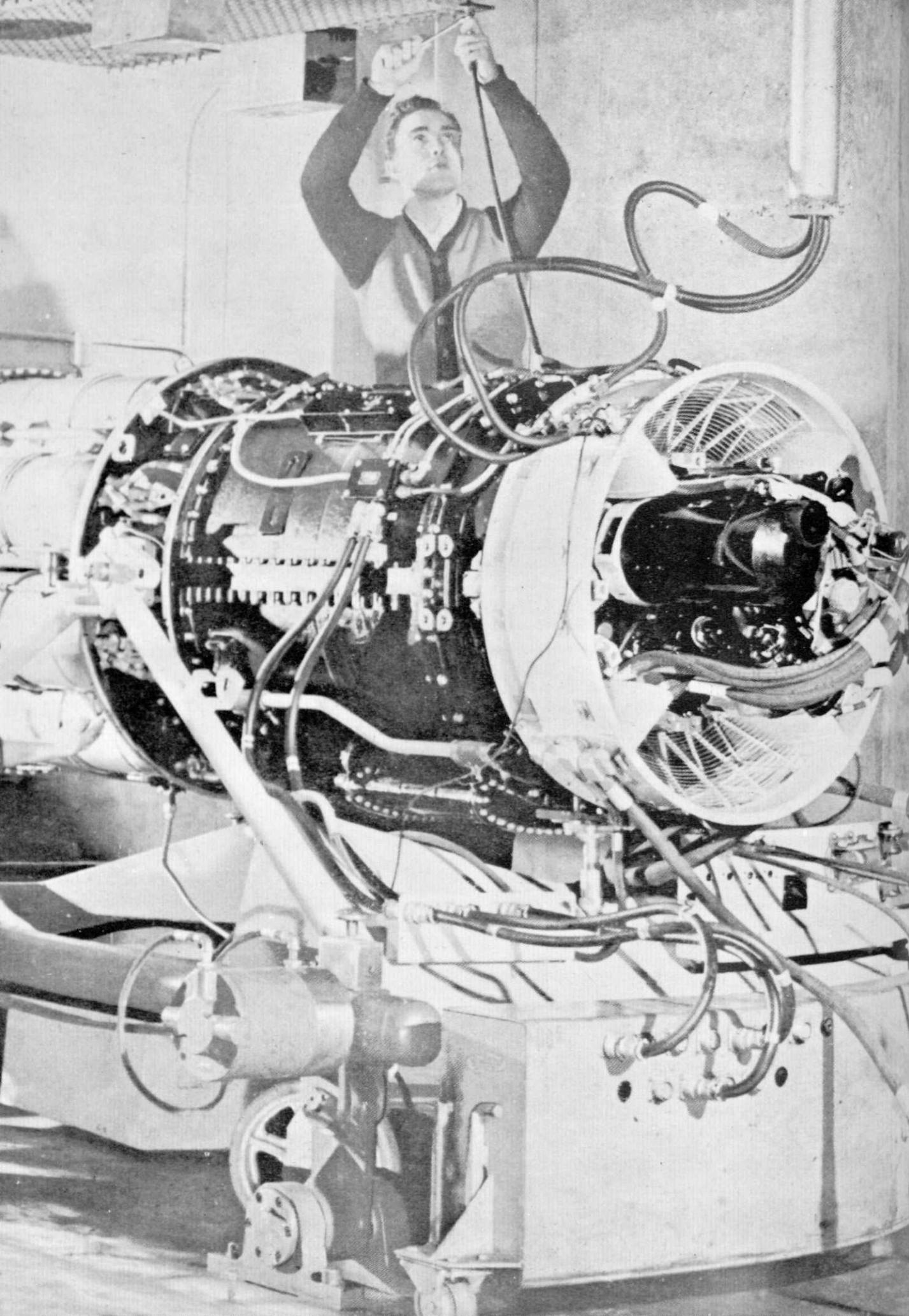


Engin — Ears

Job Prospects In June — Phi Lambda Tau Reactivated — Industrial Engineers Will Organize New Group This Month

BY HERKIE BOWERS
Spartan Engineer Editor

LO, THE POOR SENIOR!

Next June, the largest class of engineers in history will be graduated. Next June, some 650 of us—MSC's engineering seniors—will leave to try for a place in industry.

Lo, the poor senior!

According to figures Dean Miller gave us the other day, the prospects for this year's graduates leave much to be desired. He estimates there are some 350,000 engineers practicing at the present time. He also estimates that the profession will absorb only about 20,000 new men each year.

With approximately 47,000 engineers slated to receive degrees next spring, apparently less than half of us can expect to find jobs in our field.

To our way of thinking, one excellent solution of the problem is graduate work. For those men scholastically eligible, and able to afford it, an advanced degree would give them an additional "selling" point in the future and take them out of the present surplus of job-seekers.

In addition to assuring graduates a chance at the better positions, advanced degrees generally mean higher starting salaries for the graduate. According to the Dean, median starting salaries for various degrees are about as follows: B.S.—$225 per month, M.S.—$300 per month, Ph.D.—$375 per month.

The present overcrowded condition is expected to diminish in a few years. Probable figures for the next four years show:

Year	*U.S. grads*	*MSC grads*
1950	47,000	650
1951	31,000	400
1952	22,000	300
1953	15,000	200

* * * *

PHI LAMBDA TAU, ENGINEERING honorary, again is active on campus. Through the efforts of a small group of faculty members and a student committee, the fraternity was reactivated last term. Phi Lambda Tau was first organized at MSC in 1925 and was discontinued during the war years.

With the large number of engineering students now on campus, the school does need another honorary in addition to Tau Beta Pi.

These two engineering honoraries are not in

(Continued on Page 26)

THE FAIR SEX!

MSC's Women Engineers

By Dick Travers
Senior, Ch.E.

IT STILL MAY BE A MAN'S WORLD, but the fair sex is fast establishing a beachhead.

To prove this point, we dug out a musty old volume, published when grandma was a potential career woman, to determine how far a girl then was permitted to advance in pursuit of fame and fortune. It wasn't very far!

This reference book—the latest thing in guides to a career—listed every occupation open to young ladies. It even mentioned engineering drafting for those young ladies adept with rule and pencil.

This started a hunt for those Spartanettes we have seen around campus looking through a transit, pouring molten iron in the foundry and carrying slide rules as easily as hand bags.

THE FIRST FEMALE OF THE SPECIES we found was ex-marine sergeant Natalie Noble of Cummington, Mass., an EE senior. In high school, she was on the girls' basketball team, sang in the glee club, and was named to the Pro-Merito honor role. After graduating from high school, she entered the Women's Auxiliary Marine Corps and served three years in the San Francisco Bay area as a radio operator and technician. Following her discharge in 1946, Natalie entered MSC under the G.I. Bill.

During her freshman year she earned top scholastic honors and received the Tau Beta Pi slide rule award—the first woman ever to receive it.

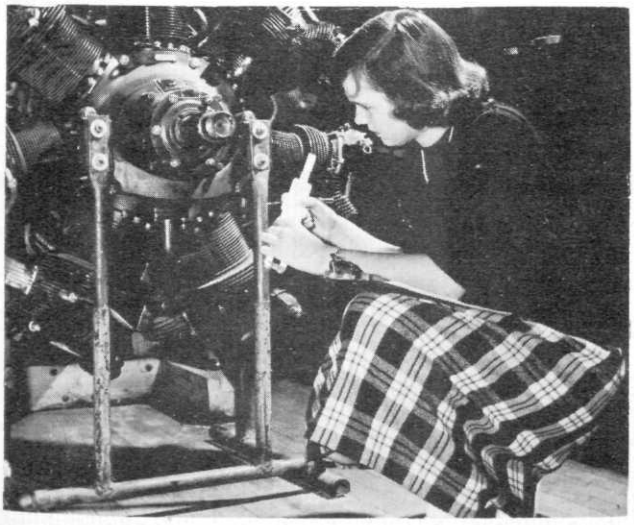
Natalie is a member of AIEE, mixed chorus, riding club and ski club. During her first year, she was captain of the women's freshman soccer team, and at present is registrar at the Sigma Kappa house. Last summer, she

Natalie Noble

attended the Reserve Officers Training Program at Quantico, Virginia, and now holds a reserve commission.

When asked why she chose engineering, Natalie replied, "It just came naturally. Between my war experience and my interest in electronics, I thought I would have a try at it. My folks encouraged me even though there are no engineers in the family. Now I'm more determined that ever to prove that a woman can be as good an engineer as a man."

WE FOUND OUR SECOND ENGINEERess hard at work in the foundry—18 year old Dolly Filipus from Benton Harbor. MSC was a new experience for her last term, although she is a junior in ME.



Dolly Filipus

She transferred to State from Benton Harbor J. C.

Most of the men were surprised when Dolly first entered the foundry. However, they found a pleasant and intelligent person who was not afraid to get her hands dirty. Dolly is proving herself capable of giving competition in a "man's field".

We asked Dolly why she had chosen ME.

"Well, in high school," she answered, "I took some engineering courses on a dare, and soon developed a real liking for them. My interest also stems from a liking for machinery and how it works. As far as my future is concerned, it is quite indefinite. I would like to start in a drafting room or perhaps go into business with my brother who is an EE senior here at State."

Dolly spends a great deal of her summer vacations doing the chores on her parent's farm. Interested not only in her duties as a farmerette, she is equally versatile in tossing around a football, playing baseball, or knitting a pair of argyle sox.

STEVE BRODIE'S DECISION TO JUMP from the Brooklyn Bridge could not have been much greater than Ann Kapp's decision to leave Brooklyn and study electrical engineering at MSC.

Ann now is a junior, and has the qualities of becoming a successful EE in the electrical appliance field. Perhaps your "kitchen of tomorrow" will be equipped with some of Miss Kapp's ingenious ideas.

A deep interest in high school mathematics and physics, as well as mechanical drawing war courses, gradually developed in Ann a strong desire to become an engineer. Because the events of the last war catapulted science and engineering into public consciousness, Ann became aware of the important role of the engineer, not merely in advancing the standard of living, but in the interest of science itself.

There were no family influences on her decision to become an engineer. Ann's parents first opposed the idea. However, they

Ann Kapp

now feel that it was the right decision. Why did Ann choose M.S.C.? Many of the outstanding eastern universities were overcrowded and wouldn't accept women as engineering students.

Several well-known firms already have reaped benefits from Miss Kapp's engineering abilities. During the war she was employed by Cox & Stevens, and last summer by George G. Sharp, both of New York City, as an engineering draftsman.

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STRENGTH for STRUCTURES

Pre-stressed Concrete Opens New Fields Of Structural Design

By Earl Rogers
Senior, C.E.

ENGINEERING HISTORY WAS BEING made when ground was broken in Philadelphia last April for a 160-foot span bridge. This marked the first use of pre-stressed concrete in important structural construction in this country.

Of more importance to practical-minded designers, however, was the fact that the bridge contract was won competitively by a bid that was $200,000 lower than others with more conventional designs.

Although construction of the Philadelphia bridge made U.S. history, in some parts of the world it would be considered commonplace. Other sections, particularly Europe, are far out front in the development of pre-stressed concrete structures. The reason being that shortages of steel and wood forced designers to search for non-conventional methods if the postwar reconstruction job was to be even partially completed.

What is pre-stressed concrete, and what are its advantages?

It is known that the compressive strength of concrete is much larger than its tensile strength, and the difference is still increasing.

For example, compressive strengths of 6000 psi are now easily obtained, with 9000 psi reached with special treatment. Compare this with tensile strengths of only 350 psi. Since every beam under load is subject to equal compressive and tensile forces, a prime consideration in concrete design is to prevent its cracking under the tensile loads.

In the conventional reinforced design method, enough mild reinforcing steel is used to prevent any appreciable elongation and consequent cracking. However, in the pre-stressed method, a large compressive stress is formed in the concrete before the load is applied by high yield strength steel wires or cables. This compressive stress, approximately 5000 psi, and larger than the designed tensile stress, neutralizes the tensile stress and maintains a margin of compressive stress thereby eliminating the tendency to crack within the concrete when the load is applied.

The most important advantage of pre-stressed concrete is its ability to utilize the recently developed concrete compressive strengths of 6000 psi and steel yield strengths of 150,000 psi. These strengths are compared with the compressive and yield strengths of 2000 psi and 40,000 psi of concrete and steel respectively, which are used in conventional reinforced concrete design.

