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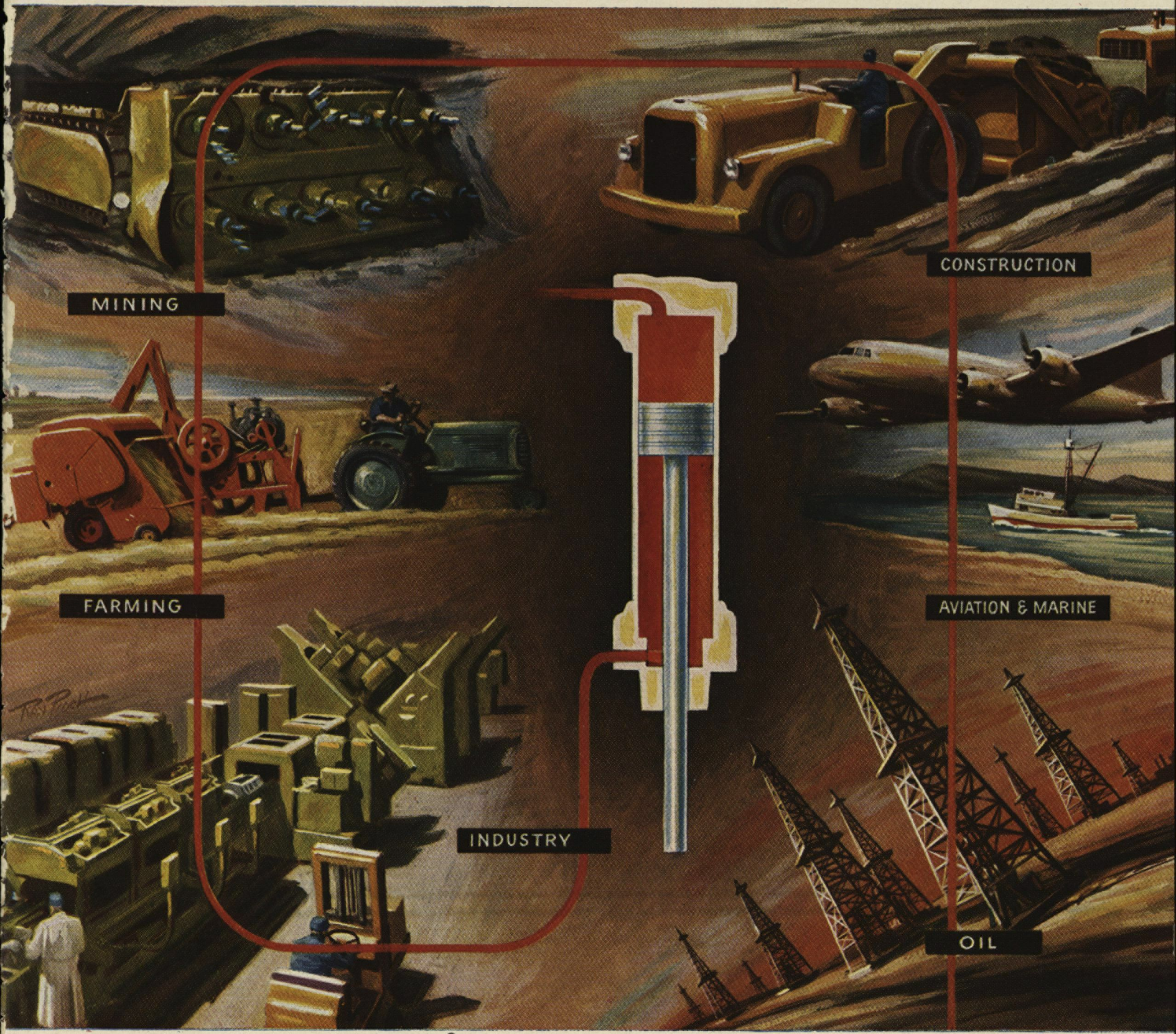
Rose-Hulman Institute of Technology

RoseTechnic



MEMBER ENGINEERING COLLEGE MAGAZINE ASSOCIATED

NOVEMBER, 1951

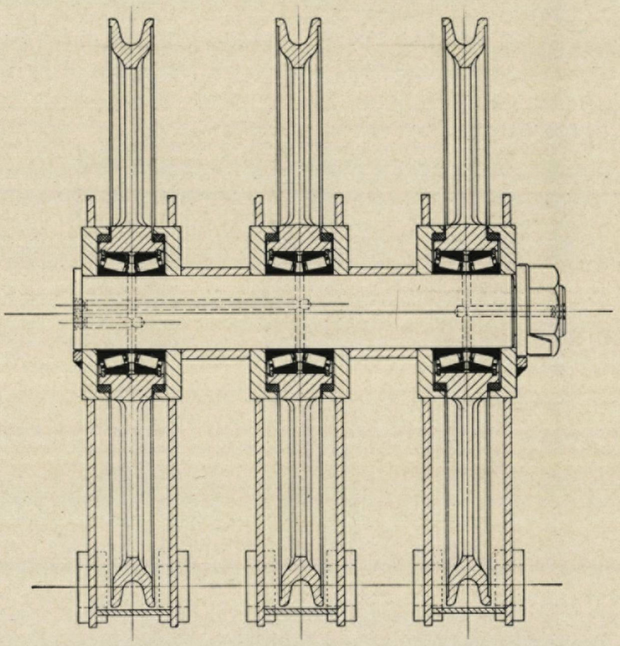
Another page for **YOUR BEARING NOTEBOOK**

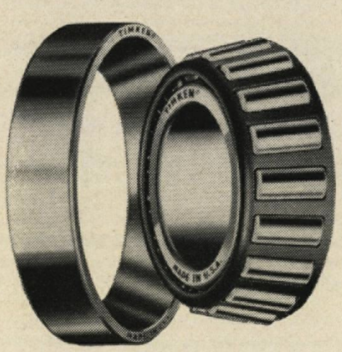
How to buck up a bucket

To carry the tremendous load on the sheaves of this giant, 17-ton-capacity clamshell, engineers mount them on Timken® tapered roller bearings. Due to line contact between rollers and races, Timken bearings have unusual load-carrying capacity. And because of their tapered construction, they take radial and thrust loads in any combination. Friction is practically eliminated. Lubrication is kept to a minimum because Timken bearings permit effective closures to keep dirt and water out and retain lubricants longer.

Mounting sheave bearings

The Timken bearings in this application are mounted with slotted cone spacers to provide lubrication through the shaft. The entire sheave assembly is clamped together by means of a nut and spacers between each bearing assembly. Felt seals are used. Cups are mounted with a press fit in the sheave hubs and positioned with snap rings.





TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

How you can learn more about bearings

Some of the engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'll be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

RoseTechnic

VOLUME LXIII, NO. 2 NOVEMBER, 1951

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Representative applications of hydraulics to power and control problems. Courtesy of SPERRYSCOPE.

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Installation of a large Diesel Engine. Courtesy of GENERAL ELECTRIC.

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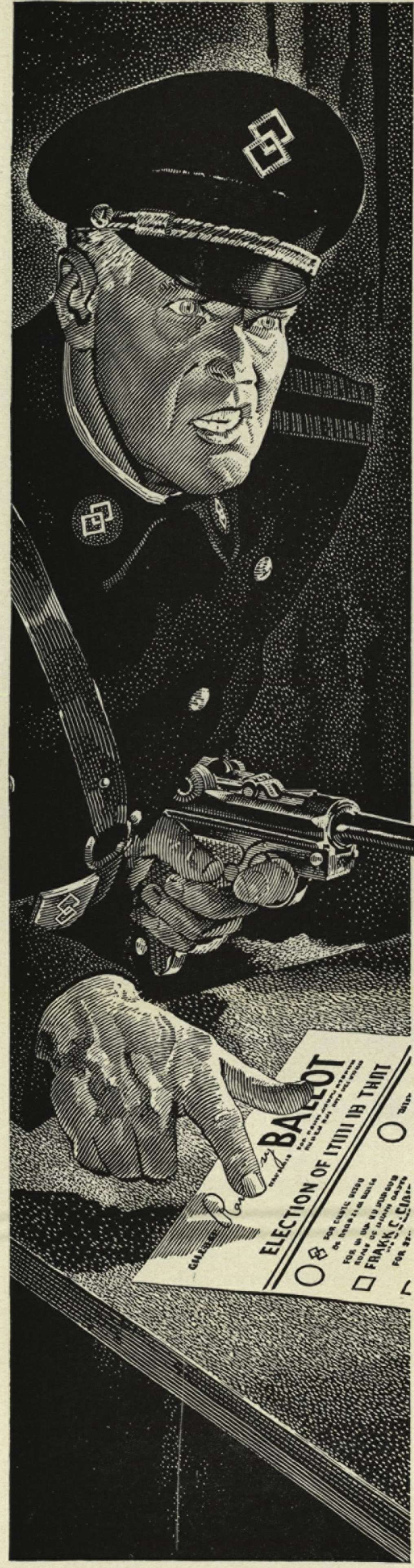


"Put your *X there!*"

"Ever have nightmares?

