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Rose Technic Staff
Rose-Hulman Institute of Technology

Rose Technic

MEMBER ENGINEERING COLLEGE MAGAZINES ASSOCIATED

MARCH, 1950

How to make 31,000 people happy

ONE of the biggest single housing developments ever undertaken has taken its place in the panorama of New York City's lower East Side. It is the result of cooperation between private enterprise, the State, and the City.

The rise of Peter Cooper Village and adjacent Stuyvesant Town has changed the face of this 80-acre section of Manhattan . . . has transformed a slum area of tenements and factories into modern, roomy living quarters for 31,000 people.

Many similar projects . . . some perhaps not so large, some even larger . . . must take form before America licks its housing problem. And they'll all require vast quantities of steel, for steel is the backbone of modern construction.

Today the steel industry is looking ahead toward tomorrow's big projects. At United States Steel, a vast training program is going forward continually, preparing men to handle the many highly-technical jobs that modern steelmaking involves. Many of these jobs are far removed physically from the roaring blast furnaces and glowing open hearths —at the same time, they are absolutely essential to today's precision steelmaking.

Through its training program, United States Steel is laying the foundations for promising futures for young men who meet its qualifications.

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UNITED STATES STEEL

Rose Technic

VOLUME LXI, NO. 6 MARCH, 1950

In This Issue

Cover

This month the ROSE TECHNIC salutes Saint Patrick, Patron Saint of Engineers, who performed the greatest engineering feat of all by driving the snakes from Ireland.

Frontispiece

The caissons supporting the derrick floor are five to six feet in diameter and up to 200 feet long to resist waves often 20 feet high. The frontispiece shows the derrick with the barge in the rear.

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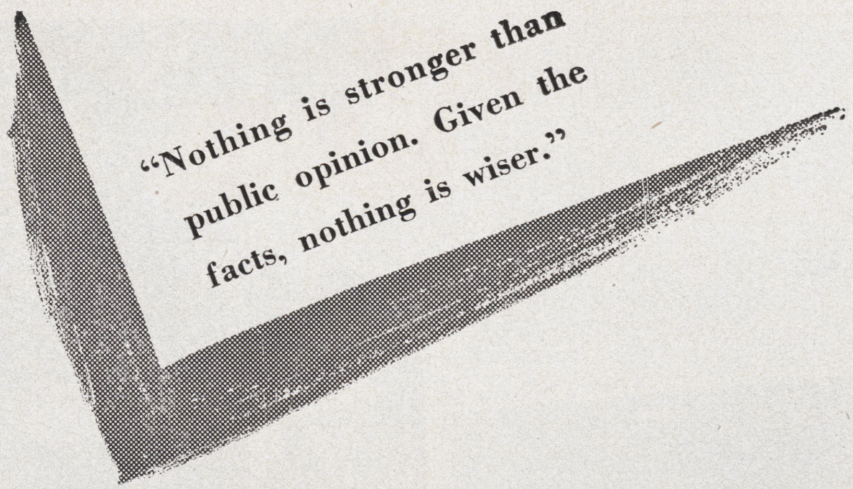


On Competition

Hatch a good idea and you hatch competitors.

It works this way—to take General Electric as an example:

In 1934, the automatic blanket was initially developed by General Electric. Today there are twelve other companies making electric blankets in competition with G. E.

In 1935, General Electric first demonstrated fluorescent lamps to a group of Navy officers. In 1938, the first fluorescent lamps were offered for sale. Today they are being manufactured by a number of companies.

The first turbine-electric drive for ships was proposed and designed by G-E engineers. Today four companies in this country build this type of ship-propulsion equipment.

After several years of laboratory development, General Electric began production and sale of the Disposall kitchen-waste unit in 1935. Today fourteen other companies are in this field.

The first practical x-ray tube, developed at General Electric years ago, is now a highly competitive business for seven manufacturers.

In 1926, a practical household refrigerator with a hermetically sealed unit was put on the market by General Electric. Today 34 companies are manufacturing household refrigerators with hermetically sealed mechanisms.

* * *

Research and engineering snowplow the way, not only for new public conveniences, but also for new companies, new jobs.

There are 20% more businesses today than there were immediately after the war.

Industry furnishes over 10,000,000 more jobs than ten years ago.

The average family owns more and better products of industry than ten years ago.

Any American company that plows back money into research and engineering development makes new business not only for itself, but for others.

The economy that does most to foster competition is the one that makes easiest the establishment and growth of business.