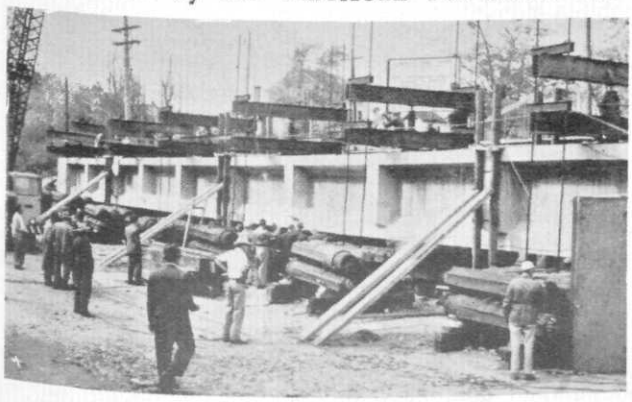
Conventional design cannot take advantage of these increased strengths for a number of reasons which follow in a chain-like sequence. If the high compressive strength concrete were used, the cross-sectional area would be too small to allow the required allotment of mild reinforcing steel. Then, if high yield strength steel were substituted,

the greatly decreased area would be large enough; however, the elongation of the steel would be five times as great which would allow cracking of concrete under tension, thus making its use unsatisfactory.

Many of the pre-stressed concrete's advantages stem from this initial advantage. For example, the reduced cross-sectional area reduces the dead weight a corresponding amount. Also, the required amount of concrete is decreased; which effects a large saving, since the cost of concrete is a major item in the total cost. Cold drawn or high yield strength is costlier than mild steel, but the required amount of cold drawn steel is one-fifth smaller, making the steel costs about equal. It is also possible with reduced cross sections to decrease the overall building dimensions without sacrificing space.

Fatigue stress in the wires is negligible since the addition of the load would only vary the stress, at the most, four percent. However, the stress in reinforcing steel could vary from 0 to 20,000 psi. Because fatigue is unimportant, and because the failure of one wire through a defect is inconsequential due to the large number of wires, designers conclude that stresses up to *eighty percent* of yield strength are permissible in pre-stressed concrete steel as compared to the general rule that stresses up to only fifty percent of yield strength are permissible in concrete reinforcing steel.

Another advantage of pre-stressed concrete is evident in the construction of the new Lansing sewage disposal plant. The large cylindrical concrete shells, which will serve as sludge digestion tanks, were constructed without the usual reinforcing, and though the shells are only six inches thick, they are crackproof and leakproof due to a compressive stress initiated by wires wound around the periphery. Incidentally, the shells were constructed by the American Pre-Load Corporation of New York, builders of about 700 similar tanks throughout the United States, a record which represents almost the entire pre-stressed construction in the United States up to the present time.



Pre-stressed Concrete Test Girder

Currently, there are numerous methods of pre-stressing in actual practice, and no one method has come to be recognized as standard. The impetus for the series of modifications is the result of efforts to lessen labor costs, overcome transporatiton problems, and seek other applications—a trend that is natural after any wide, sweeping engineering developement. The most successful methods used thus far are the Freyssinet or French method, the Maguel-Blaton or Belgian method, and the Hoyer system, used in Sweden and England.

The Maguel-Blaton method, which has been used the most, utilizes cables consisting of thirty to sixty quarter inch wires, stressed to 135,000 psi. The wires are spaced uniformly within a rubber or sheet metal sheath cast in the concrete. After the concrete has hardened, a five ton jack is used to stress two wires at a time. The locking mechanism consists of metal wedges which fit into a grooved "sandwich" plate. This plate bears in turn against a carbon steel distributing plate which compresses the concrete beam. When the wires are stressed and secured, grout, a fairly fluid concrete, is pumped into the hollow spaces within the sheath to protect the wires from corrosive action.

The best feature of this system is the ability to place any number of wires within a cable and insuring a uniform stress. Disadvantages are the time taken to stress each pair of wires and the extension of the distributing plates beyond the end of the member.

Freyssinet, who first pointed out that high yield strength steel was necessary to retain a compressive stress in concrete, devised a method which has been used successfully in France. This system employs eight to eighteen wires enclosed in a round sheet metal sheath held in position by helical springs. Instead of a distributing plate, the wires are secured in a cylindrical concrete block which, after pouring, becomes an integral part of the concrete beam.

Sweden and England have utilized the Hoyer system, a refinement of the earlier methods, which has opened the field of mass production of standardized members to pre-stressed concrete. In this method, 0.2" diameter wires are stressed and secured to

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Your First Job

What Industry Expects Of The Engineering Graduate

By Fritz Harris
Asst. Prof., M. E.

IN OUR SENIOR YEAR, AS WE APpraise our qualifications with the hope of finding our place in industry, we most often consider only the first half of the requirements set for us by industry.

In our appraisal we consider our background in fundamentals given in college courses. We may wonder a little whether our grades are as good as industry desires. We concern ourselves with our appearance and our manners. We complete our preparation by getting out our Sunday suit and Sunday manners for the interview.

At this point, we have prepared for industry's first view of our qualifications. In general, industry assumes from our college's reputation that we are sound in fundamentals.

Scholastically, we have placed ourselves on various levels, and the industrialist considers our apparent scholastic qualification in relation to the positions open with his organization. The best positions do not always require top scholastic averages, although our grades often indicate our interest as well as our ability.

Our appearance, poise, mannerisms and manners come in for close observation as the interview is conducted.

Our other qualifications, or as we might define them, our possibilities, are most thoroughly searched for. These possibilities are our social interests and abilities, outside —as well as inside—our business world; and our interest in continuous study in our chosen field; as well as our acceptance of responsibility over and above that required by our present position.

Socially, we must know and understand each of our business associates. We must concern ourselves with the problems and welfare of each of these persons. After business hours, sociability with our associates plays a great role in our industrial success. In both of these phases our consideration must be that we respect equally all of our associates whether above or below us on the industrial and social ladder.

Continuous study in our chosen field is a must if we are to keep abreast of changing conditions and stay on the road to success. Industry has much to offer, and is willing to cooperate fully with the person who is interested in further educational opportunities. Your gain in knowledge is industry's gain in progress.

The last possibility—and the major one—is our acceptance of additional responsibility. Many grade 'A' college graduates, although otherwise desirable, fail completely when they do not exhibit the ability nor the desire to accept a little more responsibility or a little more work over and above that normally required to perform their duties. Extra hours and extra responsibilities assumed through our own initiative are the final requirements for success.

Evaluate yourself on these qualities before you have your next interview.

WE PRESENT . . .

Datus Pierson

HE LIVES ON BORROWED TIME

By Harry Horn
Senior, E. E.

"THE WORST NEVER HAPPENS" IS the philosophy of Mr. Datus Pierson, graduate EE from MSC.

Mr. Pierson claims he has lived 87 years on borrowed time. Since his actual age is 58 years, his claim is not self evident. He explains this oddity as follows:

In the horse and buggy days of the year 1900, while playing marbles in the middle of Grand River Ave., in Detroit, he backed into a moving electric streetcar. Caught on the car's cow-catcher, his head was bounced along the pavement for a hundred feet until he was shaken loose and then the rumbling streetcar seemingly finished its job by running over both of his ankles.

DATUS PIERSON

The daily newspapers assured its readers that the lad would be dead by morning, but he lived and gained fifty years of borrowed time. However, his flesh and blood feet were supplanted by artificial ones. He refers to them as "these damned twigs".

In 1920 a streetcar smashed the roadster in which he was riding. He suffered a very serious V-shaped skull fracture and was bleeding from one ear where the organs had been crushed.

His wife was rushed to his bedside so she could see her husband before he died. But once again he denied death. That is how 30 more years were added to his borrowed time. The accident caused permanent deafness in one ear.

The "Grim Reaper" smiled with certainty again in 1943 with the onslaught of a heart attack. Mr. Pierson's son was given an emergency furlough from war duty in China to be with his dad during his last moments. Although causing his early retirement, the heart attack was not fatal, and Mr. Pierson added another seven years of borrowed time. This is how he explains his 87 years of borrowed time.

"The Worst Never Happens", has become one of Mr. Pierson's favorite expressions.

Mr. Pierson made a success of his engin-

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ENGINEERING ——

IT'S CRIMINAL

Opportunities In A New Field

By William Throop
Junior, E.E.

THERE OUGHTA BE A LAW ON JUST how much a guy can take around here. For the past couple of years I've been running myself ragged trying to find the ideal engineering major. At one time I even got so desperate that I thought of trying human engineering*, but I'd sooner pluck ducks for a living.

You characters must be a bunch of geniuses with a lot of guts to get some of these engineering courses that they toss at ya. I've tried all six engineering majors, and each one keeps giving me a tough time.

I decides that it's about high-time I goes over to see my enrollment officer again. She seemed quite agreeable about giving me a transfer to something else, but to what....I'd tried 'em all and failed. No other branch of the school would take me with my minus point two average. Even if I did get an "A" in Pogo-Stick 201, it didn't seem to cut no ice with her. "We usually have some type of course to fit every personality", she says. "OK sister", I says, "I'm game if you are, whaddaya got that I ain't tried?" "This course is made to order for a person of your character**", she says as she slips me this here little course out line which says on the cover "Criminal Engineering". The frontispiece is a pitcher of a babe with no clothes on. I signs up.

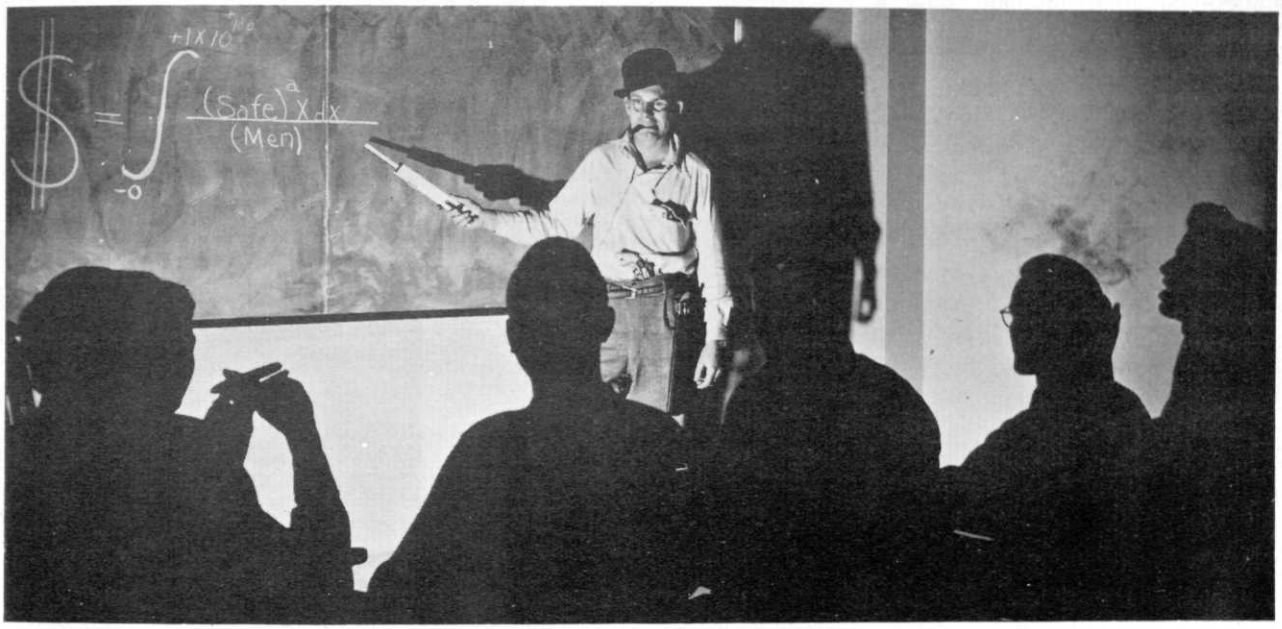
The first day of classes I recognize my buddies what flunked effective livin' with me. There was old Below Bottom Bowers and Plum Poor Paul in the gang. I began to feel right at home in this mob. Pretty soon in comes some shady looken character who is eating the end of a cigar which I smell prior to his entry. This man is nothing but skin and bones, although his dirty pink sport shirt bulges with a couple of roscoes. He must not trust nobody as he's even got a gat in his slide rule case and one stuffed in his belt.