"I don't, often. But I sure had one last night! Wasn't my usual one, being chased by a lion and falling off a cliff. In *this* dream it was Election Day. I was at the polls, kidding with some of the boys I knew . . . but they weren't kidding back. They looked sort of worried or scared or something.

"Anyway, I got my ballot, stepped into the voting booth and pulled the curtain. I wet the end of the pencil . . . to make my X's big and black. *Then the nightmare part began.*

"A tough-looking soldier stepped into the booth. He put his finger on the ballot and said, *'Put your X THERE! And THERE . . . and THERE . . .'* None of the names I'd picked, either. He had a big black gun pointing right at me.

"That was last night. Today, all day, I've been thinking about it. I'd known that was how some elections got settled in other places. But it never occurred to me before how lucky I was to be a citizen of *this* country. *Here* I vote according to my conscience, not a gun. And I do other things the way I please . . . like going to church, or picking out my own kind of job down at the Republic plant. Try that where there's no freedom!

"That's it . . . *Freedom!* We've got all the Freedom in the world. But, honestly now, do we *really* appreciate it? Do *you?* I admit I've done *my* share of griping . . . probably never will get over that habit.

"But, with Freedom-grabbers at work here as well as abroad, I want to be sure on Election Day that we're *all alone* in that voting booth. With nobody to tell us, *'Put your X THERE!'* No sir!"

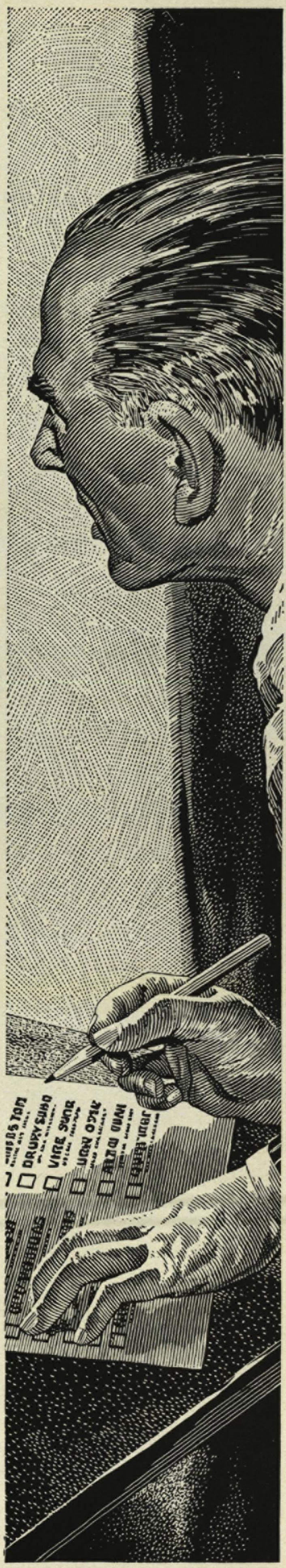
REPUBLIC STEEL

Republic Building, Cleveland 1, Ohio

Republic BECAME strong in a strong and free America. Republic can REMAIN strong only in an America that remains strong and free . . . an America whose many thriving industries have brought the world's highest living standards to her people. *And in serving Industry, Republic also serves America.* Take, for example, the Food Processing Industry. Here untold millions of pounds of food are processed, refrigerated, packed, canned and frozen for the American table. And here Republic's gleaming Enduro Stainless Steel can be found on the job . . . in vats, cookers, sterilizers, mixers, coolers, to name but a very few . . . guarding faithfully the food your family eats.

* * *

For a full color reprint of this advertisement, write Dept. H, Republic Steel, Cleveland 1, Ohio



AL ENDRES IS ONE of a team of Standard research men engaged in testing the effectiveness of a new powder against plant fungi in the greenhouses at Whiting. Men at Standard Oil's Whiting laboratories often work in close conjunction with research projects at university centers.

AL CHECKS EFFECTS of a spray on an apple tree with Lloyd Boyd. This is part of another project being carried on in our Whiting greenhouses. Al also worked on control, and corroborative tests that led to development of petroleum fractions to kill weeds.

How chemistry is winning the War on Weeds

AGRICULTURAL weed control has for a long time presented chemistry with one of its most interesting problems. Recent successes in this field by petroleum scientists demonstrate the broad scope of activity to which research men in Standard Oil's Whiting laboratories are daily exposed.

The story of weed control begins with wartime manpower shortages on truck farms. Vegetable crop failures increased because weeding could not be done by hand. Scientists discovered that certain petroleum cuts would rid carrot crops of weeds without harm to flavor.

This led to further experiments on the weed-killing possibilities of petroleum fractions by Dr. B. H. Grigsby and his assistants at Michigan State College—cooperating with groups of scientists at other agricultural colleges. Great progress was made on weed-control in the cultivation of celery, asparagus, caraway, dill, parsnips, and cranberries.

Another tough weed-elimination problem was crab grass. To do the job, it was necessary to find a killing agent which would knock out the crab grass, yet leave other grasses unharmed. Recently, Standard Oil has been able to announce successful test results on the petroleum fraction which is today's miracle crab grass killer.

These are just a few of the many problems that give young Standard Oil research men the satisfaction of knowing they have contributed to an advance in our way of living through new uses for petroleum and petroleum products.

Standard Oil Company

910 South Michigan Avenue, Chicago 80, Illinois

STANDARD

Nuclear Reactors

Adapted by Alvin B. Thomas, Sr., Ch. E.,
from a paper by Robert G. Rinker

Editor's note: The paper, "Nuclear Reactors," by R. G. Rinker, Rose '51, won first prize last year at the A. I. Ch. E. Student Convention Contest held at Northwestern University. With the author's permission, this article is, in part, a paraphrase of that paper.

The youngest of the engineering sciences, nuclear engineering, has existed but nine years, and its growth has been phenomenal. Since 1942, when the first experimental "pile" was built at the University of Chicago, the atomic energy program and nuclear engineering have progressed to a point of reliable rationality. Consequently the United States has today numerous nuclear reactors and laboratories devoted to the furtherance of atomic science and national security. It is the purpose of this article to explain and describe briefly the common unclassified reactors existing today so that those interested may have at least in some measure a knowledge of developments which, in time, may markedly affect their lives.

Background

For a proper understanding of reactor technology it is well to quickly review a few basic ideas. It is known that, essentially, the nuclei of atoms are made up of neutrons and protons. The protons have a finite mass and one positive charge each; these particles determine the number of electrons which surround a nucleus and which give an atom its chemical properties. The neutron is uncharged but has a mass equal to that of the proton; these particles therefore contribute, effectively, only to the weight of the atom. Isotopes are atoms having identical charges on their nuclei but differing in mass, i.e., the number of neutrons in isotopic nuclei vary.

Certain isotopes are unstable and give rise to radioactivity, the dispersion of radiation and/or particles from the nucleus. Among the heavy isotopes, particularly those of uranium, this unstability is very pronounced and under suitable conditions the nuclei of the material may split into two approximately equal parts. This latter process is called fission and occurs, for example, when the uranium isotope, U^{235} is bombarded by neutrons of the proper kinetic energy.