You can put your confidence in—

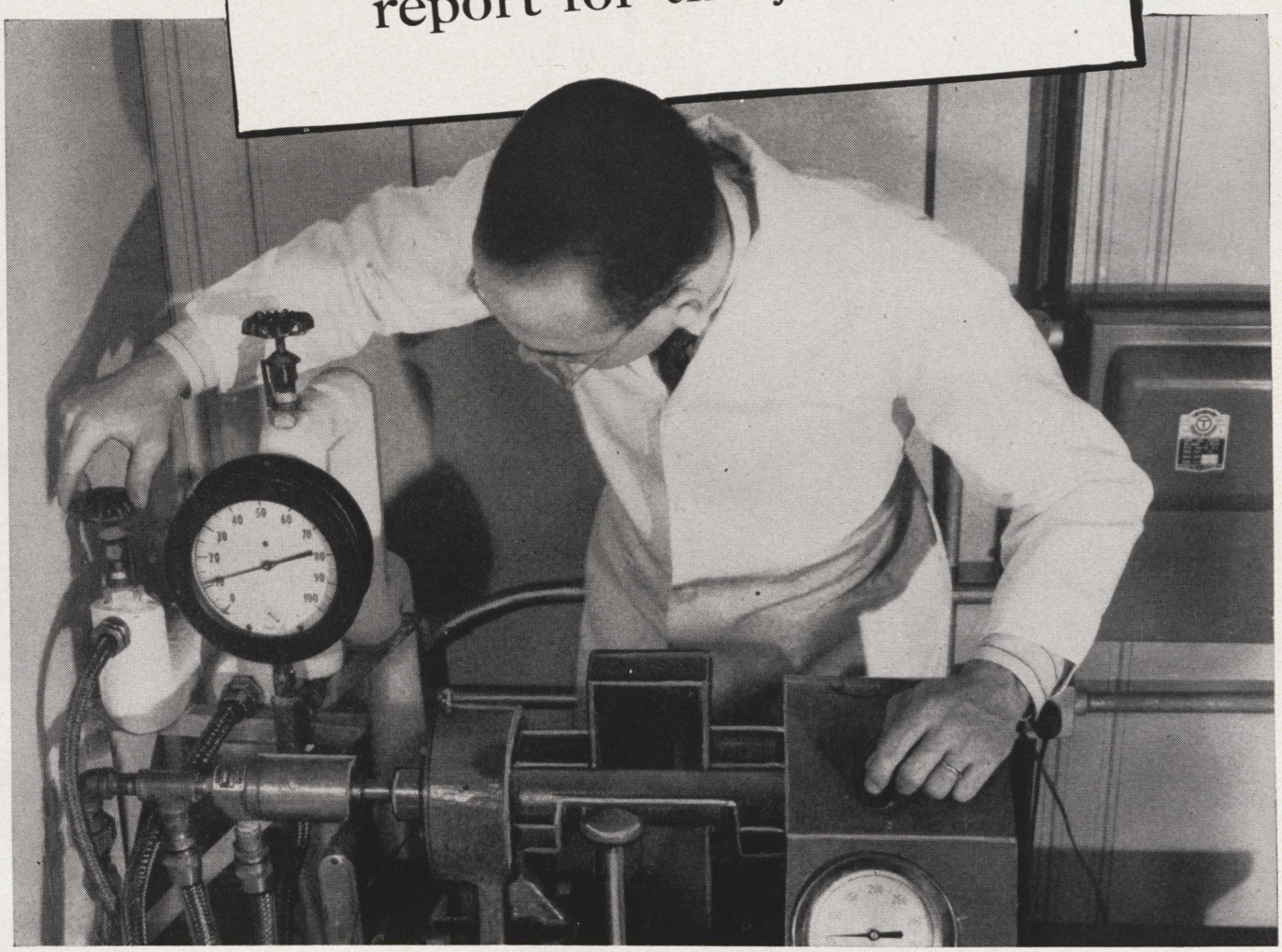
GENERAL ELECTRIC

Rose Polytechnic Institute offers accredited courses in chemical, civil, electrical, and mechanical engineering. The next freshman class will be admitted in September, 1950. For information and application forms address

NOBLE C. BLAIR
ADMISSIONS COUNSELOR

ROSE POLYTECHNIC INSTITUTE
TERRE HAUTE, INDIANA

We have good news to report for the journals



SOME JOURNALS are technical publications. Some journals are the parts of rotating shafts that turn in bearings.

For both kinds of journals, there's good news in Standard Oil's performance testing program. One result is a new testing device for mill and locomotive driving-journal grease that enables us to tell more accurately than ever before what our greases will do under actual conditions of use. That, in turn, enables us to proceed more directly with the job of making our greases still better.