"OK, youse guys," the cigar butt moves over to the other side of his mouth without him touching it, "I give orders around here, see? Any objections?" There are no objections.

"OK, dis is Bank Heists 201. Da first tree weeks we study da approach of da Fiscus mob in Chi. I woiked wit 'em all—the Eraser mob before they got rubbed out, and the McCandles in St. Louis. One of the McCandles was snuffed out in a bank heist back in '02. Dey knew how to operate real scientific like. Here, lemme show ya."

He starts writing on the board. After a few minutes he's all through, and there's a formula that's at least five feet long which sports an integral sign. At this point I am once more ready to change my major, but I string along.

*Business Administration
**I Am



"Dat's da payroll job formula. Da exponent is two, for two guards; tree, for tree guards, and so on. Wit one substituted for "a" you can solve for a simple stick up. Dis here is one of those empirical formulas, so loin it good."

"Now dis course is busted into tree parts; Casing and Entering, Pulling da Heist, and da Getaway. Da text is "Maken and Breaken Out", by Monk Miller, one of me old pals. OK, scram and all of youse grab one of dese shivs onna way out. Take this card overta the Union ta get your heaters cause we're gonna need 'em next week."

On the way to the next class we pass a C. E. 316a Sand, Cement, and Concrete lab mixing a big batch of concrete with a water-cement ratio of 0.6792. The group is pouring this wet concrete into an open form which surrounds a man, the head of whom protrudes slightly from the wet concrete. I recognize the man as a physics prof I once had. I put my hand into the wet concrete, smear this over his face and continue on.

The walls of the persuasion laboratory are lined with a sound-proof material. The professor, who has a busted nose and cauliflower ears, demonstrates to us what he calls "persuaders." These are: a hunk of garden hose, a vat of red hot lye, some blow torches, and a calculus book. The use of these is demonstrated to the group. Evidently there is a plentiful supply of grandma dummies for this is what is used as the demonstratee. During this time a phonograph plays a record of somebody yelling like hell. This provides the atmosphere. We are told to do this to people when they don't want to play ball. Incidentally, it is advisable or even necessary to use a new dummy for each demonstration.

The professor with the cauliflower ears then shows us how to get better grades from unwilling instructors and more dough from future employers. A dummy is used in lieu of an instructor. The likeness is amazing. The dummy is supposed to represent an old man with grey hair. The instructor begins.

"OK, Buster, where's me passen mark for this term?"

The dummy makes no reply and for this he is busted one in the snout by the instructor. A big puff of sawdust issues forth. Then he grabs the old man's cane and whacks him across the back of the head with it.

"C'mon, c'mon, I ain't got all day or maybe youse want another kick in the lip.

The prof boxes the old man on the ears. When the family resemblance becomes plain, he gives him the heel of his boot in the pit of the stomach. He then knocks over some chairs and walks away saying: "I'll be around again tomorrow, Buster, and if I don't get them decent grades by then, I'll really have to go to work." By this I guess he means that the gangster leader will fire him.

We move on to the final class for the day, Crooked Gambling. This is good because I don't like to see the dummies of nice old grey haired profs be knocked all to pieces. It's so hard on the dummies. I don't like these math classes too much, but I keep mum

(Continued on Page 30)

NODULAR CAST IRON

NEW STRENGTH FOR AN OLD MATERIAL

By Bill Fiscus
Senior, Met. E.

NODULAR CAST IRON, WHICH IS synonomous with ductile cast iron, is a material possessing high strength, high elastic modulus and a substantial amount of ductility.

These desired properties are obtained by the addition to a cast iron melt of an element which puts the graphite in spheroidal or nodular form instead of the flake form common to gray cast iron. This type combines the process advantages of grey cast iron, fluidity and castability, and also has the advantages of cast steel, high tensile strength, and good ductility.

Is nodular cast iron something new?

In a book published in 1918, "The Principles, Operation and Products of the Blast Furnace", J. E. Johnson tells of cast irons that had been developed having nodular structures. Many metallurgists of today have made attempts to disprove Johnson's discovery. These metallurgists claim he did not obtain nodular graphite structures, but obtained flake and under-cooled structures.

Discovery of this material was announced in this country at the American Foundryman's Society meeting in Philadelphia, May 7, 1948. It was stated there that the process for making nodular cast iron "is based on introducing into the iron a small amount of magnesium or magnesium-containing agent such as nickel-magnesium alloy. This produces a partial conversion of graphite to the spheroidal form and the remaining graphite takes on a compact form. A larger addition insures that all the graphite is converted to the spheroidal form, and the strength increases to a value several times that of the untreated product."

Magnesium is not the only element that may be added to bring about these spheroidal graphite structures. The British Cast Iron Research Association discovered that adding ceruim will bring about this same property.

Grey cast iron contains graphite in long flares, forming a multitude of voids and notches in the matrix which are primarily responsible for relative brittleness and low strength. Great strides have been made in the metallurgy of cast iron in the last twenty-five years. By means of carbon control, alloying, and general improvements in melting practice, a wide range of properties have been achieved. However, as long as graphite is present in the form of flakes, there are great limitations to the level of properties obtainable, especially those related to toughness and ductility.

This has created a wide gap between the cast irons and the cast steels. Many large manufactured parts which require toughness have had to be made from expensive cast steel. The use of malleable iron is mostly limited to small parts and light sections. With the advancement of nodular cast iron this "gap" is reduced and it soon may be possible to make available a low cost foundry iron which is easily produced, has excellent

casting qualities, and good physical properties.

* * * *

Through photomicrography it is possible to show the changes in structure resulting from the formation of graphite from flakes to spheroids. Figure 1(a) shows the microstructure of high carbon cupola iron as melted down; it is the common structure of pearlitic iron with long graphite flares. Figure 1(b) shows the microstructure of the same melt after magnesium has been added; it shows

Fig. 1a

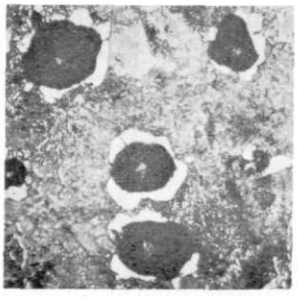


Fig. 1b

the graphite as dispersed spheroids or nodules, each partly sheathed in ferrite (relatively pure iron), and a pearlitic matrix.

In order to improve the ductility of nodular cast iron the pearlitic structure must be broken down. As in malleable iron, this is done by annealing. However, the transformation is completed within a few hours as compared to 24 hours or longer for malleable cast iron. The annealing serves to decompose the pearlite giving an entirely ferrite matrix. The micro-structure is shown in figure 2.

Elasticity and stiffness of iron is greatly dependent upon the graphite form. Flake graphite iron does not follow Hookes' law (stress proportional to strain) since the modulus of elasticity decreases with increasing stress. On the other hand, nodular iron behaves like cast steel where stress is proportional to strain up to high levels of stress. Figure 3 shows this relationship in a typical stress-strain curve.

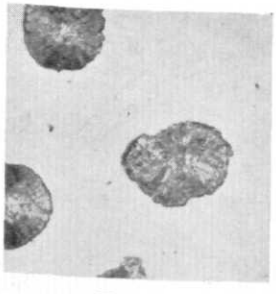


Fig. 2

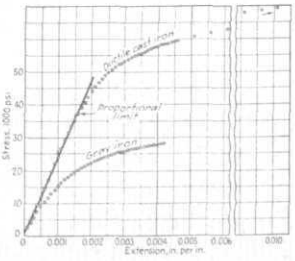


Fig. 3

The endurance properties of nodular iron are greatly improved over those of grey iron. The reason is believed to be that nodular cast iron has no graphite in the flake form to cause severe internal notching. Improvements in destructive growth at high temperatures are looked for by metallurgists by striving toward a fine-textured graphite flake. Since nodular cast iron has no flake graphite, destructive growth at high temperatures is less than that of grey iron.

Nodular cast iron is as free machining as grey iron of the same hardness. The surfaces of this material are much smoother and do not tear as grey iron does. A broken chip is formed in lathe turning of the as-cast nodular iron, while in the annealed state a continuous chip is formed.

The casting quality of nodular iron is excellent. Fluidity is about the same as grey iron of the same composition. However, nodular iron has a distinct tendency toward piping, and inadequately fed sections may collapse. Complicated castings have been successfully produced by using the molding practices set up for malleable cast iron. Nodular iron, because of its great ductility and resistance of thermal shock, may replace high carbon castings used for railroad car wheels and ingot molds.

The welding of nodular cast iron is done by following the same techniques as for grey iron. However, no indications of cracking are found in nodular iron when arcwelded and there are some indications of greater hardenability along the weld margin. It would seem logical that the nodular graphite around the welds would return to the flake form, but the spheroidal graphite bodies float in the molten zone and cool down without being regenerated.

Nodular cast iron possesses greater strength and ductility than grey iron and better casting characteristics than cast steel. These are the main reasons for its rapid development in the past three years. Forty-three foundries are licensed to use this treatment, but none as yet are on high production.

Many potential applications exist for this new material. The agricultural implement, automotive, and railroad industries no doubt could apply nodular cast iron, both in the as-cast and heat-treated condition.

There still are a number of problems to be solved before the process can be considered

(Continued on Page 38)

CENTURIES of SERVICE

ANCIENT IRRIGATION SYSTEM STILL SERVES CHINA

By Max Christensen
Senior, Ag.E.

THE CHINESE LONG HAVE BEEN noted for their engineering feats of which the Great Wall of China, pagodas, and their irrigation systems are the best known.

In this great group is the Tukiangyien Irrigation System. It was designed and constructed in 250 B.C. by the Governor Li-Ping and was engineered by his son. The project is located in the Szechwan Province on the Meankiang River in western China. Spanning this project is the equally famous 1820-foot bamboo suspension bridge.

The system irrigates over half a million acres in fourteen districts of the Chengtu Plain. The two main feeder channels, nine canals, their 2726 laterals and sub-laterals make up a total of seven hundred miles of constructed waterways. The river itself has a flow of 262,000 cubic feet per second which is equal to the combined flows of the Missouri and Ohio Rivers.

Most important structure of the system is the "Fish Snout", so named because of its shape. This structure divides the river into the inner and outer feeder canals. The inner canal is mainly for irrigation; while the outer canal, which is the Meankiang proper, does the same in addition to being the flood channel. The "Fish Snout" is a diversion structure over a mile in length and made of rock saussages. These are simply bamboo baskets filled with rocks. Silt and other sedimentation materials lodge in this rock structure and make it impervious to water. It is interesting that all these rocks were gathered from nearby stream beds and laid in the structure by hand.

The inner feeder canal always is supplied with irrigation water. During floods, it is not over-supplied because the dike at the open end of the "Fish Snout" is only high enough to maintain a sufficient level for irrigation purposes. The excess water flows over the dike at this point and into a spillway later re-enters the river.

Water from the inner and outer canals can be diverted into the nine canals and numerous laterals and sub-laterals by the use of sand and bamboo-cage diversion structures.

The most unusual and interesting part of the system is the method of annual repair. All work is done by hand at low water stage. There is no machinery. To facilitate repairs, cofferdams are placed across the outer canal at the tip of the "Fish Snout", diverting the flow to the inner canal. After the repairs have been completed on the outer system, the procedure is reversed and the inner system is repaired.

The cofferdams, constructed of wooden tripods and bamboo mats plastered with mud, are made and placed by hand. After repairs are completed in one channel, they are placed in the other channel.

This, of course, differs greatly from our elaborate system of gates and spillways for

(Continued on Page 36)

The Societies

On October 27, Otto H. Hall, engineer for the Michigan State Department of Conservation, addressed the Civil Engineering society on the advantages of registration for the professional engineer. He stated that there was a large amount of misunderstanding as to the true nature of engineering by the general public. He added that, "Registration would unify the engineering profession".

One of Mr. Hall's staff members who had just recently taken the first part of the registration examination told the Society of the nature of the test.

The society is making plans to contact former CE students and keep their names and addresses on file.

Fall term saw the Ag Engineers gather again in their Club Room and welcome new members. Guest speakers for programs that were presented were members of the AE Staff.

Professor McColly showed slides and presented a discussion on his recent two years in China. Prof. A. W. Farrall presented a program with slides taken in Europe. Clare Gunn showed an outstanding movie covering the tourist and resort business in Michigan. Another program was "Faculty Night", in which the Ag Engineering Faculty was introduced to the group. Mr. Fisch, new to the faculty, was elected club advisor to assist Prof. J. S. Boyd.