A chain-reaction and even an explosion can occur if a large enough mass of fissionable material is present. U^{235} is constantly decaying and giving off neutrons (this is radioactivity, not fission); however, when a critical mass is available the decay neutrons inaugurate a fission process which multiplies itself rapidly, unleashing huge quantities of energy.

Controlling the fission chain-reaction allows energy to be drawn from the process, usually as heat, at a rate at which it can be handled effectively and put to constructive uses. The "machine" in which the fission chain-reaction is sustained and controlled is the nuclear reactor.

Reactor Components

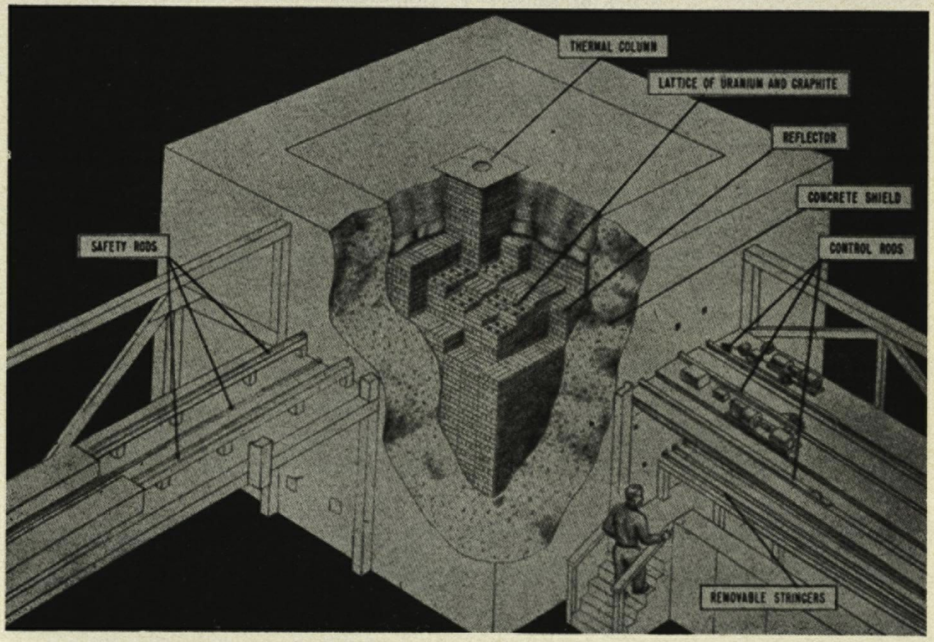
The essential components of a reactor are a fuel, a moderator, a reflector, a shield, coolants, structural materials, and control devices.

The fuel for a nuclear reactor is a fissionable material such as U^{235} or plutonium. Many reactors utilize these elements in pure metallic form, but often compounds such as uranium oxide or uranium carbide are used alone or in addition to the metal. Solid fuels are often in the form of small parcels coated with aluminum which prevents the spreading of radioactive products within the reactor core. Solutions of salts containing fissionable atoms such as uranyl sulfate and uranyl nitrate find application in homogeneous reactors.

Moderating materials have the property of slowing down rapidly

Continued on page 16

Heterogeneous Reactor



Alumni News

By Chris Sharpenberg, sr. m.e.
William Sharpenberg, fresh.

'25 Ernest A. Evers, E.E., has been recalled to active service from the Army Reserve. Major Evers is with the Signal Corps Procurement Agency in Chicago.

'28 Robert A. Thompson, C. E., is General Superintendent for the Dravo Corporation in charge of the reconstruction of Locks Number 2 of the Monongahela River, near Pittsburgh. The work has attracted the attention of both engineers and river navigators because of the design and construction problems.

When completed, the new locks will provide a modern navigation facility that should serve the Pittsburgh area for many years.

'34 James I. Mason, M. E., was recently promoted to lieutenant colonel. He is director of personnel services at 931st Engineer Aviation Group Headquarters, Korea.

'34 & '40 Brent C. Jacob, Jr., E. E., '34 who is on the staff of the vice-president in charge of production, Chrysler Corporation, and Norman G. Eder, M. E. '40, staff engineers with Eureka Williams Corporation, Bloomington, Illinois, were enrolled during the summer in an intensive course for quality control specialists conducted at the University of Michigan. Several universities and interested industries co-operated in setting up the program.

'42 David M. Demaree, M. E., is now an Electrical Consulting Engineer in Phoenix, Arizona.

Feb. '43 Word has recently been received from Michael W. Percopo, Ch.E., telling of activities leading to his present position in Italy with E. R. Squibb & Sons.

After graduating from Rose, Mr. Percopo attended the Harvard Business School. Finishing there, he took a job with E. R. Squibb & Sons. In April, 1949, Laboratori Palma of Rome, Italy, approached the Squibb Company for the purpose of obtaining license to manufacture the full Squibb line, especially Streptomycin and penicillin. Mr. Percopo was assigned the task of coordinating manufacturing affairs, which consisted of all engineering and manufacturing know-how for the project.

When he arrived in Rome in 1949, the antibiotic plant was a skeleton of a building. Now, they are about to start the production of Streptomycin.

Mr. Percopo was well pleased with the opportunities of traveling and living in Europe. However, the bachelor life was too much for him; so last fall he married Miss Catherine Walker, a Vassar graduate whose home was in Kentucky. They met while working for Squibb.

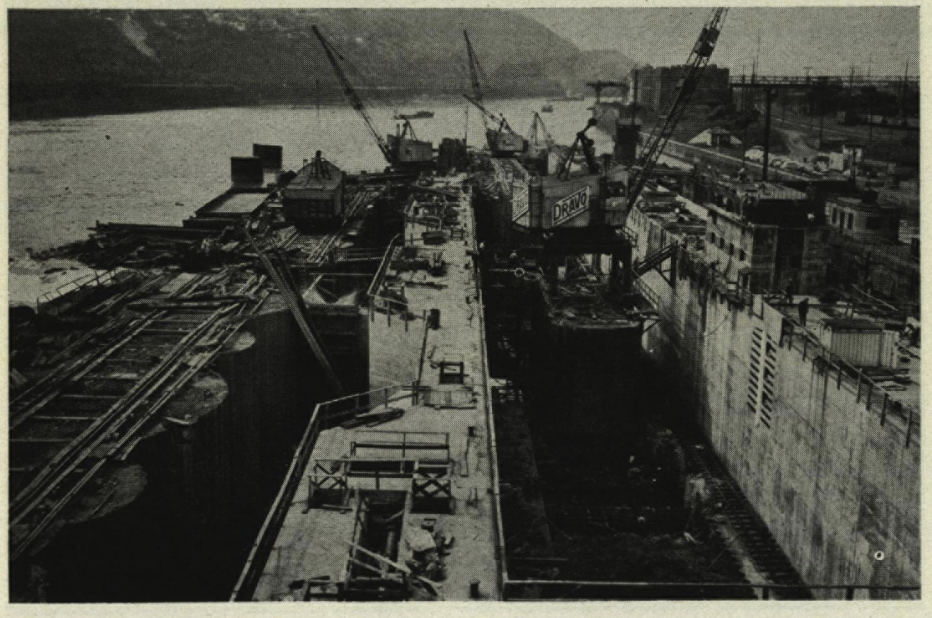
Dec. '47 William R. Buechler, M. E., has completed training in the General Electric Company's "Creative Engineering Program" and was awarded the company's graduation certificate at a dinner in Schenectady, New York. He has spent two years in developing new ideas, approaches, and applications to engineering assignments.

Dec. '47 Herbert Katz, E. E., was awarded The General Electric Company's graduation certificate for the "Advanced Engineering Program" at the graduation dinner in Schenectady, New York. He has spent three years developing the application of theoretical material to highly-complex engineering problems.

Nov. '49 Carl R. Hildebrand, E. E., who has been with P. R. Mallory and Company in Indianapolis since his graduation from Rose, has been promoted to field sales engineer and expects to be located in Cleveland in the near future.