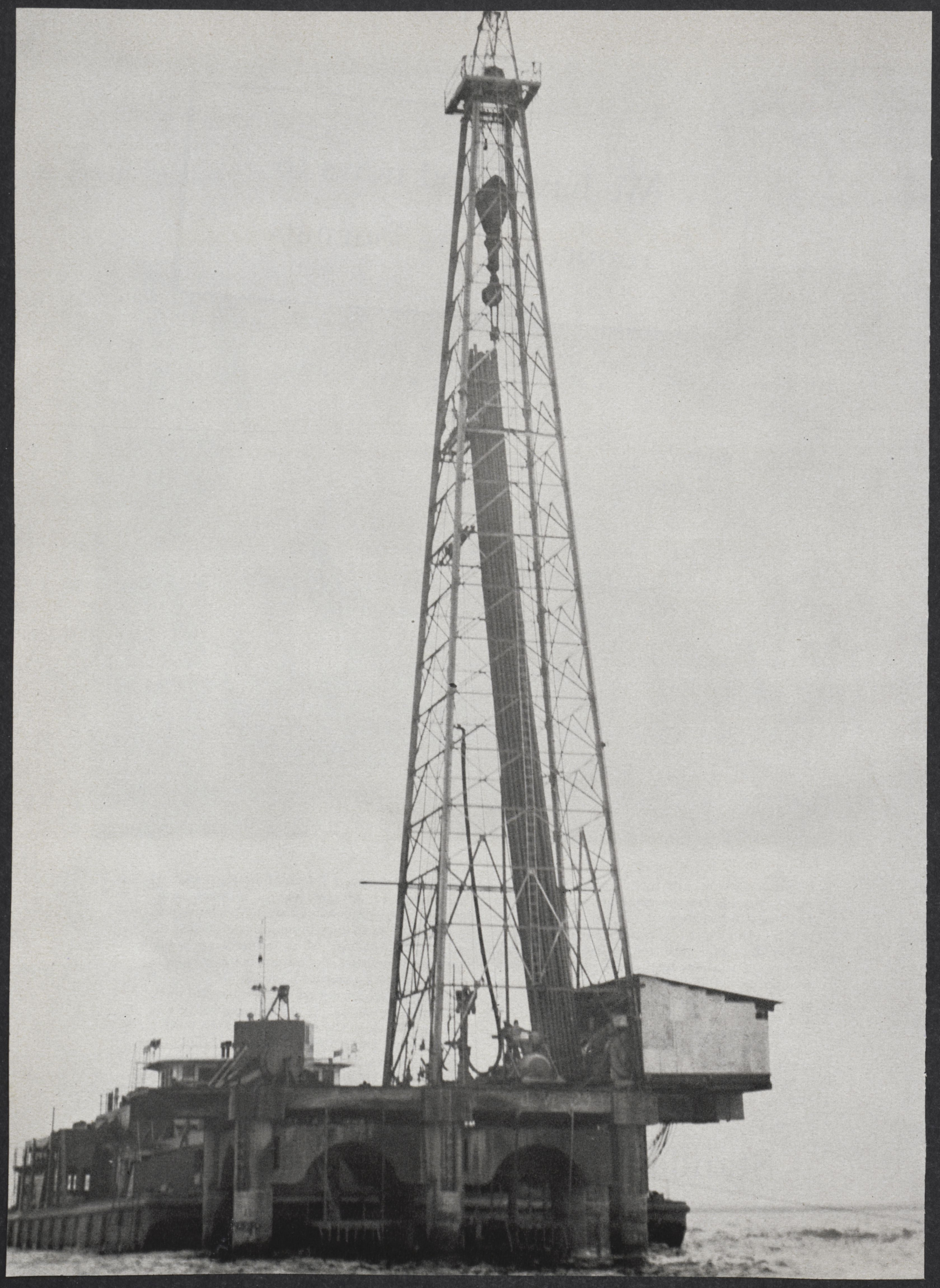
Standard Oil took the lead in performance testing, and is a leader today. During the war our tests furnished information that enabled the Army to procure certain products with greatly increased reliability of performance. Some of our tests have become a part of government specifications. Many users of our products are benefiting, both from better products and from more accurate information.

As time goes on, we are doing more and more performance testing. In some cases, we have to develop not only the tests but also the testing equipment. But to Standard Oil researchers and engineers, any effort is worth while if it will help make better, more useful petroleum products.

Standard Oil Company

(INDIANA)

STANDARD



. . . concerning our school

An important topic of discussion around school presently concerns the new improvements. This brief page will be devoted to expressing a few facts and opinions about the subject.

Last term the new school auditorium was completed and work was started on the new library and front offices. The common opinion seems to be that these projects were paid for by the students and hence that the students should have easy access to them. When the auditorium was locked up feeling ran rather high. The truth is that the funds came from the alumni and were designated solely for the above mentioned projects.

The improvements made by Rose in the last several years and those which are now in the planning stage are very notable and necessary. Money has not been spared to make these projects adequate and beautiful.

It is about time, however, that some of the funds solicited from the alumni were projected toward buying new equipment and remodeling the laboratories. Many students have been badly disappointed when first coming to Rose to find that much of the equipment is antiquated. In order to draw new students Rose must have not only a good appearance but also some good apparatus.

Granted that Rose is one of the top engineering colleges in the nation, and that this status has been achieved and maintained with a minimum of facilities; nevertheless it would seem desirable to replace some of our older equipment.

D. B. L.

Deep Water Oil

by

Larry F. Leonard, soph.

It is hard for Mr. and Mrs. America to realize the quantity of oil which is consumed in the United States each day. It is expected that about 5.9 million barrels will be needed every 24 hours to satisfy this country's needs in the coming year.

This figure is six per cent higher than the previous peak of about 5.2 million barrels in 1946. By 1951 this nation's daily oil requirements are expected to rise about six million barrels. In addition to home demand, some 400,000 barrels daily of crude oil and its products are estimated to be needed for export in 1951.

From this astounding data it is easy to explain why this country must find and exploit new oil reserves to meet the increasing consumer demand. The search for oil has carried oil companies to the temperamental waters south of Louisiana in the Gulf of Mexico. Here they are probing the Gulf bottom in their efforts to discover new fields.

Using the instruments of geophysics, these deep-water oilmen are seeking chiefly the outlines of salt domes. Geophysics studies the make up of the earth's crust, wherein lie buried mountains of salt that ages ago upheaved the overyling rocks and created natural oil traps.

Geologists have estimated that something like four to ten billion barrels of petroleum may lie beneath the shelf off Louisiana and Texas. No one yet knows whether or not that guess is correct—or whether those reserves could be developed commercially if they were there.

The drilling for oil from formations lying under water will set no precedent. In the shallow bays of the Texas coast, in the bayous of Louisiana, and in the Gulf just off the Louisiana marshes drilling rigs have been making holes for years—and producing oil.

Californians, too, have been tapping oil deposits under their coastal waters; but they have kept their feet dry by drilling directionally from locations on land. In Venezuela drilling in lake waters is an old story.