Ed Seligman, President of Pi Mu Epsilon, mathematics honorary, announced the inauguration of a new program of speakers for the meetings last term. Speakers from various departments talk on the use of mathematics in their field of study. The program already is in progress.

Dr. Hunt of the Zóology department was the first in the series. He discussed the use of mathematics in the study of genetics. At the following meeting M. D. Rogers, of the EE Dept., spoke on the application of differential equations to electrical circuits.

Thirty-three students were initiated into the honorary during fall term.

Plans to raise the minimum scholastic requirements for membership were discussed but a final vote was delayed until winter term.

ASME members were presented a variety of programs during fall term, including talks and movies.

Prof. Jesse Campbell, superintendent of the college power plant, gave a short address on the power department. He stated that MSC has invested over a million dollars in its plants, and that the generation of electricity actually resulted as a "by-product" of the heating requirements.

Several movies were shown, including "Rail Bar Steel", showing the re-use of worn out railroad rails; and "This is Magnesium", depicting the manufacture of magnesium from sea water. An interesting fact in the movie was that from one cubic mile of sea water 4,500,000 tons of metal can be extracted.

Chemical Engineers learned of a possible career in the paint industry last term. William Barrett, president of the Detroit Paint Association was guest speaker at a meeting and gave a talk

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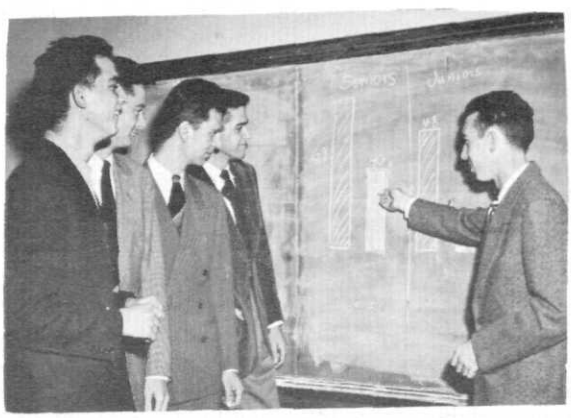
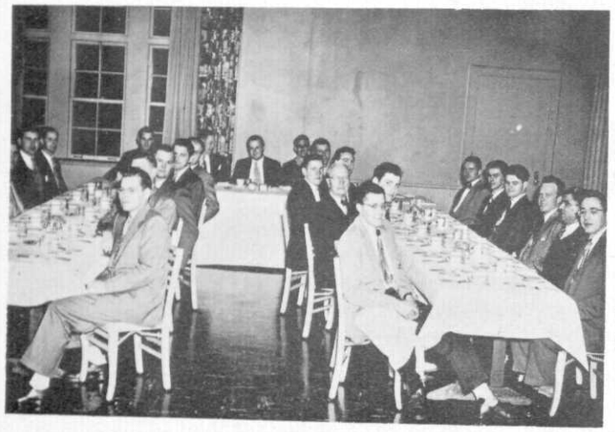
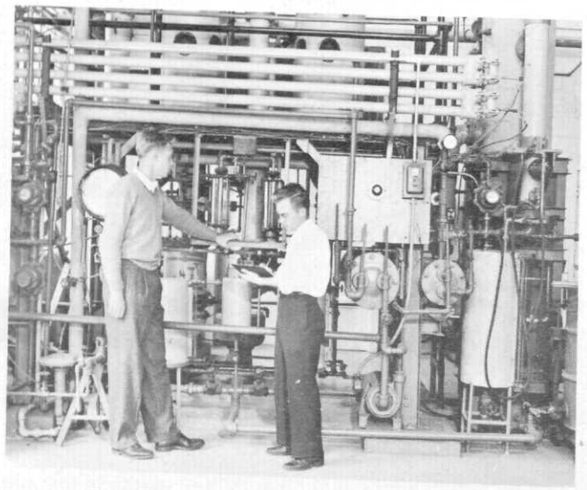


Chem Engineers discuss a few statistics.

... THE CANUS SCENE



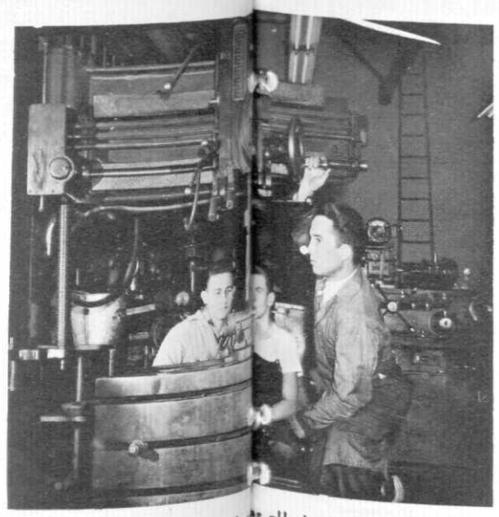
Fiscus tries to steal the show at the Phi Lambda Tau initiation dinner.



Bewildered looks plus all those pipes mean only one thing—Chem. Engineering Lab.

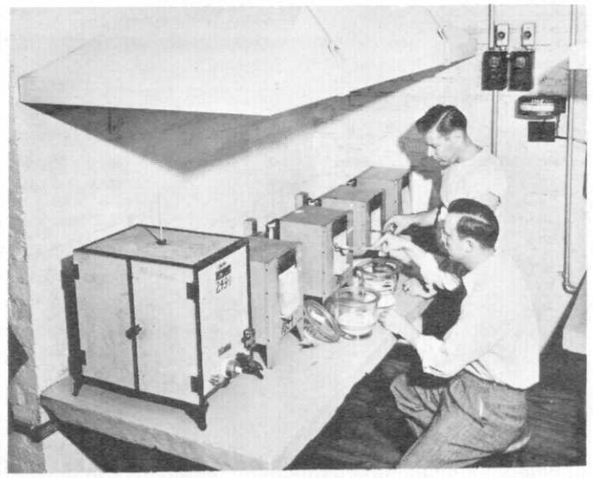
Guest speaker gives the Ag. Engineers the inside info on conditions in Europe.

Everyone waits a long wait is better than a hike fourth floor.



One little crank does all that machery to the astonishment of the operators in the Mach. Lab.

Shaw has the new-look for the dominant male.



Easy does it in the Met. Lab.

New Tau Bet's look sleepy. Wonder why?

. . . CAMPUS NEWS

ASST. PROF. M. F. OBRECHT OF the Ch.E. dept. is conducting a ten-week course in "Boiler Feed Water Treatment", for power engineers through-out the state. The instruction is designed to aid engineers with their increasing use of high pressure equipment, in which the tolerance limits of such things as scale and corrosion are drastically reduced.

Prof. Obrecht began teaching this as a regularly scheduled course in March. He already has given several lectures in various Michigan cities.

IN A PERIOD OF TWO YEARS THE industrial engineering option has grown from a few inquisitive engineers into a very enthusiastic group of some 150 students. This includes students other than mechanical engineers. Professor Apple's enthusiasm and efforts have brought the option to the attention of many people in the field, and it has been received with enthusiasm.

The staff is tied in with Professor Horn's Industrial Training Program in Continued Education in Industry. The conference held here last summer was so successful that a much larger and more comprehensive meeting will take place next summer.

Industry has expressed a lively interest in the department's plans to inaugurate a material handling research laboratory here.

The staff has a good collection of visual aids and has the equipment necessary for its own pictures. The script now is being prepared for new movies to be enacted by students. The present goal is to have a complete course in industrial engineering and management on slides, motion pictures, strip film, and printed material to be rented to interested groups.

The staff is composed of men who not only have completed the necessary academic work, but have a wealth of experience in the field. They are attempting to teach what industry needs and wants in the engineer.

Field trips included a visit to Detroit to hear Mr. Mogenson, one of the foremost proponents of work simplification and a trip to Kalamazoo to Upjohn Co. As soon as the staff can arrange it, field trips will be a weekly affair as part of the course. Plans are now under way for setting this option up as a degree conferring department.

THE ELECTRICAL ENGINEERING department has announced the resignation of two men and the addition of two others to the staff.

Assistant Prof. D. S. Pearson resigned to go to Penn State college as an Associate Professor.

Assistant Prof. C. E. Goodell resigned to enter private business with his brother. They own a manufacturing plant in Caro, Mich.

Instructor E. I. Doughty, who received his M.S. in Physics recently at Union College, now is in charge of a course in Basic Electricity and Small Motors, set up with the Redmond Company of Owosso. This course is part of MSC's program of Continuing Education.

Dr. R. J. Jeffries, an alumnus of the University of Connecticut, has been added to the staff. During the latter part of the war, he was a member of the National Advisory Committee for Aeronautics at Langley Field, Virginia, while instructing at the University of Virginia. He received his Ph.D. from Johns Hopkins University in June of 1948. In addition to his teaching duties, he now is doing consulting work for two major companies. He has had over a dozen papers published and has articles in the December issues of both the Review of Scientific Instruments and the Instrument Society of America.

LOUIS L. OTTO, GRADUATE ASSISTant in the M.E. department, addressed the Syracuse section of the Society of Automotive Engineers on December 19. It was

(Continued on Page 32)

NEW Developments

Magnetic Clutch

Magnetic oil is the key to a new magnetic fluid clutch invented and developed by the National Bureau of Standards.

In its basic form the clutch consists of only four elements; a driving shaft with a plate at its end, a driven shaft and plate, an iron-oil mixture between, and a coil to magnetize the mixture.

The magnetic oil is made by mixing ordinary oil and iron dust, producing a mixture containing millions of tiny particles of iron. The electric system magnetizes the iron particles as needed.

The electromagnetic fluid clutch is extremely smooth in action because all contacting surfaces, both plates and carbonyl iron powder, are coated by a lubricant. When the iron oil mixture is not magnetized, it permits the engine to move independently of the wheels, as when the clutch in an ordinary car is released. Current passed through the magnetic coil, which may be wound inside the driving disk, established a magnetic field between the two plates. The iron-oil particles seem to solidify in the magnetic field, producing the same effect as in a standard friction clutch.

Described as extremely smooth in operation, the electromagnetic fluid clutch is suitable not only for automobiles but for many types of industrial machinery.

Ultrasonic Generator

High frequency sound waves, pitched above the range of human hearing, have been found to do such things as scramble eggs and homogenize mercury. The device which produces these sound waves is called an ultrasonic generator. It produces the waves by means of a wafer-shaped quartz crystal, vibrating when a voltage is impressed upon it.

Experiments with the ultrasonic generator have shown that water placed in a chamber above the crystal quickly dissipated into the air as a fine fog. A glass rod thrust into the fluid, through which the waves pass, soon becomes hot enough to burn holes in paper. Experiments with the sound waves have been made to shatter glass, mix paint, churn butter, and homogenize milk.

The equipment for producing the silent waves is contained in a cabinet similar to a floor-model radio. On top of the cabinet is mounted a transparent cylindrical can filled with oil. The can contains the crystal. The oil serves to insulate the voltage across the quartz, and transmits the sound. The frequency of the sound waves may be controlled by varying the thickness of the quartz crystal.

This instrument has many possible applications for experimental work in the biological, industrial, chemical, and physical fields.

Measuring Molecules

Tiny microwaves, similar to those used by radar sets, now are being employed to measure molecules. By use of such waves, scientists are finding the dimensions of certain molecules and how fast they spin.

As used in these experiments, the microwaves vibrate on the average of 24 million times per second. To measure molecules, the waves are passed through a 16-foot rectangular pipe containing the gas under study. If, while passing through the pipe, the waves happen to be at one of the characteristic rates of the molecules, they are absorbed and this additional energy increases the rotation of the molecules.

Working in this method, the scientists watch a horizontal line on an oscillograph. A dip in the line shows when absorption occurs, and the frequency is measured by comparison with a standard frequency.

New Bridge Control

The Stickel Memorial Bridge which spans the Passaic River between Newark and Harrison, New Jersey, recently has been equipped with a new electric drive and control system.

The new control system is capable of

raising the 1,350 ton bridge span 100 feet in 105 seconds. To keep the 222 foot span level while it is being raised or lowered, an "amplidyne control system" is employed. This system, working through the master control device, will start the leveling process as soon as the span gets a fraction of an inch off level.