Mr. Hildebrand was married to Miss Beverly Zimmer on June 23, 1951.

Work of Robert A. Thompson, '28



Campus Survey

By Duane Pyle, sr. c.e., Carl Bals, sr. ch.e.,
Jack Farell, soph. ch.e., Jesse W. Foreman, soph. ch.e.

Homecoming 1951

Homecoming at Rose, always one of the most enjoyable events of the school year, was bigger and better than ever this year. Rosie's grand entry into Terre Haute Friday night officially opened the weekend's festivities. The Greencaps gaily rolled Rosie around town in the usual fashion, pausing only long enough to scoop up some invisible substance left in the wake of the elephant. Of course, Rosie was autographed by all the unescorted females within range of the marauding Freshmen.

After the parade a large crowd gathered on the Rose football practice field, and, in the light of the well-built bonfire, alumni sought out alumni, as is the custom.

Having witnessed the blazing demise of the "little house," the crowd slowly sifted into the field house where refreshments of cider and donuts were served by Blue Key Fraternity. A pep session followed, featuring cheers and a "dissertation" by Coach Phil Brown. Phil, with typical P.B. humor, introduced the players and managers and gave a general summary of football at Rose in 1951.

At 9:30 Saturday morning the alumni held their annual business meeting in the auditorium and, among other things, elected a new set of officers. Having completed their business session, the Rose grads adjourned to the campus for a barbecue luncheon.

One of the most important events of the weekend occurred at 1:20 Saturday afternoon, at which time the dedication service for the new Dolly Gray Memorial Entrance was held. This beautiful stone structure was donated to Rose by the widow and two daughters of Chesleigh "Dolly" Gray, class of 1913, in memory of this distinguished engineer and citizen.

At 2:00 o'clock the big moment at last had arrived. The Fighting Engineers of Rose took the field against their traditional rivals, the Franklin "Grizzlies." The Engineers showed a lot of spirit and demonstrated a great deal of latent ability, but their efforts fell short of the mark. As the final gun sounded, the scoreboard showed Rose on the short end of a 20-6 score.

The spirits of the alumni were not dampened by the loss, however, and after the game the grads and their guests attended an Open House sponsored by the Wabash Valley Rose Tech Club at the Terre Haute House.

Following the Open House the annual Banquet was held in the Mayflower Room of the Terre Haute House. Simultaneously the wives of the alumni held a dinner at the Deming Hotel. The Rose Glee Club presented a short program at both banquets.

One of the most eagerly anticipated social events of the year, the Rose Homecoming Dance, was held from 10:00 to 1:00 in the Mayflower Room of the Terre Haute House. In spite of the rather crowded conditions everyone seemed to be having a wonderful time. As the "wee" hours of Sunday morning approached the crowd dispersed and everyone went his way, anxious to return for another gala Rose Homecoming next year.

Honor Assembly

At the assembly on October 12, 1951, twenty-two Rose men received Honor Keys, seven were tapped for Tau Beta Pi, and five were tapped for Blue Key. The Honor Key presentations were made by Dave Leeds, President of the student council, and tapping ceremonies were conducted by Tau Beta Pi president Joe Perona and Blue Key president Al Forsaith, respectively.

In addition to the above awards, vice president Carl Wischemeyer made the presentation of the bronze Heminway Medal to Jack Farell. This medal is awarded annually to the sophomore who has maintained the highest scholastic standing during his freshman year. Tau Beta Pi awarded five dollars credit toward the purchase of a handbook to Robert W. Sutton; this award is made annually to the sophomore who has raised his cumulative the most during his second semester as a freshman.

The names of those receiving honors at the assembly are as follows:

Tau Beta Pi: Moody, Pirtle, Brunner, Klaus, R. C. Bosshardt, Ray, and Grinslade.

Blue Key: Rout, Flesor, Badger, Klaus, and R. C. Bosshardt.

Honor Keys: Ulbrich, Little, Hauser, Bals, Klaus, R. C. Bosshardt, Updike, Mudron, Willian, W. Jones, Failing, Pyle, Forsaith, Hirschfield, Metz, Leeds, Zorman, Brunner, A. Samuels, Ray, Cross, Wm. Stewart.

Deming's Face Lifted

During the past summer, Deming Hall received a much needed "face lifting". The improvements to the dorm were made possible by last year's Eli Lilly & Company's $75,000 grant to the school.

The most noticeable change occurred in the lounge, where a complete job of redecorating was done by the interior decorating firm of Quinn-Johnson of Indianapolis. All of the old furniture was removed and new over-stuffed chairs, davenports, lamps and tables were added. The walls were repainted in pleasing colors and a new carpet was placed on the floor. The only remnants of the old lounge furniture are the bookshelves.

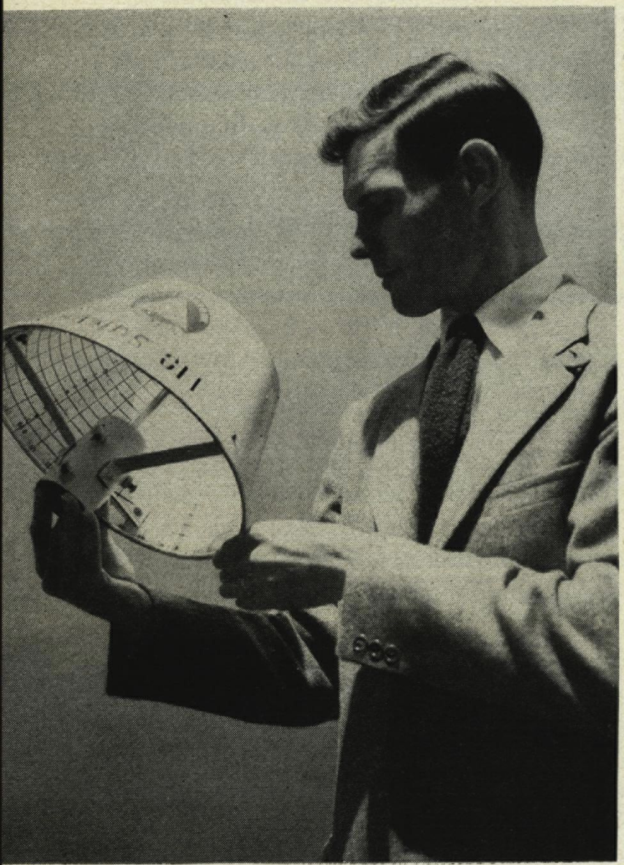
Research And

By Fritz Wheeler, jr., e.e., and John Rinker, jr., ch.e.

Ultrasonic Cleaning

Sound pitched so high that it cannot be heard is now being used for what is believed to be the first time in industrial cleaning on a production line basis. By means of an ultrasonic cleaning machine, high-pitched sound waves directed through a liquid solvent silently remove metal particles, lapping compound, oil and grease from tiny openings and corners of electric shaver heads. Cleaning of the tiny openings has long been a major problem in the electric shaver industry, previous methods requiring long, tedious operations. Engineers said that special compounds used in grinding, as well as metal particles resulting from grinding, become lodged in the small corners and capillary spaces, making cleaning difficult.

Ultrasonic Cleaning



Previous methods involved several expensive steps, including treatment with alkaline cleaners, agitation washing machines and manual brushing of each tiny opening. The new method simplifies the cleaning process and eliminates hand brushing, thus speeding the operation, and cutting expense. The ultrasonic cleaning machine occupies less than one-third the floor space previously required for cleaning. Two persons operate the machine. One places shaver heads on a conveyor chain which carries them through a trough containing a solvent. The other completes the operation by removing the shaver heads and placing them into a tray. As the shaver heads pass through the cleaning trough, alternate electric charges on a quartz crystal under the trough cause high-pitched sound waves to be directed through the solvent and into all small openings and corners of the shaver heads.

Although a cleaning solvent is used in the process, as it was in previous methods, action of the sound waves greatly increases effects of the solvent in removing dirt, grease and metal particles from small corners and crevices, where the solvent alone would be ineffective. During the trip through the cleaning trough, the shaver heads are thoroughly cleaned and rinsed.