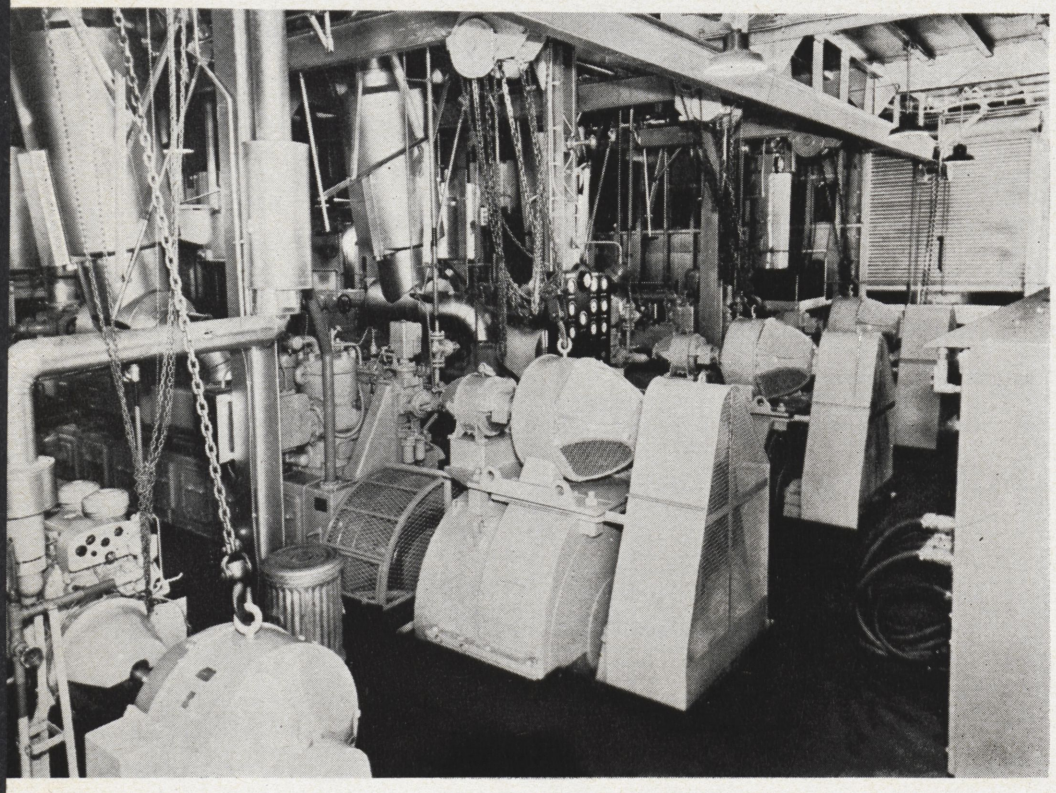
The current Gulf development is different. Now for the first time men are drilling for oil in waters up to 65 feet deep, exposed to all the weather hazards that a rambunctious Gulf can dish out. Last May at least 21 drilling rigs were at work in the Gulf. Some are thirty miles from shore, opening oil fields on the continental shelf. This shelf of submerged land slopes away from the continents gradually and finally drops off rapidly into the ocean depths.

The horizon of the salt-water exploration is seaward, ever farther from shore; but the reason for their new and intensive search is behind them, on dry land. For the Gulf Coast, a 100-mile-wide band of lowland that follows the Gulf along the edge of Texas and Louisiana, is a concentration of saltdome structures. For its size, the Gulf Coast is the nation's greatest oil-producing area.

From the oilman's viewpoint there is no great difference between structures formed by rising hills of salt and similar structures formed in countless other geologic ways. Any structure is simply a disarrangement of rock layers that may create an oil trap. The deep-water geophysicists, therefore, are as much interested in *normal* faults and anticlines as they are in salt domes. Since the rock formations that underlie the Gulf Coast stretch out under the Gulf, it is presumed that most of the oil structures found offshore will be salt domes.

Soon after the end of World War II, the geologists began to test their

Power House of Oil Rig



theories. With the first few months of exploration behind them, they found themselves facing strange new problems. These problems began when they tried to fix survey stations to determine the precise locations of their gravity meter readings or seismograph charges.

Surveyors had been accustomed to survey their stations in the usual landlubber way: post a man with a stadia rod, take a reading and drive a stake. It is not feasible to stand an assistant out in deep water or to drive a stake there as a marker. Gulf exploration apparently called for a new means of survey.

The surveyors started by adapting their land method for the sea. From their boat they fixed a station by sighting on several land objects and triangulating the position. Then they marked that position with a buoy, and established succeeding stations by measurement. This required tremendously long and strong wire which they unreeled from a huge spool at the stern of the boat.

Each new position, similarly marked with a buoy, became a new point from which to stretch their miles-long *tape measure* to a new station. The heavy seas that often plague the deep-water crews created obstacles to unreeling as many as 45,000 feet of wire from a boat. Radar came to the surveyor's aid.

Radar can pick up tiny targets at great distances; furthermore, it shows in careful measurement the direction and distance of such targets. The survey boat can speedily take radar *sights* on two or three land targets of known position, and triangulate the boat's position without actually seeing land (a big help in fog). With a small marker-boat stationed at the established point, the survey boat can speed down the line, triangulate again with the marker-boat as new target, and then quickly place temporary station markers. Stations were usually two-foot red or black balloons anchored by window weights at the ends of long cords.