Power for the system is supplied by two 158 horsepower, direct current motors, one for each side of the span. The bridge can be raised or lowered with a wide range of speed. An automatic speed regulator insures a smooth stop.

Improved X-rays

X-rays with energies of a billion volts or more which were originally intended for atomic research work may soon be available for medical applications. It is believed that they will give a more favorable distribution of energy absorbed in the body.

This can be done with the fluoroscope on which the x-ray shadows show as a visible pattern. However, watching the screen for prolonged periods subject the doctor as well as the patient to dangerous amounts of radiation. This problem may eventually be solved with the adaptation of the wartime sniper-

(Continued on Page 30)

Engin-Ears

competition with each other. Each has a different objective. Tau Beta Pi seeks to honor those who have shown outstanding scholastic ability. Phi Lambda Tau is concerned with those who have demonstrated leadership ability and unusual initiative plus above-average scholastic ability.

A candidate for membership in Phi Lambda Tau must be a senior or junior engineering student in the upper half of his respective class. The candidate must fill out an application, listing extra curricular activities and other pertinent information. These activities will be evaluated to select those students to become members.

During the early part of this term, cards will be sent to those juniors and seniors scholastically eligible. These cards will invite the individual to *apply* for membership. The receiving of one of these cards should

Charter members of Phi Lambda Tau get acquainted after the initiation last term.

not be construed as an actual invitation to join the organization.

Application blanks will be available in room 109 Olds Hall about the third week of school this term. Applications may be turned in at the Spartan Engineer office, room 508 EE Bldg., or mailed to Box 468, East Lansing.

* * * *

TENTATIVE PLANS HAVE BEEN made for an organizational meeting to form an industrial engineering group. The first meeting is scheduled for Tuesday, January 24. Confirmation of this date will be made in IE classes.

Primary purpose of the organization will be to have speakers who are authorities in the IE field. It is expected that the group will form as a branch of the ASME rather than affiliate with a separate national organization.

The instructors in the department are encouraging all students in the industrial option to attend this initial meeting and assist in forming the group.

* * * *

THIS YEAR'S ENGINEER'S BALL IS January 14 in the Union Ballroom. The dance is semi-formal, Eddie Mack's orchestra will provide the music and intermission entertainment.

According to Union Bldg. rules, only 300 tickets may be sold for the dance, so ticket sales promise to be a first come, first served proposition.

Judging by the careful plans the Engineering Council made, it should be a gala affair.

See you all—
At the Engineer's Ball.

We Present

eering career. He began by attaining a high scholastic average in college even though he participated in numerous extracurricular activities.

Having written his thesis on storage batteries, he entered this line of work upon graduation. On the basis of this experience he eventually entered Dodge Bros. in a responsible position.

In 1936, Crysler Corp. (having previously absorbed Dodge Bros.) showed their faith in "Date" Pierson by placing him in charge of their newly formed Air Temp Corp. Air Temp produces heating and refrigeration equipment.

Local members of Tau Beta Pi will remember him from a banquet given last spring in honor of retiring Professor Cory. He delighted those attending with his humorous speech of farewell to his good friend.

He laughs at his wooden leg handicap by telling about the time his wife accidently purchased a pair of shoes for him that had built-in arch supports.

Mr. Pierson stresses the point that a person can overcome handicaps, and he lists himself as an example. Although he has sustained the loss of both legs and weakened hearing, he has been able to fill his niche in life and to enjoy all that anyone could ask from life—an unmatchable wife, two wonderful children, and success enough to keep the sheriff away from his door.

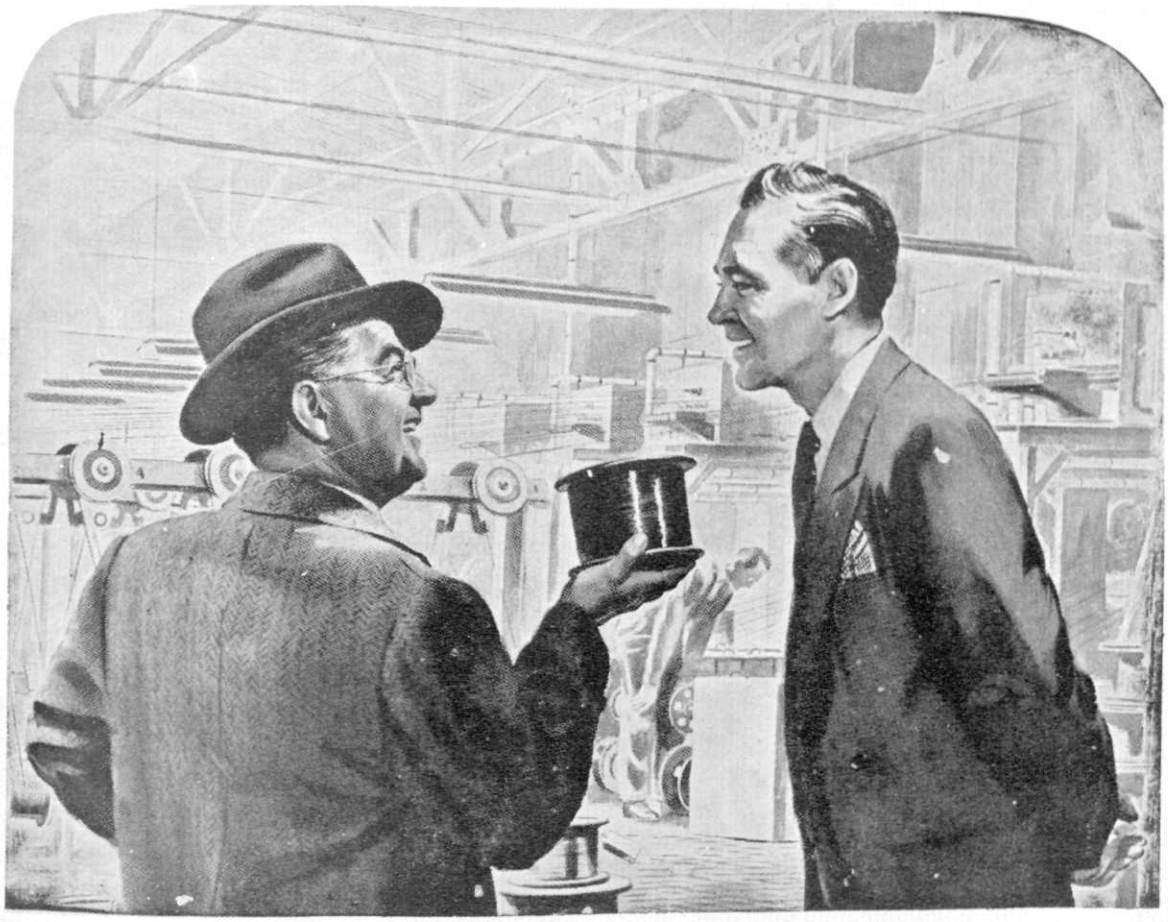
The Fair Sex

Best of luck to you, Ann, Dolly, and Natalie on passing your "stiff" courses this term with flying colors.

THESE THREE ARE NOT THE FIRST girls to study Engineering at State. In 1934, Ethel Lyon received a B.S. degree in Chemical Engineering.

Even more recently June Mitoray of St. Louis, Mo. graduated "with honors" as a Ch. E. in 1947. At present, Miss Mitoray is employed in the organic research department of the Monsanto Chemical Co., St. Louis, Mo. Her work concerns the development and improvement of plant processes.

Most recent of the women graduates is Rose Mary Carroll who received her degree in C.E. last June, and now is working for the State Highway Dept. in Lansing.



"Magnet Wire? I didn't even know ROEBLING made it!..."

THIS VISIT to just one of the Roebling works has been an eye-opener. Everyone in my line knows Roebling wire rope, but I never heard that you stack up so big in electrical wires and cables."

☆ ☆ ☆

Many people are surprised to learn of the wide diversity of Roebling's line of wires and wire products. It is often news, too, that several different items in the Roebling line are used in one and the same field. In mines and quarries, for example, Roebling Wire Rope, Aggregate Screens and Portable Electrical Cable are all likely to be on the job together. Wherever there's industry, there are Roebling products that help bring highest efficiency and lowest service cost.

WOVEN WIRE FABRIC. Roebling weaves wire screens to meet every sort of industrial requirement. From large size Aggregate Screens to closely woven Filter Cloths, wires made of special steels and non-ferrous metals bring new measures of resistance to abrasion and corrosion.

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ROUND — FLAT — SHAPED WIRE. Manufacturers adopt Roebling high carbon wire for its dependable uniformity which minimizes machine stoppages and rejects, and pulls down production costs.

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Whatever career you are studying for, when you get on the job you will find one or more types of Roebling products serving there, dependably and at low cost. John A. Roebling's Sons Co., Trenton 2, N.J.

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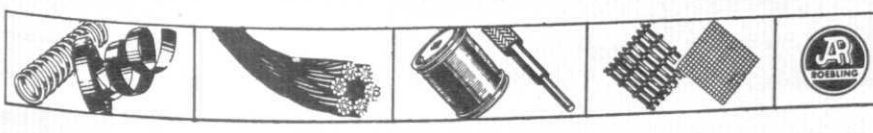


ROEBLING
A CENTURY OF CONFIDENCE

Engineering--It's Criminal

on account there is already too much intolerance in the world. Besides, I had Differential Equations waved by my enrollment officer because I was taking this Crooked Gambling class. The math prof begins.

"Siddown ya crumbs, siddown, Take a load off your feet."

This character talks like a vacuum cleaner salesman and has a smile like it is tied to his ears. He tells us about sliding dice. He brings in something about surface tension that I don't quite get.

"Suppose your point is nine...now it's for sure you can't make nine if one face is a one or a two, so you slide a die to come up five giving you three to two odds on any even money chance. Now watch this."

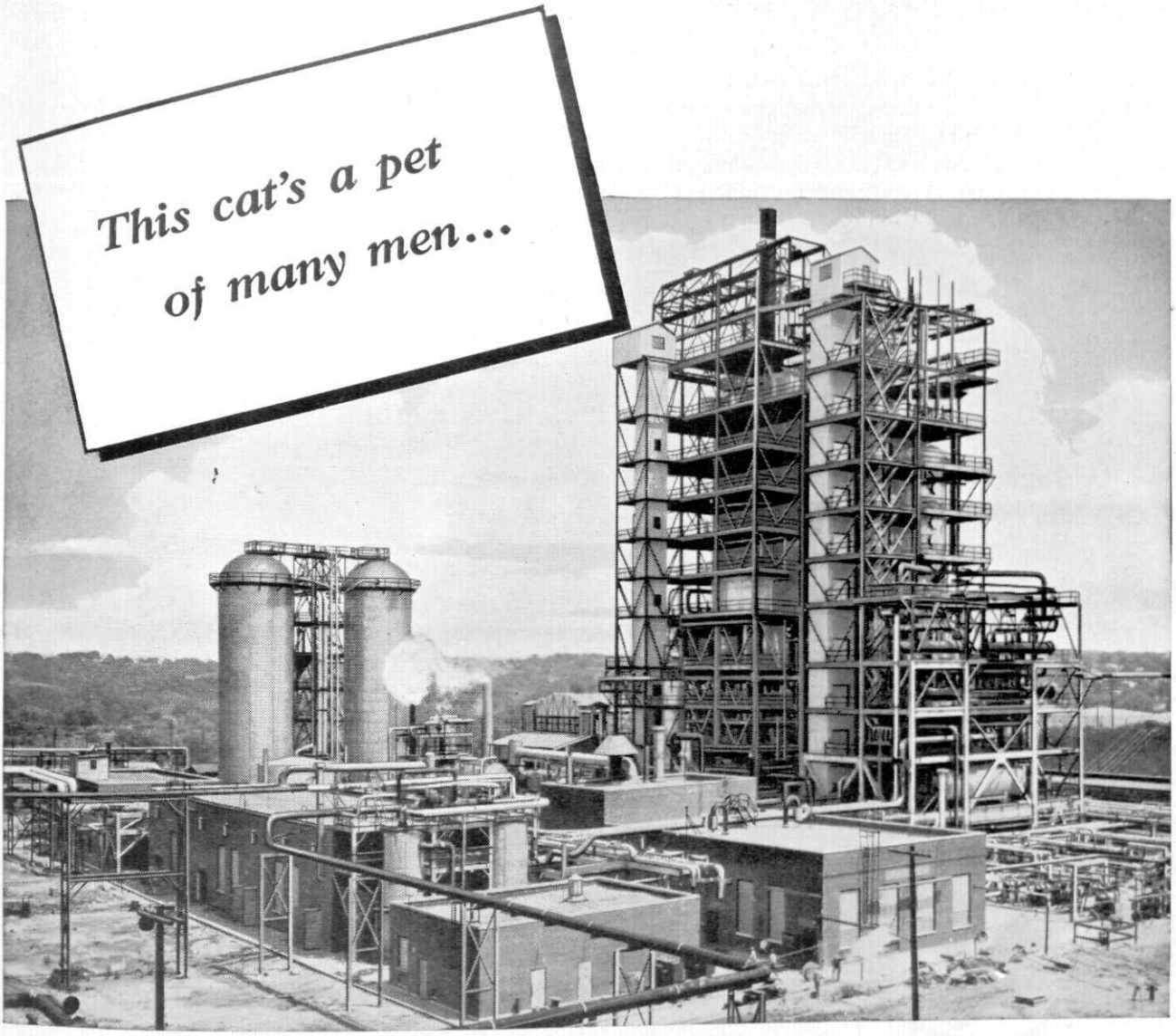
He then rolls a pair of dice on his desk, picks them up and rolls again. Then he says: "I rolled a different pair of dice the second and fourth times than I did the first, third, and fifth times. These," he held up the dice, "they got a pair of twos, threes, and sixes on opposite sides of each die and if your first roll isn't boxcars you can't miss because you can't get a seven to crap with. That's enough for today. Next period I'll show you the cold deck switch."