Radiation Lampshade

A "radiation lampshade," so-called because it resembles a lampshade, is designed to determine quickly and accurately the position of an atomic bomb explosion. The device is part of a grid monitor system being set up for the Schenectady, New York, area. The purpose of the system is to provide immediately after an atomic bomb explosion the necessary data to enable rescue workers to proceed with the greatest efficiency.

Engineers said that the instrument would determine the height at which an explosion has occurred and the position of "ground zero," the point directly under the burst. They described the device as made of sheet metal, about a foot in diameter, smaller at the top than at the bottom, and painted white inside and out. On the inside surface are numbered vertical lines and lettered horizontal lines. A pointed brass rod projects upward inside the device. The instrument as such would be mounted out-of-doors, so that it would be exposed to radiation.

During an atomic bombing, intense heat radiation would scorch the inside painted surface in relation to the direction of the burst from the location of the device. Because the heat radiation, like light, would travel in straight lines, it would form shadows of objects in its path, and thus shadows of the upper edge of the device and of the pointed brass rod would appear as unscorched areas on scorched regions. The positions of the shadows as determined by the numbered vertical lines and lettered horizontal lines would furnish evidence of the direction and height of the bomb burst.

Radiation lampshades should be located so that at least four would be within one to two miles of any burst. Wardens would inspect them immediately after an explosion and report the letter and number of the lines where the shadows of the upper rim and point fall, thus giving the direction and altitude angle of the burst. With two or more such reports, a headquarters unit could determine ground zero and the height of the explosion.

Development

Jack Vrydagh, jr., m.e.

Heat Treatment

Heat treatment of plastics to give them desired properties, using methods similar to those now employed with metals, is now foreseen. It has been found that plastic crystals may be made to form by proper application of heat in a manner closely analogous to crystal formation in a metal such as steel. In the plastic, as in the metal, each crystal forms around a nucleus of some foreign matter, or "dirt".

Research has been concerned with a plastic bearing the chemical name of "polychlorotrifluoroethylene." As prepared, it is in the form of clear sheets. If heated to more than about 400°F., at which it softens and becomes rubbery, and then allowed to cool slowly, the sheet becomes cloudy.

Studies of this cloudy plastic by special microscopes, x-rays and other methods, reveal many tiny circular groups of crystals, each group a hundredth of an inch or less in diameter. The electrical and mechanical properties of the plastic containing crystals are very different from that of the normal form, where there is no regular order in the arrangement of the atoms of which it is made. In a crystalline material they are arranged in a regular lattice. It is seen that the crystal formation occurs mainly at temperatures above 350° F. The nuclei, around which the crystals form, are provided by the "filler" that is added to the plastic in manufacturing.

Similar effects occur with many types of plastics including nylon and polyethylene, which is widely used as a transparent covering. It is believed therefore, that application and choice of the proper heat treatment and filler might afford means of regulating the properties of a plastic.

For example, if a plastic of considerable tensile strength is desired, many crystals might be formed. If, on the other hand, it was desired to have one that could be flexed back and forth a great number of times, without as great resistance to being pulled apart, the non-crystalline form might be preferred.

Similar methods are widely used in the heat treatment of metals. They may be heated, then cooled, and held for a certain time at a lower temperature. This induces formation of crystals of the size and distribution needed to give the qualities that are required.

Tests On Guided Missiles

Three items commonly found in any high school physics laboratory are being used by engineers of the General Electric Company to simulate flight conditions of rockets and guided missiles hurtling through the atmosphere at better than 3,500 miles per hour.

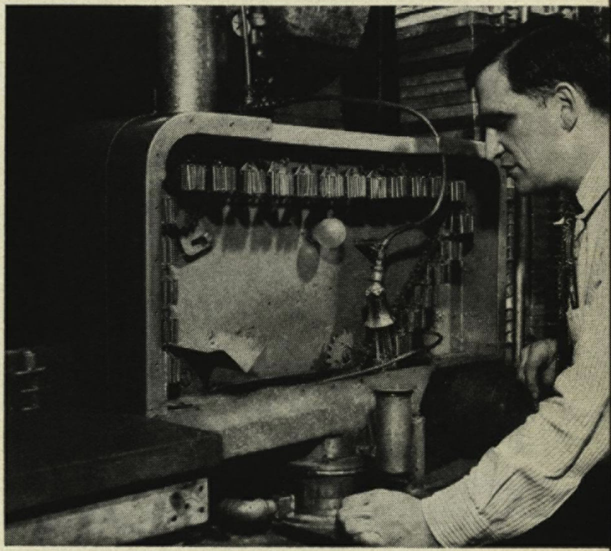
The items—a set of weights, a thermocouple, and a potentiometer—make it possible to "test fly" materials used in the construction of missiles without leaving the laboratory. Through the tests, engineers hope to collect information which will lead to the improvement of materials used in the outer skin or shell of missiles. The engineers said the tests are conducted to study an unusual temperature condition occurring during the flight of the missiles.

It has been found that during flight, the temperature of the outer skin of missiles rises at a tremendous rate, often as much as 80 degrees Fahrenheit per second, and up to as high as 1,500 degrees. This rapid rise in temperature, caused by the friction of air passing over the outer skin, could possibly distort the shape of the missile and affect the accuracy of the flight, or could cause the surface of the projectile to be weakened, engineers said.

The "test flights" are conducted with sample pieces of metal heated with electric currents. By regulating the current, the engineers can control the heating of the samples until they match conditions of missiles in flight. The stresses and strains which would affect a missile in flight are simulated by hanging weights to the samples.

The ideal metal would have to be both light and strong; light, so that the rocket could carry more fuel or instruments in proportion to its size; and strong, in order to withstand the buffeting and extreme temperatures of flight. Among the metals tested have been various alloys of aluminum, cold-rolled steel, and stainless steel. One of the most successful metals tested so far has been a cheap grade of low-carbon, cold rolled steel, the type of metal used by the Germans in construction of their V-2 rockets.

Radiation Lampshade



Fraternity Notes

Theta Xi

During the past month Kappa chapter has had a busy time. The local Marine Corps recruiter, Master Sergeant Christensen, recently showed two hours of combat films taken in the South Pacific and in Korea.

The nurses at St. Anthony's Hospital threw a dance for us on October 6 and a hayride on October 22, which was quite successful despite (or perhaps because of) the rain which kept everyone in the barn.

The Homecoming Banquet, stag, and open house after the game and again after the dance were all well attended by both alumni and actives. Many thanks to our new housemother, Ann Isaacs, for the wonderful food.

On Sunday afternoon, October 21, the most unusual interscholastic contest of the year took place when Kappa accepted the challenge to a game of field hockey issued by the sophomores of St. Mary's-of-the-Woods College. The girls put up a tough fight, but were no match for our intrepid athletes and could do no better than hold us to 2-2 tie. The only casualty on either side was George Wence, who was clubbed in the nose by one of the girls.

Cigars were passed out this month by R. C. Miller, Don Somes, and John Coddington. Congratulations also go to Bud Guiler, who was pledged last month; to Jim Mook who won the chapter's scholarship award for the greatest improvement in grades last term; to Harry Zorman for his election to vice-presidency of the Sophomore Class; and to Gene Hailstone, treasurer of the Senior Class.

Sigma Nu

The Homecoming proved to be an especially enjoyable event to the men of Beta Upsilon. The House Decoration trophy was won with the theme, "R.P.I. Railroads Grizzlies." Open house on Friday and Saturday nights was quite a success, with many alumni and friends dropping in.

It is planned to have 100% chapter donation to the present Red Cross Blood Donor Drive. Twenty men have contributed to date, and appointments have been scheduled for the rest of the chapter. Appointments with the Red Cross mobile unit have been handled by Bill "The Vampire" Stewart and Robert Harrison, Eminent Commander.