Except for whatever obstacles the Gulf weather may set up, the remainder of the survey is routine and fairly easy. The gravity-meter boats take their stations by the balloons, lower their meters in heavy containers that settle into the bottom ooze, and read the findings by remote control. This method is much simpler and quicker than the previous practice in which an operator went with the meter in a diving bell.

The seismograph crews scurry about the Gulf until they line up at their positions. Black balloons indicate instrument boats and red balloons indicate shooting boats. Two boats are needed for shooting dynamite while one carries instruments and drage the geophones with the cables. If the Gulf does not act up more than usual, shooting the dynamite and making readings take only a few minutes; however, dragging the heavy cable along the Gulf's bottom to a new set of balloons is a long task and sometimes the work goes slowly. As rapidly as gravity readings and seismic records are made, they are rushed to land. There technicians convert them into geophysical maps.

The drilling of oil wells, based on the findings of the geophysical crews, began in the fall of 1947. The geologists had been right—within a year the sea-going drillers had opened seven oil or gas fields, a remarkable achievement in view of the new problems which had confronted them.

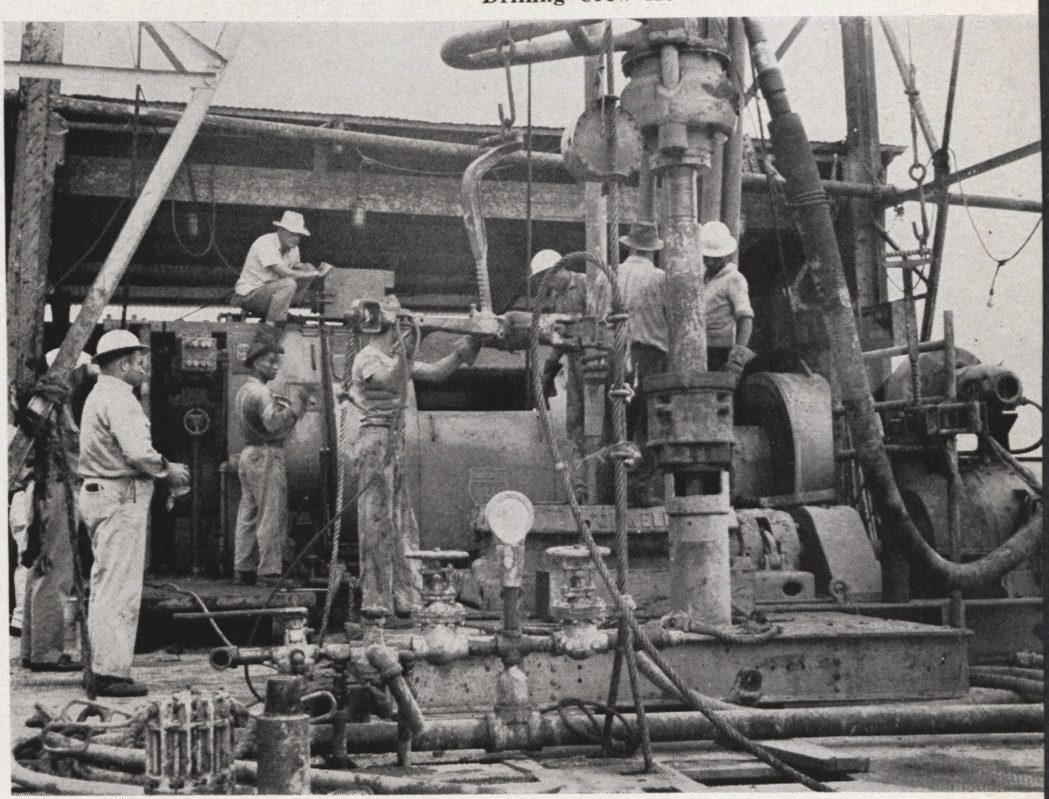
If the location of the oil fields was a triumph of geology and geophysics, their development is equally a triumph of engineering. For an example of the broad imagination and intricate planning that went into the projects, consider the marine drilling program as developed by one pioneer in the Gulf: Humble Oil & Refining Company, affiliate of Standard Oil Company (New Jersey).

Humble's engineers decided very early that drilling a hole in formations under water would be basically the same as drilling on dry land. That is, the same drilling rigs could be used—if foundations could be set up for them. Instead of drilling from sunken barges, as had been done in the marshes of Louisiana, the engineers planned drilling platforms that would be higher and more solid, so that they would withstand Gulf hurricanes.

It was know that supplying the drilling crews on an offshore location would be something far different from the simple procedure of rolling trucks up to the well. The thousands of feet of pipe, massive pumps and

Concluded On Page 18

Drilling Crew At Work



Research and Development

By George W. Eddy, sr., m.e. and Fritz Wheeler, fresh.

Cleaning of Engine Blocks

Through the application of a special process for the internal cleaning of engine blocks the possibility of engine trouble developing due to inadequate block cleaning has been practically ruled out.

The process employs a new shot blast cleaning machine that is the first of its kind in the automotive industry. It guarantees additional protection against core sand remaining in the internal cylinder block water passages.

The new pressure blast machine supplements conventional equipment now in use to remove burnt core and molding sand and scale from interior and exterior surfaces of the motor block casting.

The new blasting technique works this way: motor blocks to be blasted are brought by conveyor one at a time into the blast cabinet. Two work positioning arms, one for each side of the casting, register the block in correct position for applying the blast of shot. The blast is blown through sixteen nozzles under air pressure of 85 pounds per square inch.