Leaving this class for Arson Lab, I have the feeling my money worries are about over. I have at last found my major. It is apparent that I am the criminal type.

After Arson Lab I takes a glance at my program to see what's on the agenda for tomorrow. Wouldn't you know it. I got an eight-to-eleven Sexual Assault Lab. I go to my room to get plenty of rest.

New Developments

scope, a device used for seeing in the dark. It would intensify a faint image and enable the user to see clearly with the intensity of the rays at safe, low limits. It also would facilitate motion pictures recording actual movements.



A fluid catalytic cracker is the realization of the plans and the work of many men. It costs many millions of dollars—but it owes its efficiency to catalyst studies that begin in beakers that cost only thirty cents each.

The "cat" and the beaker symbolize the enormous range of our research work, which draws on nearly every phase of chemistry, physics and engineering in its effort to make petroleum products more useful. And every new fact we discover about oil opens up new avenues of inquiry, new possibilities, new jobs.

Many scientists, technical men and engineers work for Standard Oil. We choose them carefully, provide them with the finest equipment, and try to create an intellectual climate that will stimulate their best work.

From their beakers and pilot plants comes the impetus that keeps Standard Oil in the forefront of industrial research, that provides thousands of better products so that millions of people can enjoy better living.

Standard Oil Company
(INDIANA)

STANDARD

Strength for Structures

buttresses with lock nuts *prior* to the placing of the concrete. After the concrete has been placed and has hardened, the lock nuts are released and the stress is transmitted to the concrete by bonding action. This innovation is potentially tremendous in scope for it permits the members to be sawed to any length. Already, retailers in Sweden offer it in stock sizes as a substitute for steel and lumber in the building industry.

Actually Sweden is not alone in finding new applications of pre-stressed concrete. All of Europe is using it in a variety of ways. For example, bathtubs, railroad ties, roof slabs, lamp posts, storage bins, pilings, and the important bridge and factory structures are among the successful products of prestressed concrete.

Yet the utilization, even in Europe, of pre-stressed concrete has just begun, and the potential will increase with every advance in steel and cement manufacture. Its existence offers a challenge to structural engineers, for it offers them a chance to be pioneers in a field with a promising future.

Campus News

a joint meeting with the Syracuse Technology Club, an affiliation af all professional engineering societies in the area. His talk was on automatic transmissions.

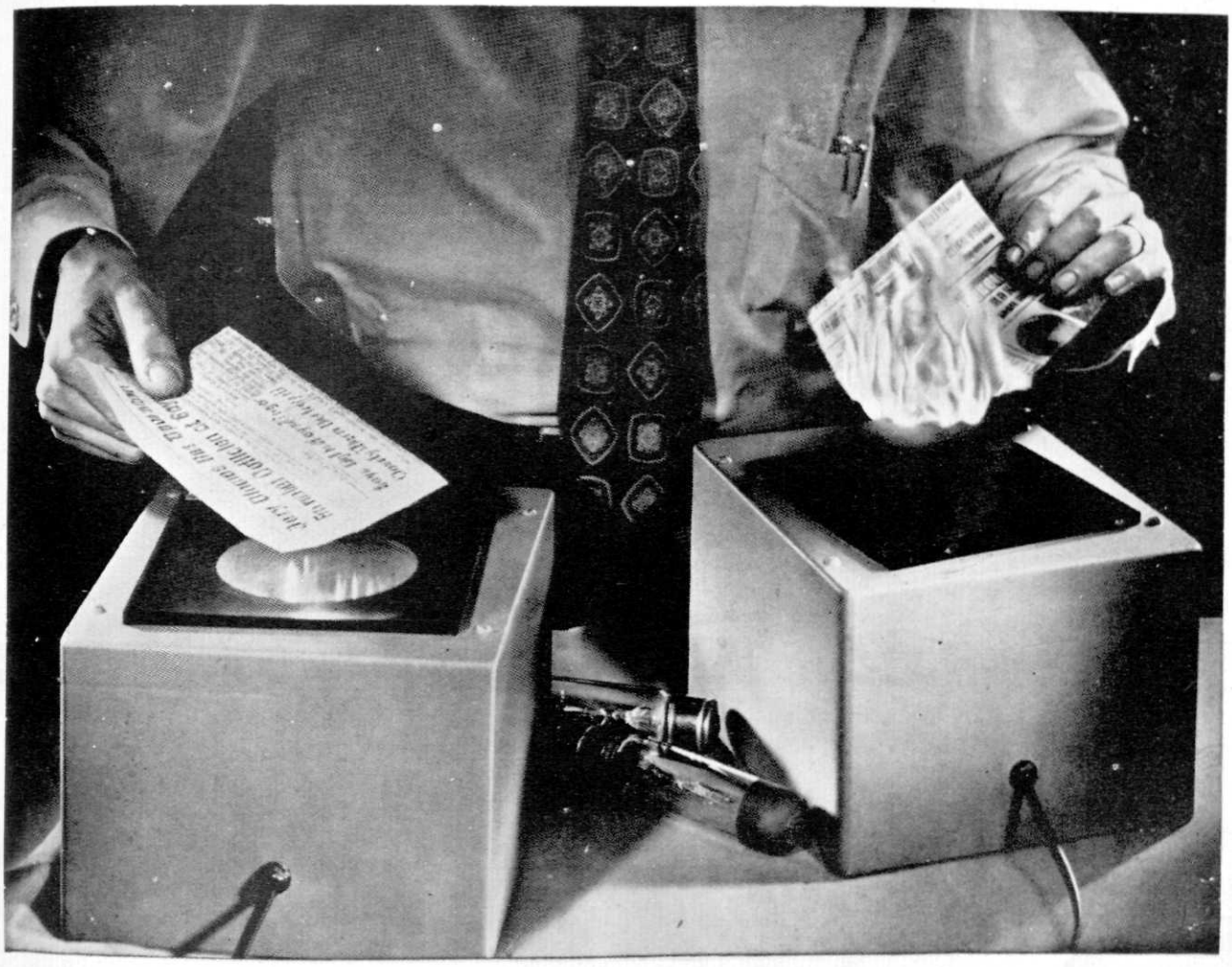
Mr. Otto is on leave of absence from Cornell university where he is an associate professor of mechanical engineering. He is a candidate for a Ph.D. in automotive engineering at State.

The college automotive lab has been expanded with the acquisition of part of the old garage space vacated when the new stadium garage was completed. The additional space will be used for engine bench work and fuels and lubricants testing.

The old room now will be used for dynamometer operation and testing. Set-up and in use now are 100 HP and 20 HP dynamometers.

During winter term there are prospects that graduate students in automotive engineering may do some development work for Reo motors. This would be on engines to be used for the Army contract which Reo received last summer.

(Continued on Page 38)



Glass that picks fire out of a light beam

The electric lamps you see between the boxes on the table are exactly alike—they generate both powerful light *and* intense heat.

If you should concentrate the beam of one of them with a reflector and plug it into an ordinary socket, you'd be practically blinded by its glare and your clothes scorched by the heat—unless you turned away fast!

But look what happens when you put them into the fixtures in the foreground, so their beams are covered by two different kinds of Corning glass.

The beam from the bulb on the left is cooled down so sharply that you can hold a wisp of newspaper in it for hours without its catching fire. Yet the light is almost as dazzling as ever.

Notice now that no light apparently shines from the bulb in the fixture on the right. But if you hold a piece of newspaper over it—in a matter of seconds you have fire in your hands!

The explanation is: One of the glass plates transmits the comparatively cool, visible rays generated by the bulb, blocking off most of the invisible heat rays. The other allows only the invisible heat rays to pass.

These pieces of glass are only two of the dozens of ray-transmitting or ray-blocking glasses that Corning makes—glasses that can pick out any segment of the light spectrum and put it where it's needed.

For example, a lamp shielded with a Corning glass which transmits *only* near ultraviolet rays lights automobile instrument panels without glare. Another kind of Corning glass transmits only invisible infrared rays and is used in electronically controlled burglar alarm systems.

Throughout industry, *Corning means research in glass*—and these ray-blocking, ray-transmitting glasses represent only one of a multitude of outstanding developments that have earned Corning this reputation.

We hope you'll keep in mind that Corning research and technical skill have made glass one of the most versatile engineering materials there is.

For when you're out of school and are concerned with product and process planning, you'll find it to your advantage to call on Corning before your plans reach the blueprint stage. *Corning Glass Works, Corning, New York.*

CORNING
means research in glass

The Societies

on the technical aspects of paint manufacture. He also spoke about job and career possibilities for Ch. E's in the paint industry. After a color movie about the uses of paint and modern manufacturing methods, Mr. Barrett was called back to answer many questions about the industry.

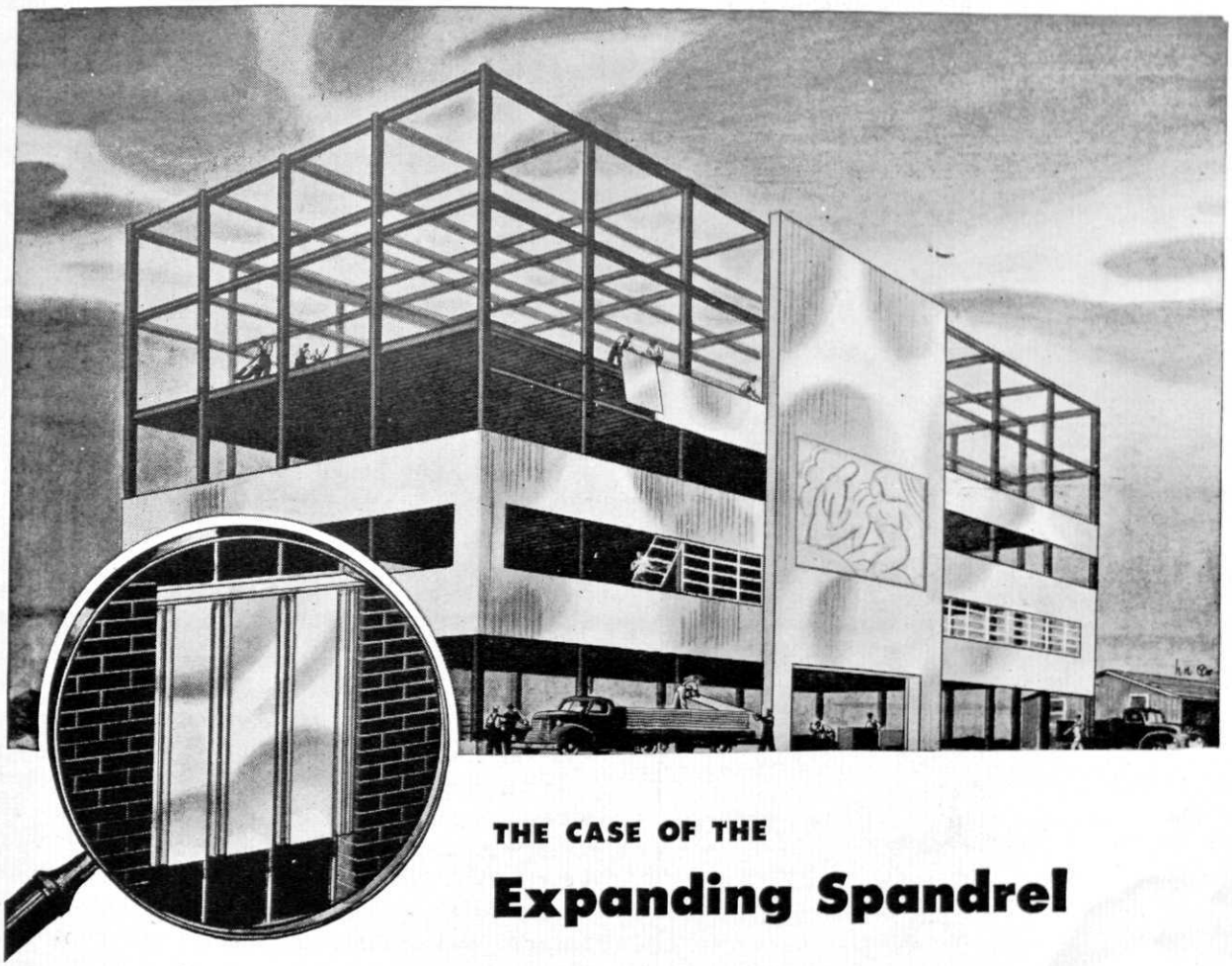
Earlier in the term, about thirty members accepted the invitation of the Detroit Section of the Professional AIChE to attend their meeting at Wayne University. J. A. Clark of the DuPont Company gave a talk on "The First Professional Position of the Chemical Engineer".