Hearty congratulations from all the chapter go to Owen Meharg who was initiated in formal ceremonies held on Oct. 30. At the recent Honor Assembly, Robert Ray was tapped for Tau Beta Pi and Harry Badger was tapped for Blue Key. Brothers Bill Stewart, Bob Ray, and Ken Cross received honor keys. Beta Upsilon is well represented on the basketball team with "round-ballers" Bob Dedert, Harry Badger, Ken Brinson, Don Fyfe, Ric Werking, Dick Green, and manager Ken Cross.

Theta Xi Playing in the Woods

Alpha Tau Omega

Gamma Gamma was again well represented in the Honor Assembly held October 11. At that time pledges were named to the honorary fraternities and Rose Honor Keys were awarded. A.T.O.'s tapped were Ron Brunner, Al Klaus, and Bob Bosshardt for Tau Beta Pi; Chris Flesor, Al Klaus, and Bob Bosshardt for Blue Key. Rex Hauser, Al Klaus, Bob Bosshardt, Stan Updike, Clyde William, and Ron Brunner were recipients of Honor Keys. The assembly was presided over by Student Council President Dave Leeds and Tau Beta Pi President Joe Perona.

The chapter enjoyed a spontaneous house party on Saturday night, October 27, after Old Man Weather

Continued on page 22

Football Flashbacks

By Allen Forsaith, sr. m.e.

Grizzlies Maul Engineers 20-6

The Franklin Grizzlies spoiled an otherwise perfect Homecoming by dumping the Fighting Engineers 20-6.

Early in the second quarter the Engineers flattened the Grizzly punter and took over on the Franklin 17. A drive was started which carried to the 1 yard stripe before being temporarily halted. The forthcoming Franklin punt was taken by Quarterback Morris Griffiths who smashed his way back to the 26. The Engineers lost the ball on an interception but recovered it on the next play when Ray Rice fell on a Grizzly fumble. The Rosemen then drove to the 11 where three straight line plunges by Gene Hailstone carried to pay dirt. The attempted boot was wide.

WHEEEEEEEEE! ! !

After eleven successive derailments Coach Phil Brown's Fighting Engineers climbed back on the winning track by rolling over the Eureka Red Devils 14-7.

The first Rose touchdown came the second time the Engineers got possession of the pigskin. The drive which followed ended with halfback Gene Hailstone scoring off left tackle from the three yard line. The conversion attempt by Leo Little was wide. A penalty on Eureka, however, gave Leo another try at the conversion, and this time it was good.

The Red Devils tallied in the second quarter with a pass from a spread formation making the halftime score 7-7.

On the first play of the second half Morris Griffiths flipped a 35 yard pass to "sleeper" Bob Mogle who plowed for another 20 yards before being brought down. This gain was nullified by a penalty, as were the next three. When the fumes cleared the Engineers found themselves back on their own two. Solution: one punt. Then with only five minutes to go in the ball game, Joe Verdeyen tossed a 30-yard touchdown pass to Gene Hailstone in the end zone. Jim Moulton converted for the extra point.

The first play of the game sidelined "Big Erv" Ulbrick with a broken nose.

Earlham Forfeit Declined

Word was recently received from Earlham that they had forfeited their 13-0 gridiron victory over Rose because an illegal player was used by the Quakers during the contest.

Coach Phil Brown declined the forfeit in a letter which read, in part, as follows:

"Rose Polytechnic Institute had nothing whatever to do with any telegrams concerning the eligibility of any of your players. We had no knowledge of the personnel of your squad and/or the past history of any transfer students. In view of the long-standing friendship between Rose and Earlham we would never protest any Earlham player and his eligibility, since we do not question Earlham's policy.

"We did not initiate any investigation of any of your players, consequently we have never, and do not claim a forfeit of the game between our colleges. Rose Polytechnic has its troubles winning football games, true enough, but we don't want to win one by forfeit. There is no pleasure in that kind of victory. We don't even want the forfeit which you have offered. We won't accept it. In our books the score remains, 13-0 Earlham."

Rose Drops Cedarville For Second Win

The Fighting Engineers racked up their second win of the season by dropping the Yellowjackets of Cedarville College 14-6. The last half of the contest was played in a gathering snowstorm.

The engineers started to march the minute they received the first Yellowjacket punt on the Cedarville 46. Two first downs carried to the 20 where fullback Leo Little took over and ran around the end for the score. He also kicked the extra point.

A fumbled punt on the Rose 8 brought out the best in the Poly defensive "platoon". They did more than just hold the line, they drove the Yellowjackets back to the 20 where Rose took over on downs and started the big push for the second T.D. Two first downs carried to midfield where a 30-yard pass from quarterback Morris Griffiths to halfback Gene Hailstone set the stage for a 20-yard dash to pay dirt by Rex Leonard. Leo Little added the extra point.

The cold and snowy second half was barren as far as scoring went, however it produced some fine runs.

The Rose running attack was highlighted by a 27-yard gallop by Rex Leonard and a sensational 40-yard run back of an intercepted pass by halfback Milt Danner.

The only threat of the half was a Yellowjacket march that penetrated to the Rose 9. The Poly forward wall stiffened and smeared the next four plays to take over on downs.

Orchids to quarterback Morris Griffiths for his fine punting and to the whole Rose line for a terrific game.

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Continued from page 7

moving neutrons. Neutrons emitted from radioactive sources usually have high velocities and are absorbed with difficulty by other nuclei. Fission is inhibited. However, if these neutrons' velocities are reduced to the velocity of atoms and molecules at ordinary temperatures, it is demonstrated that fissionable nuclei can easily absorb them, and fission occurs. Efficient moderators are carbon, beryllium, and heavy water. Repeated collision of "fast" neutrons with atoms of these materials causes a sufficient kinetic energy loss to the neutrons so that their velocities drop to around 1.4 miles per second, the average thermal velocity of atoms and molecules. It is imperative that moderating materials do not absorb appreciable quantities of neutrons, for this would reduce the neutron flux in the reactor core and consequently provide fewer neutrons for fissioning.

A reflector usually surrounds the active core of a reactor and reflects back into that core neutrons which might otherwise escape. The same materials which serve as moderators serve equally well as reflectors. The reflector is a valuable reactor element, for with good reflectors surrounding the core, less fuel is needed to sustain a chain-reaction. The abundance of neutrons provided creates a higher probability for fission.

It is inevitable, of course, that some neutrons will escape from the reactor, and there is always by-product radiation from fission and radioactivity. If this deadly radiation is unchecked there is a tremendous hazard to personnel operating the reactor and to the buildings and land of the reactor site. Thick shields of concrete, lead, or water encase reactors and absorb escaping neutrons, electrons, and radiation.

The temperature of a reactor must not rise too high if the reactor is to be efficiently and safely run; removal of heat is also the easiest way to obtain energy from the reactor. Circulation of coolants such as air, water, and liquid metals (sodium, bismuth, and potassium) through the reactor core provides adequate heat transfer.

Good coolants must not absorb appreciable neutrons, they must be stable under intense radiation, and they must have excellent heat transfer properties.

The control of reactors is largely automatic, since personnel cannot go near the active parts of a reactor. All pumps and motors inside a reactor must be designed so that they *never* need maintenance or at best only very simple adjustment. The problems of self-sufficient instrumentation and control for reactors are challenging ones and many opportunities lie in this field. Control rods of cadmium, boron, or steel are installed into many reactor cores. Such materials absorb neutrons and allow control of the neutron flux and reactions.

Structural materials for reactors must be permanent and have suitable nuclear properties. Concrete is excellent for external framework and steel is often used for reinforcement. Graphite has desirable structural and moderating properties and has been widely used in the active reactor parts. The necessity of using only non-absorbing substances in reactor cores has led to the development of many strange structural materials; beryllium and its alloys, and alloys containing the rare earth elements are finding application.

Types of Reactors

Reactors may be classified according to their functions. The principal reactor functions are given below.

1) A reactor may be used to produce fissionable material, notably

Continued on page 18

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Continued from page 16

plutonium. Such reactors are called "breeders" and are designed to produce more fissionable material than the quantity of parent fuel consumed by the chain-reaction. Plutonium is produced, in one instance, from unfissionable U^{238} by bombarding this elemental species with thermal neutrons. A mixture of U^{235}, (fuel), U^{238}, and moderator forms the reactor core. As neutrons from U^{235} fission are produced they are absorbed by nuclei of U^{238} which undergo transmutation into Pu^{239}. Periodically the reactor core is refined and pure plutonium is separated. The 620 square mile Atomic Energy Commission site at Hanford, Washington, is this country's major plutonium manufacturing plant.