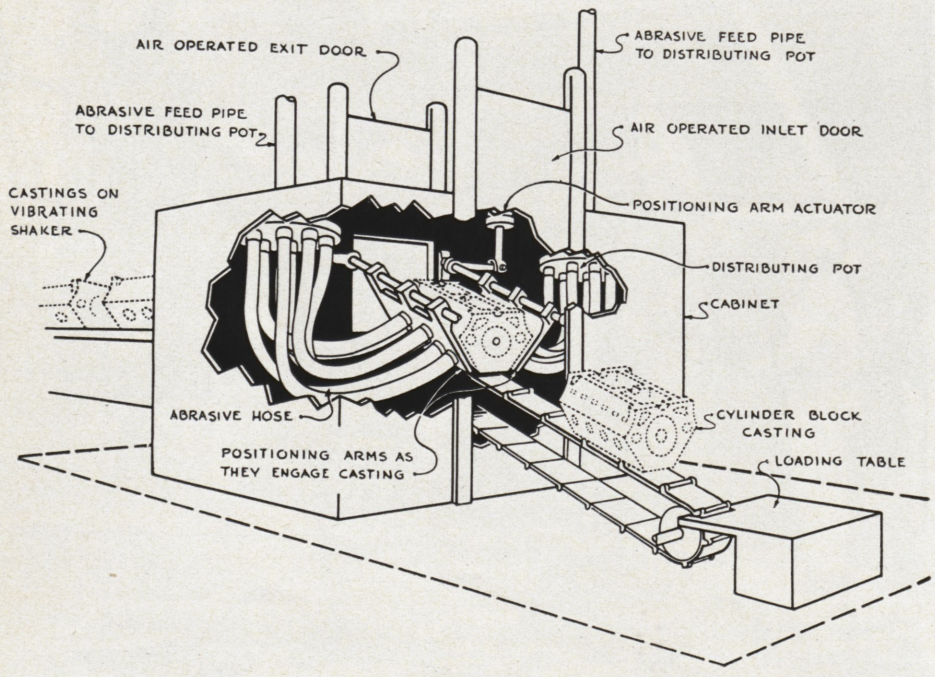
The air-driven shot strikes hidden sand or scale, freeing it from the metal's surface. The loosened material then can be removed from the block's interior.

Surfaces of the water jacket, crevices and thin sectional openings are blasted clean—exposing bright virgin metal to the cooling water circulated from the radiator.

The material used in the blast process consists of iron or steel shot and grit. The air blast equipment operates automatically, the blast period being controlled by an automatic timer.

As a result of this efficient internal cleaning, water passages in the block are smooth and free from flow interferences and result in cooler operation of the engine, particularly at heavy loads.

Shoe Blast Cleaning Machine



Xerography

A new method of reproducing documents, which employs a charge of static electricity on a sensitive metal plate, is expected to provide enlargements of microfilmed engineering drawings at a fraction of their present cost.

The system, known as Xerography, uses a dry method of making a direct positive enlarged print in approximately one minute, and requires no chemical solutions and no specially-treated paper. It is so simple to use that no special training is necessary for operators.

Basis of the Xerography process is a metal plate coated with selenium which accepts an image in much the same manner as does a photographic plate. The chief difference is that the Xerographic plate is exposed in the camera or under the enlarger. During exposure the electrons escape from the areas which receive light, but are retained on the dark areas.

Next the surface of the exposed plate is dusted with a specially prepared black developing powder. Electrostatic attraction causes the powder to adhere only to those portions of the plate where the electrons have remained. Printing of this powder image is accomplished by placing a sheet of paper in contact with the powdered plate and then spraying the paper with electrons. The electric charge lifts the powder particles from the plate and causes them to stick to the paper. The powder image is made permanent by heating the paper for a few seconds so that the powder particles, actually a mixture of resin and pigment, are melted and fused to the paper.

Seaward Ho!

(*Editor's Note*: Each class of Tau Beta Pi pledges is required to submit a report of some assigned research project. The latest group was required to trace the movement of one cubic chih (a Chinese unit) of Lost Creek water from the footbridge behind the school to the Gulf of Mexico. The article that follows is an adaptation of the report presented at the initiation banquet. It is the opinion of the TECHNIC that as long as men capable of producing this type of material are in the state, the fertility of the Indiana farm is assured.)

The waters of Lost Creek flow quietly past Rose Polytechnic Institute, bend northward as they avoid Terre Haute and with a final surge speed from their banks into the smooth-flowing stream of the romantic Wabash. Southward they flow past historic Vincennes, into the Ohio, on past Kentucky and Illinois until at Cairo the junction is made with the "Father of Waters", the mighty Mississippi. Southward again the waters snake their way through the Delta and at last into the placid blue waters of the Gulf.

Obviously the study of the movement of a cubic chih (5.8 cubic feet) of water over so long a course and the calculations of the losses occurring enroute is an engineering problem of the first magnitude. The distances involved were determined from the best charts available, the proper frazzle factor being applied to correct any error in the string used for measuring. Stream velocities were found on charts supplied by the United States Army Corps of Engineers and entitled "Minimum Flow Rates During Spasmodic Flood Periods". Careful calculations showed that the total course length was 1007.1 miles and that the total time required to traverse this course was 147.2 hours or 529,920 seconds.