Tau Beta Pi, Engineering Honorary, initiated 42 members during fall term. This total included 29 seniors, two juniors and one alumnus.

Nine days of informal initiation were conducted prior to November 10th. On this date a formal initiation banquet was held in the Union. Professor Baccus, of the EE Dept., acted as toastmaster for the ceremonies. The principle speaker was C. W. Otto, of the Lansing Chamber of Commerce. The title of his talk was "Why Are We Here?". He discussed the more satisfying values of living and stressed the importance of harmonious community living.

During Fall term the AIEE-IRE conducted a successful membership drive. Meetings that were held included, General Motors' "Train of Tomorrow" movie, and a talk by F. B. Harris on the various major fields open to engineers.

M. D. Rogers has been selected as faculty advisor for the combined AIEE-IRE organization. Officers of the society are, John Foulkes, president; Paul Fair, vice-president; Dean Morgan, treasurer; Vernon Kidd, AIEE secretary; Blaine Cadwell, IRE secretary.



THE CASE OF THE

Expanding Spandrel

Night and day, winter and summer, year after year, for more than twenty-six years aluminum spandrels (the vertical area between windows in skyscrapers) were exposed to the weather . . . and nothing happened.

That was proof enough for the architects.

Proof that Alcoa Aluminum castings used for spandrels stood up in all kinds of weather, resisted corrosion, kept up their good appearance, never needed maintenance.

"Aluminum works so well for spandrels," reasoned the architects, "why not expand its use . . . make entire walls of it?" They came to Alcoa with their ideas. Alcoa engineers had kept pace. Designs and methods for making complete walls were ready. New ways had been found to make aluminum cheaper and more useful.

Today you will see aluminum-clad buildings going up in every part of the country. These buildings are quick and inexpensive to build. Their aluminum walls never will need expensive painting or repairs.

This case is typical of the history of Alcoa and of the men and women who work for it. While aluminum was proving itself in small applications, Alcoa engineers were perfecting the methods for large scale production and fabrication Within the lifetime of men now living, this company has grown to be one of America's great industries. New developments now underway in Alcoa's laboratories are pointing the way to even more widespread uses for aluminum in the years ahead. ALUMINUM COMPANY OF AMERICA, Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

Centuries of Service

huge permanent structures constructed with machinery and modern equipment. Long bamboo cages filled with gravel collected from near by stream beds are the chief elements of wier and protection works.

Plans have been made to improve the present structure, eliminate its defects, and enable it to develop full utility. Beside improving the existing irrigation and flood control measures, navigation and water power is to be stressed with modification of the existing structures and the incorporation of new ones. Dikes will be built to protect the land from the ravages of flood waters. They would also serve to control the river.

The channel would be improved to carry off excess flood water with its accompanying loads, thus relieving the irrigation channels of the threat of flood and silt deposits. Moveable gates would be provided to regulate water flow at the tip of the "Fish Snout". There also would be a series of moveable gates to provide an equitable proportioning of the irrigation water in the channels, laterals, and sub-laterals.

In transportation starved China there is great need for improved facilities. The cheapest way is through improving the many waterways. It has been proposed that locks be installed and the river dredged to handle barges and boats. A power plant also is planned, to provide electricity for the irrigation pumps, lighting, grinding mills, and small industries. It would be necessary for the plant to produce about 26,000 kilowatts to meet this need.

Although over 2,000 years old, the irrigation system is among the largest in the world today. Neither the design nor the method of diversion have been changed. Though improvements are contemplated, this system functions as well today as it did 22 centuries ago.

Watch For....

A story on photoelectric devices in the March issue of

THE SPARTAN ENGINEER

Electronics

GLAMOUR GIRL—OR PRODUCTION WORKER?

by H. A. BARTLING
Manager, Electronics Section
General Machinery Division
ALLIS-CHALMERS MANUFACTURING COMPANY
(Graduate Training Course 1927)

H. A. BARTLING

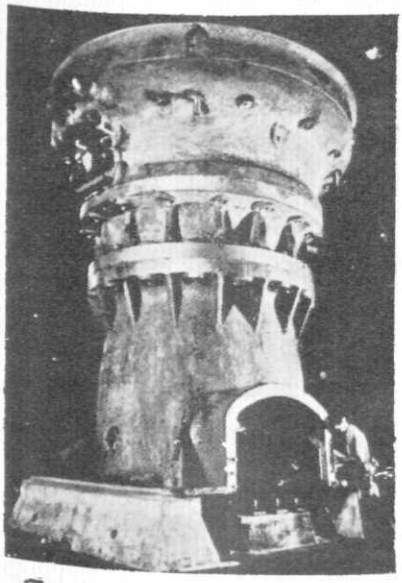
SO MANY near-miracles, actual, experimental or imaginary, are being attributed to electronics that it's quite the glamour girl of the electrical industry. Working closely with this infant prodigy, we find it is indeed fascinating and astonishingly versatile. We find, too, that it is a terrific worker. Applying electronic principles to tough, matter-of-fact industrial jobs is the work of this section.

It rewards us with some really amazing success stories, and with abundant opportunity. The field has hardly been touched.

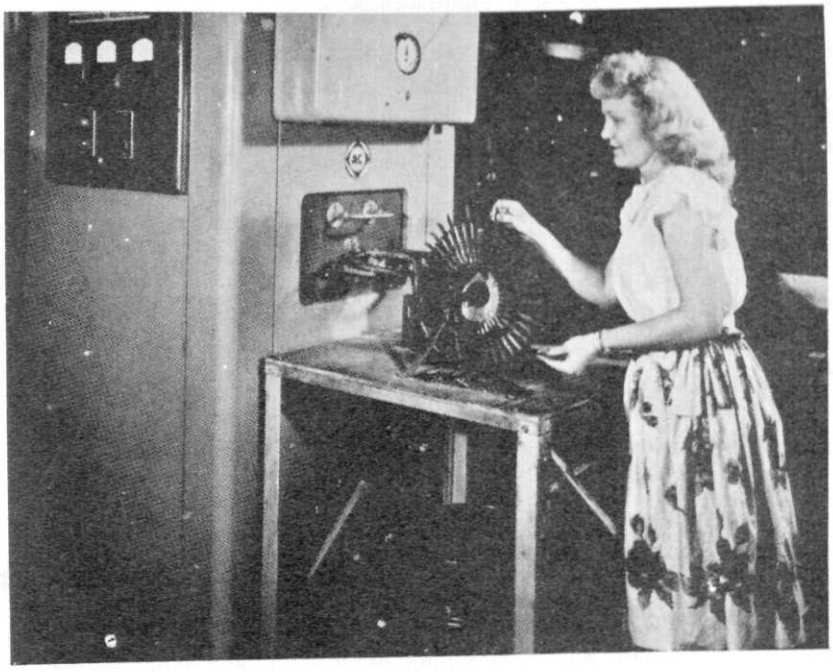
New Field

This field of industrial electronics was completely unknown, of course, when I received my degree in Electrical Engineering from Illinois and entered the Graduate Training Course at Allis-Chalmers in 1925. During the 2-year course I stuck pretty close to electrical work—and at its completion, I was on the electrical test floor helping run tests on some of the first big blooming mill motors the company ever built.

Next, I worked in the Basic Industries Department on electric mine hoists. In 1931, I moved back to the Electrical Department, doing sales application work for the Motor and Generator Section. I worked, successively, on unit sub-stations, had charge of the Mixed Apparatus Section, was in Industrial Sales, handled contract negotiations and sales liaison work during the war, and in 1947 took charge of the company's growing Electronics Section.



Massive castings for a 60-inch Superior-McCully crusher being assembled in the A-C West Allis plant. Machine will reduce 5-foot boulders to crushed rock—handle 2500 tons of ore per hour!



Hardening 2200 trimmer blades per hour, this Allis-Chalmers Induction Heater is stepping up production for a Southern manufacturer of textile machinery.

Here we develop and apply four main classes of industrial electronic equipment: Rectifiers, Induction Heaters, Dielectric Heaters and Metal Detectors. With the exception of Rectifiers, this equipment is relatively new to industry. We're turning up new uses and applications every day. It's an absorbing line of work, and pioneers an entirely new frontier of industrial methods.

Wide Choice of Interests

I've traced this brief personal history to illustrate the widely varied opportunities a young engineer finds at Allis-Chalmers even within a single field such as electricity. I never got far from the Electrical Department, because I found what I wanted right there. But I wouldn't be giving a true picture of Allis-Chalmers if I didn't touch on the other great departments, covering just about every major industry.

Many GTC students find their greatest interest and opportunity in the Basic Industries Department. There they design, build and install the machinery for mining, smelting, cement making, flour milling, oil extraction, food and chemical processing. Others become interested in hydraulic or steam turbines, the complexities of centrifugal pumps and the engineering problems of small motors or V-belt drives.

Some fit into engineering and design. Some find themselves most interested in manufacturing or in field work such as service and erection. Many like selling, and find their engineering training pays off best in a District Sales Office.

Whatever a man may eventually find most to his liking and advantage, the Allis-Chalmers Graduate Training Course is a wonderful vantage point from which to start. It offers contact with all major industries, and a chance at many types of work: design, manufacture, research, testing, installation, selling, advertising, export. There is no other organization that can offer a graduate engineer such a wide range of activities.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin

Campus News

Two instructors from the M.E. department, Professors Price and Apple, attended the ASME meeting in New York last term.

Mr. Apple was a member of the work standardization committee. The committee project is to standardize the terminology used in the field of industrial engineering.

Paul DeKoning, of the M.E. Dept., has been awarded patents on two devices for the testing of commercial dishwashing machines.

The test is performed in two parts. The first is to spray a mixture of protein and carbohydrate material on a plate and let it stand 12 to 16 hours. The dish is then washed in the machine to be rated and placed on another machine that revolves the dish in front of a photoelectric cell. A predetermined reading of a meter, operated by the photocell, determines the rating of the dishwashing machine.

Tests completed in the Lansing area have shown only five out of twelve dishwashers as being satisfactory.

NODULAR CAST IRON

for large scale commercial adoption. One of great troubles to date is that results have been difficult to duplicate. A foundry trying to make a number of identical heats of nodular iron has found great difficulty in getting identical results. It must also be remembered that nodular iron for the most part is still in the experimental stage.

No matter what course future investigation takes, it is certain that a new engineering material is being developed having unique properties. Because of the simplicity of the nodular cast iron process, it will rank high with other casting materials for its place in industry. Industry will feel the presence of this new material more and more as new developments are made.