2) Another function of reactors is to provide usable energy as heat. Heat is generated by a fission process when the fragments of split nuclei collide with surrounding atoms.
3) One reactor at Oak Ridge, Tennessee, is utilized to produce radio-isotopes. These materials are the decaying products of fission, and hundreds of isotopes are formed. Facilities exist at Oak Ridge for the separation and purification of these isotopes, and under proper authorization they are distributed to universities and industries for biological, chemical, and industrial research.
4) Experimental reactors of many kinds are being built and studied today so that we may learn more about nuclear reactor design, heat transfer, and physical phenomena. A Materials Testing Reactor exists in Idaho and is used to study the effects of radiation upon structural materials.

Reactors are sometimes classified according to the method of fuel dispersion. Two catagories exist: homogeneous reactors and heterogeneous reactors. In the former the fuel and moderator are in a fine state of subdivision and are intimately mixed. The cores of homogeneous reactors are often solutions. Heterogeneous reactors are perhaps the more common type and the fuel, which is usually solid, is placed at various points throughout the moderator.

Los Alamos Water Boiler

A good example of a homogeneous reactor is the Los Alamos Water Boiler. This light water reactor is one of the smallest and most economical that has been built. Fuel for the reactor is called "soup" and consists of an enriched uranyl nitrate solution. The salt contains about one part of fissionable U^{235} to six parts of U^{238}. The critical load for the reactor in about 1.8 pounds of U^{235}, and peak power for the reactor is six kilowatts, representing a neutron flux of about 300 billion neutrons per second per square centimeter at the reactor's center.

The heart of the reactor consists of a one-foot diameter stainless steel sphere filled with the uranyl nitrate solution. Beryllium oxide is the reflector immediately surrounding the sphere, and additional reflection is supplied by graphite outside the oxide. Four inches of lead, 1/23 inch of cadmium, and five feet of concrete shield the assembly. The reactor, minus its shield, occupies a cube about five feet on a side.

At the front of the reactor, a square tunnel pierces the shield. This tunnel is plugged with graphite to form a thermal column (a flux of thermal neutrons are present here) which is used to irradiate samples. A one-inch tube extending through the shield,

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reflector, and sphere itself, called the "glory hole," permits materials to be irradiated at the highest neutron flux level of the reactor.

A cooling coil of one-half inch tubing is wound in the form of a helix inside the sphere. Fifty gallons of water are pumped through this coil per minute as coolant. When operating, the water in the fuel solution is decomposed to about one-half cubic foot of hydrogen and oxygen per hour. Since this gas mixture is highly explosive and since radio-active gases are produced in fission, some means of diluting and flushing out the gases is required. This is accomplished by means of a double inlet-outlet tube welded to the top of the sphere. Air is pumped through the inner 0.25 inch tube and is exhausted through the outer 1.75 inch tube.

The reactor is controlled by a shim rod, a safety rod, and two control rods, all made of cadmium. When both control rods and the safety rod are dropped at the same time, the neutron intensity falls 85 percent in one second!

Under normal operation, the system is self-regulatory due to the effects of temperature. As the temperature increases, the volume of the solution becomes greater, with the result that the reactivity per unit volume declines. This automatically slows down the raction so that under normal conditions it is impossible for the reactor to get out of control. However, if the rods are removed within a period of 0.02 second, local hot spots may form in the solution, and the solution may vaporize before the increased temperature has time to control the reactivity. In such cases the control rods would automatically drop to stop the reaction from doing serious damage. Since the reactor responds very quickly to control changes an experienced operator can bring the water boiler to full power in a few seconds.

The Uranium-Graphite Reactor.

The first reactor ever built was a uranium-graphite heterogeneous reactor. This reactor, built in 1942 at the University of Chicago, was dismantled in 1943 and moved to the Argonne Laboratories' Palos Park site where it was reconstructed with some variation from the original design.

The rebuilt reactor looks like a windowless, concrete building thirty feet wide, thirty-two feet long, and twenty-one feet high. Inside the five feet thick concrete walls lies the reactor core: a cubical shaped pile of graphite into which lumps of uranium have been imbedded according to a definite geometrical lattice pattern. The top of the pile is covered with six inches of lead and about four feet of solid wood.

The basic building unit for the core was a graphite block 4 1/8 inches x 4 1/8 inches x 16 1/2 inches. Cylindrical recesses spaced 8 1/4 inches apart from center to center were cut into the blocks. Uranium cylinders 2.25 inches in diameter and weighing six pounds were inserted. Blocks with uranium in their recesses were called live blocks, whereas those without uranium were called dead blocks. The pile was set up so that a row of live blocks was adjacent to a row of dead blocks in each horizontal layer. As the pile was built up into several layers dead blocks of graphite were always placed so that they lay above and below live blocks. The pile was fifty layers high and was surrounded by twelve inches of dead graphite serving as a reflector. Because of the shortage of uranium metal at the time when this reactor was built, a large number of recesses were filled with uranium oxide. The uranium metal was placed *in* the center of the reactor and the oxide placed *around* the center.

FRATERNITY NOTES

Concluded from page 12

ruled out the hayride planned for that night. All the couples met the situation heroically, coming through with the most enjoyable "shin-dig" had in quite awhile. The big event planned for November is the old fashioned square dance, scheduled to come off on or about November 24. This should prove quite entertaining for all those who like to "swing your partner" or "do-si-do." Louis Sasso is scheduled to relieve the caller during the breaks.

At the regular meeting on Monday, October 29, pledging ceremonies were held for Herb Gatewood. Welcome to A.T.O. from all the fraternity brothers.

Lambda Chi Alpha

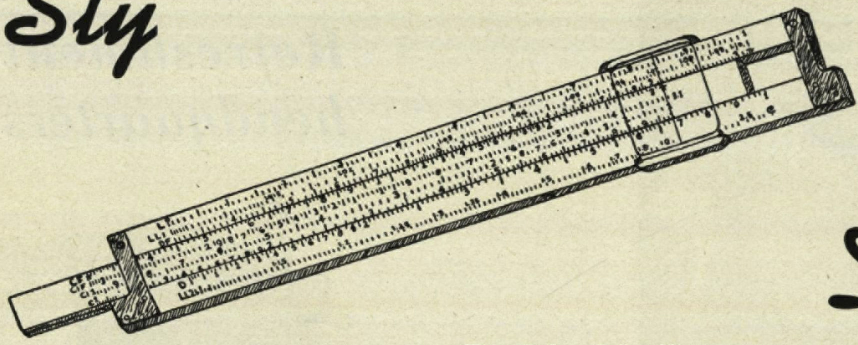
Congratulations from Theta Kappa go to Warren Jones who was pledged October 22, 1951; to Roy Moody who was tapped for Tau Beta Pi; to Glen Rout who was tapped for Blue Key; and to Carl Bals, who, under the strain of Homecoming, finally pinned Miss Mary Cale of Indiana State.

On October 20, Theta Kappa installed the Delta Lambda Sigma Fraternity at Indiana State as a colony of Lambda Chi Alpha.

Homecoming at the Chi house was highly successful. A buffet dinner was held at the house Friday, October 12, and an open house followed the bonfire. Saturday there was an open house both before and after the dance. The latter open house lasted till the "wee" hours of the morning, "whooped up" by Social Chairman Gunter Thiel and Abe Samuels, Gunt's right hand man, with Glen Rout at the piano, of course.

On the recent Sundays the Lambda Chi Sophs have suffered severe defeats, 25 to 0 and 18 to 13, at the hands of the combined junior-and-senior Chi team. The "old men" easily romped to their first victory, but the second was a gross moral injustice as they came from behind to score on the last play of the game.

Sly



Droolings

By John Voelker, jr. m.e.
John Simpson, jr. c.e., and Dick Bosshardt. fresh.