In accordance with the theory of flow the cubic chih sped from the footbridge at the rate of 0.89 miles per hour. The effects of viscosity cause the flow of a real fluid to occur under two very different conditions, or regimes—that of "laminar flow" and that of "turbulent flow". Because Lost Creek water has a rather peculiar viscosity, it was not considered as a "real fluid" and equations pertaining to these phenomena were ignored. The following assumptions were made to facilitate the study of the problem:

1. the chih was considered to travel to the Gulf without change in volume.
2. dimension changes were considered to occur only in the direction of flow and in the thickness because of the velocity variation with depth.
3. one surface of this water was at stream surface.

Experimentation disclosed that the final depth of the water was 0.001 inch and that the water had a final surface of 10,024,000 square inches. The average surface area was thus one-half of the above value and the losses resulting from evaporation were computed by applying the solar radiation constant of $1\frac{2}{3}$ calories per square centimeter per minute and other well considered constants, as the moonlight-sunlight correction factor.

Other losses were attributed to the following factors: seepage, fish consumption and splash losses. Seepage losses were determined by use of algae absorption factors, the coefficient of capillarity of river beds and the osmotic correction factor. Fish consumption is naturally dependent on the hunger and thirst of the fish and quite as naturally on the coefficient of kidney action of fish. Splash losses would occur due to falling bodies contacting the Lost Creek water when it was in the vicinity of a river bank. Small boys skipping stones, fish jumping in their quest for food and the tail flip of these same fish were thus estimated.

The total losses during this trip to the Gulf were found to total 160,000 grams proving that 5000 grams of the original water entered the Gulf. It was not thought likely that this discharge from Rose would help to cement Pan-American relations.

Remember if you will that 150,000 grams were lost due to evaporation. The possibility exists that some of this moisture returns to Terre Haute with air mass movements. This return was verified by collecting a sample of atmospheric moisture and analyzing it for traces of Lost Creek's familiar physical and chemical constituents. The odor was easily identified as was the color. Other tests proved conclusively that here indeed was the treasured wealth of that stream familiar to all Rose men returned once more to this scene of pastoral splendor.

The Tau Beta Pi pledges reported that the research required for this report added immeasurably to their store of knowledge. Among other things, they learned that water if obstructed runs down hill, and—if you'll pardon the expression — why Lost Creek water smells.

GREAT MEN OF SCIENCE

Alfred B. Nobel

By
Stanely Updike, soph.

In 1861 a group of Paris bankers gave audience to Alfred Nobel, a young scientist who was seeking backing for a new invention. Before them they saw a thin, sickly, and nervous man who looked very harmless to them; however his first statement could have changed that conception of him completely. "Gentlemen," he said, "I have here an oil which could blow up the globe."

Alfred Nobel was born in Stockholm, Sweden in 1833. His formal schooling was scant, but close association with his father, who was a chemist, broadened his education. Through his reading and travels, Nobel soon mastered several languages. At the age of 17 he was sent by his father to New York to visit Captain John Ericson, who developed the Monitor. Alfred's interest, however, remained in chemistry rather than in mechanics.

Nitroglycerin had been used widely as a stimulant in treating heart disease, but the elder Nobel believed that it had great possibilities as an explosive. Sometimes when a container of it would fall there would be no effect, but at other times a shattering explosion would occur. What was needed, then, was some means of taming this "soup" (as it was called). Money was needed for the required research and Alfred was sent to Paris to find a backer for the project.

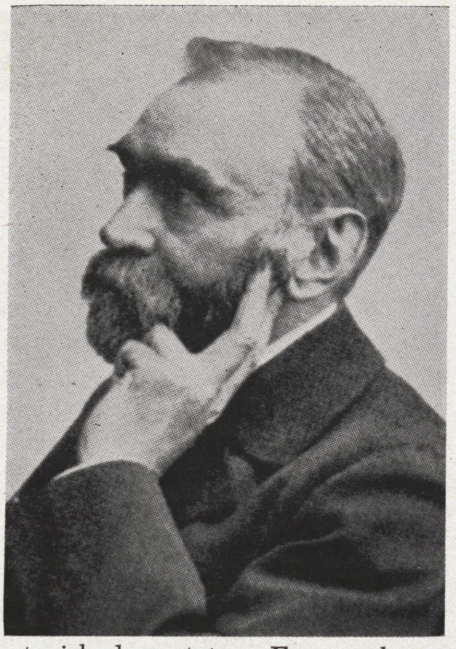
The Paris bankers were at first stunned at the thought of an explosive of such power, but soon they began to disbelieve Nobel. Anyhow, who wanted to blow up the world? Alfred left disappointed, but his trip was not in vain, for Napoleon III soon heard of his oil and presented him with a draft for 100,000 francs for his research.

With Napoleon's help, Nobel began his work in earnest. He discovered that the only positive way of exploding the "soup" was by confining it in a container and firing it by a sharp primary explosion. It was through this discovery that he developed the blasting cap which is still the basis of the dynamite and nitroglycerin industry.

Within a year the Swedish government was using his explosive to blast a tunnel for the railroad under Stockholm, and he had started manufacturing in four countries.

In 1865 Nobel's Norway plant soared sky high. A few weeks later a railroad worker tried to cut frozen nitroglycerin with an axe. The next April, 70 cases blew up on board a ship in Panama. Shortly thereafter, some "soup" destroyed a block of buildings in San Francisco.