SIDE TRACKED . . . .

Father, looking cautiously into the living room of the fraternity house:

"Does Joe Smith live here?"

Voice from the inside: "Yeah, just bring him in and lay him on the couch".

* * * *

Three football players at different schools had flunked their classes and were dropped from their teams. They got together and talked about their misfortune.

The man from Notre Dame said: "That calculus was just too much."

The man from Southern Cal. said: "It was trig that got me".

The guy from U of M said: "Did youse guys ever hear of long division?"

* * * *

Stalin was pinning some medals on his ski-troop heroes, and he went up to one of them to get some personal information.

Stalin: "Tell me, comrade, what was the first thing that you did when you came back from the war?"

Soldier: "Well, sir, I hadn't been home in four years—hadn't seen my wife—well, you know how it is."

Stalin: "Er—yes. But tell me, what was the second thing that you did when you came back?"

Soldier: "I took off my skis."

* * * *

A grave digger, absorbed in his thoughts, dug the grave so deep that he couldn't get out. Came nightfall and the evening chill, and his predicament became more and more uncomfortable. He shouted for help and at last attracted the attention of a passing drunk.

"Get me out of here," he shouted, "I'm cold."

The drunk looked into the grave and finally distinguished the form of the grave digger.

"No wonder you're cold", he said, "You haven't got any dirt on you."

* * * *

Prof: "Why the quotation marks on this exam paper?"

M.E.: "Courtesy of the man on my right, sir."

A young woman
Stepped out of bed
Slipped into her robe
Stepped into her slippers
Raised the shade
Uncovered the parrot
Put on the coffee pot
And answered the phone.
A masculine voice said:
"Hello honey, just got a 24-hour leave,
I'll be right up!"
She hung up the phone
Took off the coffee pot
Covered the parrot
Pulled down the shade
Stepped out of her slippers
Slipped out of her robe
Crawled into bed and
Heard the parrot say:
"Kee-rist, what a short day!"

* * * *

"Have you heard about the new college game?"

"No, what's that?"

"Button, button, here comes the housemother."

Little dog looking up at a parking meter: "Heck, ya gotta pay now!"

* * * *

"Boys," said the clergyman to the sunday school class, "You must learn never to lose your tempers, even under the most vexing circumstances. To illustrate this, while I've been talking, a fly has landed on my nose; I do not swear, I do not blastpheme, I merely Say, 'Go away fly.' MY GOD, IT'S A BEE!"

"He loves me . . . . he loves me not . . . . he loves me . . . ."

SIDE TRACKED . . . .

Then there is the one about the soldier who was slapped for drinking milk out of a wax container.

* * * *

The buxom soprano in the opera fainted and it took four men to carry her off stage....two abreast.

* * * *

"Do you think you can make my daughter happy?"
"But I thought that her name was Sue!"

* * * *

She was only a cattleman's daughter but all the horsemen knew her.

* * * *

The guys who think our jokes are rough,
Would quickly change their views,
If they'd compare the ones we print,
With those we're scared to use.

* * * *

"Honey, ah sho loves yo bathing suit."
"Sho nuff?"
"It sho does!"

* * * *

A pessimist is a man who feels that all women are bad.
An optimist hopes so.

* * * *

One morning a lone Irishman was at work near the top of a telephone pole, painting it a bright green when the pail of paint spilled and splashed on the sidewalk below. A few minutes later another Irishman came along. He looked at the paint, then at his country man and inquired with anxiety, "Doherty, Doherty! Have ye had a himer age?"

The bandage-covered Ch. E. who lay in the hospital bed spoke dazedly to his visiting pal:
"What-What happened?"
"You absorbed too much last night, and then made a bet that you could fly out the window and around the block."
"Why didn't you stop me?" screamed the beat-up Ch. E. student.
"Stop you, I had ten bucks bet on you!"

* * * *

Overheard in a dark corner of a hardware store. One can of paint to another: "Darling, I think I'm pigment."

* * * *

A Mississippi steamboat had stopped because of a dense fog on the river. A nosey passenger asked the cause of the delay.
"Can't see up the river," the captain replied briefly.
"But I can see the stars overhead," the passenger sharply replied.
"Well," said the captain, "unless that bad boiler busts, we ain't goin' that way."

Want ad in State News: Will trade–One good study lamp for comfortable bed. Transferring from Engineering to Bus. Ad.

* * * *

Little Willie is so distressed. He got a pair of pink pajamas and a military hair brush for his birthday. Now he doesn't know whether to go to West Point or U. of M.

* * * *

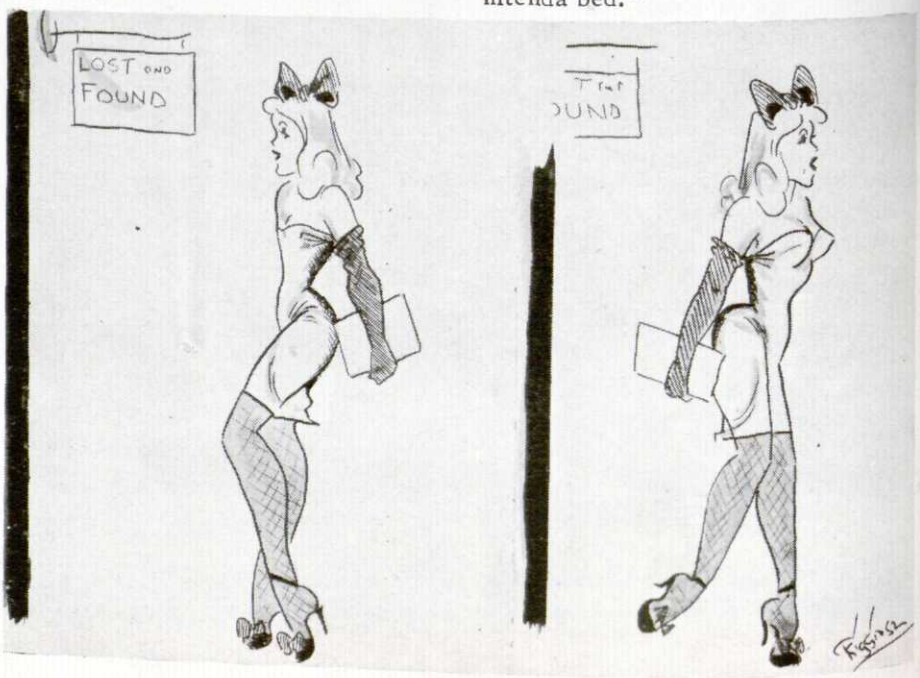
She: Have you heard those awful things people are saying about me?
He: Sure Baby, why do you think I'm here?

* * * *

The old lady was very much afraid of passing her destination. Leaning forward, she poked the streetcar conductor in the ribs with her umbrella.
"Is that the First National Bank, my good man?"
"No ma'am," replied the conductor hastily, "that's me."

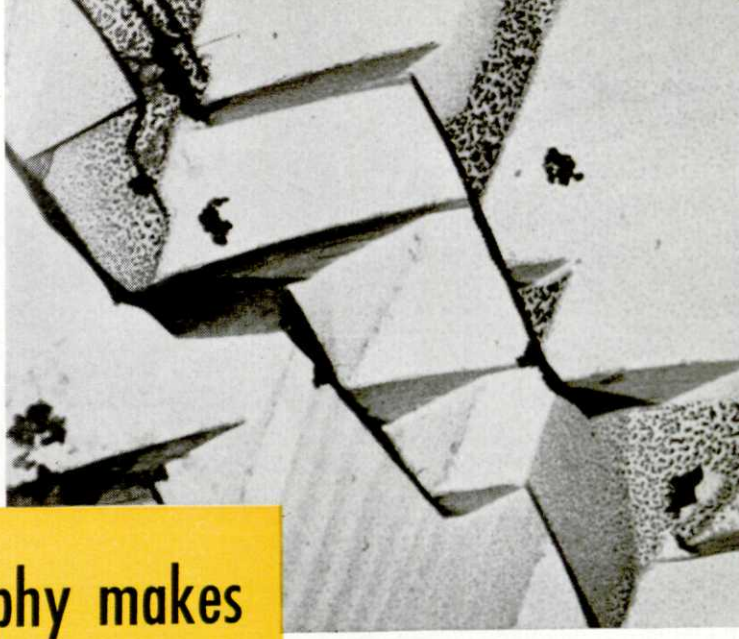
* * * *

Drunk: "It takesh me an hour or sho to get to sleep when I go home."
Drunker: "Thash funny, I always fall ashleep ash soon ash I hit da bed."
Drunk: "Sho do I. My troublesh hitenda bed."



DISPLAYS MASSIVE PRODUCTS—A Diesel locomotive can roar across the Rockies—all on a movie screen in a prospect's office. All because photography can take huge things or small, and make them of a size for a salesman, teacher, or demonstrator to show.

Photography makes big things small—small things big—and business comes out ahead



MAKES MICROSCOPIC DETAILS CLEAR—Photography takes great magnifications produced by the electron microscope (20,000X) on fine-grain Kodak plates, enlarges and records them up to 100,000X on Kodak projection papers. Previously undetectable details and new facts are revealed.

REDUCES FILING SPACE BY 98%—With microfilming, bulky records can be reduced and stored on a few rolls of film. 675 drawings, 24" x 36", can be recorded on a 100' roll of 35mm. Recordak or Kodagraph Micro-File Film. And everything is quickly ready for reference in the Recordak or Kodagraph Film Reader.

REVEALS STRUCTURE AND CONDITION OF METALS—X-ray diffraction patterns on Kodak films or plates provide important information concerning the crystal structure of metals. These patterns help show how alloys can be improved or new alloys made—give data on the effect of machining, drilling, and punching upon the structure of the material.

With the speed of a flick of light, photography can reduce or enlarge accurately to scale, and without missing the tiniest detail. And that's not all.

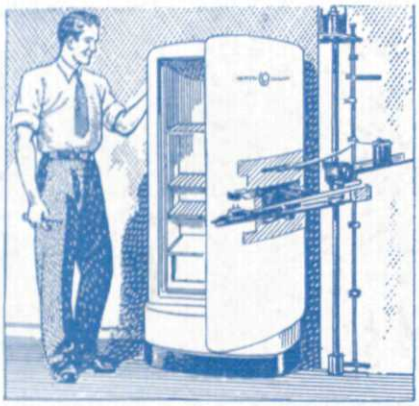
It can magnify time with the high speed motion-picture camera so that the fastest motion can be slowed down for study. It can record the penetrating x-ray and reveal internal conditions of materials and products. With movies and stills, it can repeat a story, time and again, without the loss of a single detail.

Yes, photography serves business and industry in many important and valuable ways. It can work for you, too. If you would like to know how, please feel free to write for literature, or for specific information which could be helpful to you. Eastman Kodak Company, Rochester 4, New York.

FUNCTIONAL PHOTOGRAPHY

serves industrial, commercial, and scientific progress

Kodak
TRADE-MARK



Will refrigerator doors stand up to years of slamming? This device slams them 350,000 times, equivalent to 25 years' average use.

Will vibration harm tubes for aircraft radio? G-E engineers developed equipment to shake them 25 times a second for 100 hrs.

Is there a leak in the sealed-in G-E refrigerating system? This instrument can detect leaks that would permit only an ounce of gas a century to escape.

These were also tough tests for G-E engineers . . .

A LEAK that would take years to deflate a tire is big enough to cause trouble in the cooling system of a refrigerator. How to devise test equipment sensitive enough to catch such microscopic flaws and eliminate them from General Electric units was also a tough test for engineering skill and ingenuity.

But the G-E engineer in search of solutions makes use of the stream of new ideas flowing from industry's largest technical staff—the more than 9000 scientists, engineers, chemists, physicists, and mathematicians employed by General Electric.

The principle for the new electronic leak-detector now being used to check refrigerators came out of the G-E Research Laboratory. Further development of it was carried on by the General Engineering and Consulting Laboratory. It was applied to refrigerator testing by engineers in the Company's Erie, Pennsylvania, plant.

To the consumer, this sort of teamwork means better, more dependable, longer-lasting General Electric products. To the engineer it means more varied opportunities, quicker development, the advantages of belonging to an organization where emphasis on research and incentives for creative thinking are the tradition.

You can put your confidence in—

GENERAL ELECTRIC