Prof.: "How would you punctuate, 'Mary undressed and went in swimming.' "

Frosh: "Make a dash for Mary."

* * *

Little girl: "What makes the traffic light turn red?"

Mother: "You would too, if you had to stop and go in the middle of the street."

* * *

Two men, strangers to each other, sat side by side in a suburban train. Finally one turned to the other and became confidential.

"I," he said impressively, "am the starter of elevators in a city skyscraper. When I signal them to go up, they go up. And your line is . . . ?"

"I," said the other, "am an undertaker. When I signal them to go down, they go down."

* * *

Brightly painted sign on a cross-country truck: "This truck stops for all crossroads, railroad crossings, blondes, brunettes, and will back up 20 feet for a redhead."

* * *

The minister's daughter returned at three o'clock from a dance. Her father greeted her sternly. "Good morning, child of the devil." Respectfully and demurely, she replied: "Good morning father."

* * *

Skeleton—a stripteaser who over-

* * *

did it.

"You don't love me any longer. I'm going home to mother."

"Don't trouble yourself. I'll go home to my wife."

Landlady: A chemist formerly occupied this room, sir. He invented an explosive.

New roomer: Ah! I suppose those spots on the ceiling are the explosive?

Landlady: No. Them's the chemist!

* * *

One thing about a co-ed college football game. There are more plays in the stands than on the field.

* * *

She to he: "Perhaps you can read me like a book, but the Braille system is out."

* * *

A preacher has recently announced that there are 518 sins.

He is being besieged with requests for the list, mostly from Rose students who think they are missing something.

* * *

He—Pardon me, has your dress slipped off or am I seeing things.

She—Both.

* * *

Bars are something which, if you go into too many of, you are apt to come out singing a few of, and maybe land behind some of.

* * *

Mary: When he got fresh with me, I told him I didn't want to see him anymore.

Jane: What'd he do then?

Mary: He turned off the lights.

Did you hear about the man who imported French bathing suits—the bottom dropped out of the business!

* * *

A capital golfer
Was G;
He drove
From a capital T,
And the words
He let fall
When he missed
The ball
All began
With capital D.

* * *

The melancholy days have come,
The saddest in our annals.
It's far too cold for B.V.D.'s
And far too hot for flannels.

* * *

A woman's face is her fortune . . . and sometimes it runs into a nice little figure.

* * *

Shapely shopper: Do you have any notions on this floor?

Floorwalker: Yes, but we suppress them during working hours.

* * *

Sue: Are you worried that he'll tell lies about you now that you've broken your engagement?

Sal: I don't care if he tells lies; but if he tells the truth I'll murder him.

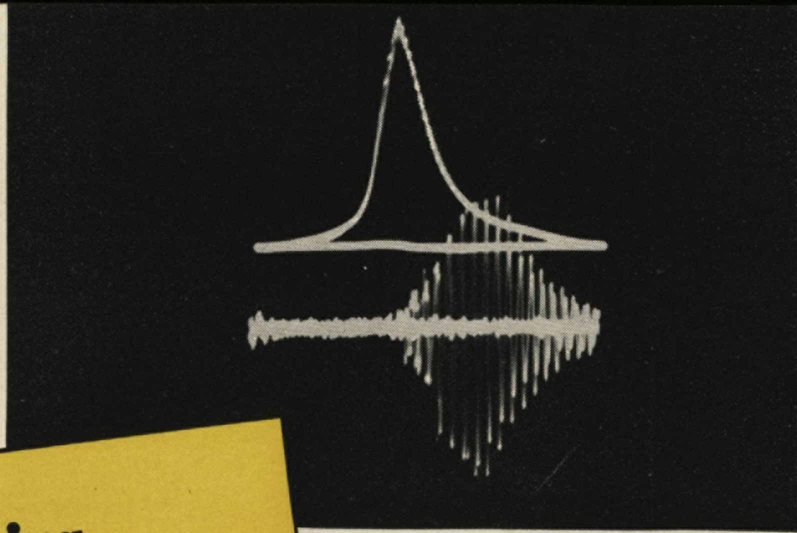
* * *

A street cleaner was fired for daydreaming—he couldn't keep his mind in the gutter.

* * *

Sober: What's your nationality?

Drunk: I'm half Scotch-(hic)-and half soda.



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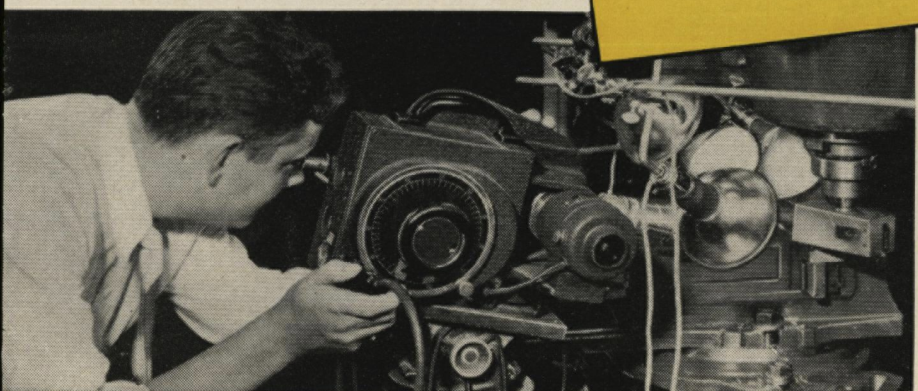

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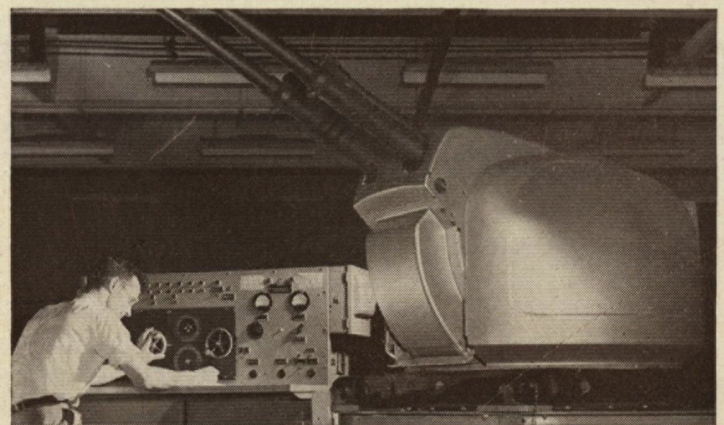
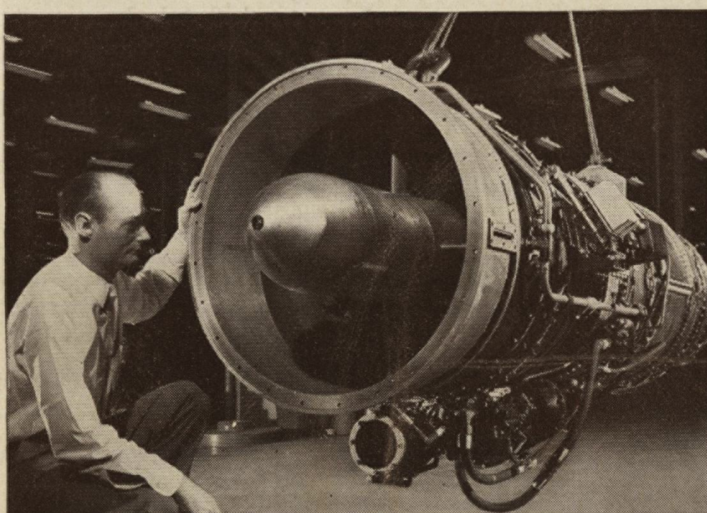


A gun turret for the B-36 bomber undergoes test as it comes off the assembly line at a General Electric plant.



An advanced model of General Electric's J-47 turbojet engine packs far more power within the same size.

G-E engineers developed this portable steering unit which enables Navy ships to be steered from any of several widely separated strategic positions.

Ideas from college graduates at General Electric are helping U. S. mobilization

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