Nobel arrived in New York with a few cases of the explosive and found himself about as welcome there as the bubonic plague. Hotel's refused him, and people avoided him. He then announced that he would give a demonstration in an abandoned quarry. Only 20 men appeared at the demonstration, and they all kept at a respectable distance. Nobel, in beginning his exhibition, poured a puddle of the oil on a flat piece of iron and raised a hammer to strike it. The group winced, expecting him to be blown into small fragments. Down came the hammer and there was a sharp report. The astonished group opened their eyes to see Nobel standing unharmed and the hammer still intact. Nobel then explained to them that only the oil under the hammer had exploded because only it had been confined and placed under pressure. He then lit the puddle, and it merely illuminated the faces of the



astonished spectators. For two hours Nobel put nitroglycerin through its paces. By the end of the show the 20 men were convinced that nitroglycerin had been tamed.

Nobel's office was now swamped with orders, but several countries still refused to allow the use of nitroglycerin. Nobel immediately started to search for a safe explosive and found it by an accident. One day Nobel's workers ran out of sawdust in which to pack the nitroglycerin cans; so they used a light absorbent earth called "kieselguhr". He mixed three parts of the explosive to one of the earth and found that the resulting matter could be kneaded like putty and packed for shipping. This new product was called dynamite, and within ten years Nobel plants were producing six million tons of it annually.

On December 10, 1896, at the age of 68, the frail-bodied but mentally-alert scientist died, leaving behind him a wealth of knowledge. His will provided that his estate be converted into money and invested in safe securities. The interest accrued was established as a fund from which the famed "Nobel prizes" are given.

"The oil which could destroy the globe" has been dwarfed by newer and more devastating explosives. Perhaps in the years to come, people will consider our fear of atomic energy much as those in Nobel's time feared his nitroglycerin.

Campus Survey

By James R. Myers, soph.,
Duane Pyle, soph.

The End and the Beginning

Graduation for last term was held February 25. The men were given diplomas without formal commencement exercises.

Those graduating in the Civil Department were: Harold B. Forsythe, William C. Gordon, Orren S. Hillman and Pierce J. Walinsky; in the Electrical Department: Roy C. Gilmore and James E. Kirchner; in the Mechanical Department: William H. Alsman, Ralph F. Connor, Roy H. Potts, Joseph D. Power, Lawrence E. Stevens, John W. Waite and Ray A. Watkins.

Student Government Conference

Representatives from all Big Ten Universities plus all Indiana colleges and many midwestern schools have been invited to the 1950 Student Government Conference. The students will convene at Indiana University March 23, 24, and 25. Forty schools will be represented by approximately 250 student leaders and faculty members.

Rose Polytechnic Institute will be represented by Gunter Thiel and Fred Corban, who are members of the Rose student council.

The theme of the conference will be the responsibilities of student self-government. It is a continuation of the program begun after the last war.

**New Library—
New Librarian**

During the greater part of last term, Rose students were kept alert dodging long two-by-fours in the hall under the ramp. Men working on the new library frequently brought in timbers for scaffolding and a student walking around with his nose in a book was likely to find himself in a dangerous position. Despite such handicaps the new library is growing speedily, amid the confusion of students, workmen, architects and we-give-advice-without-charge Rose instructors.

On March 1, Rose acquired a new librarian—Carson W. Bennett, recently a member of the library staff of Alabama Polytechnic Institute. Mr. Bennett is a graduate of the George Peabody College for Teachers in Nashville and was formerly with the Indianapolis Public Library Reference and Technology Department. His home was originally in Sealtsbury, Indiana; he is married and has one child.

Rifle Club

The Rifle Club has its winter season in full swing. Two meets have been fired. One with the University of Cincinnati was fired during the week of December 3, and another with the University of Dayton was fired during the week of December 17.

Future meets are still in the planning stage. However, a meet is scheduled with the University of San Francisco during the week ending January 21, and another with Cornell University during the week ending February 25. These are Postal Meets. In this type of match each team shoots on its own range and then sends its score to the other team. A shoulder-to-shoulder meet scheduled with Purdue was forfeited by Purdue and will probably be held this year.

An invitational meet of 20 teams is being planned and will be held at the University of Illinois sometime after the first of the year.

The Rifle Club has been doing a fine job with the few men it has but can use more men. The club has an average of around 350, so prospective members need not be discouraged.

New Activities Director

Professor Paul B. Headdy has assumed the extra duties of Supervisor of Student Activities at Rose. It should be made clear that his job is to co-ordinate, not to actually supervise. All student activities will be reported to him so that he may schedule them on his calendar to prevent conflicts. This includes the social activities of the various classes and fraternities. Mr. Headdy is to see that all social functions are properly chaperoned but will not take the place of the faculty advisors of the organizations.

It is hoped that all organizations will give their full co-operation in helping Mr. Headdy keep the student activities of Rose operating smoothly.

Honored Visitor

Rose was very honored to have as a speaker on March 1 Professor M. M. Cory, National President of Tau Beta Pi Fraternity. Mr. Bob Nagle, the national secretary, was also present.

Dave Smith, president of the Rose chapter of Tau Beta Pi, introduced

Concluded On Page 20

Alumni News

By Allen Junkers, jr., mech.

'92

On the 9th and 10th days of February, four of the nine living members of the Class of '92 held an informal meeting at the home of W. Arnold Layman, Clearwater, Florida.

There was no pre-planned agenda, but the impelling motives as the meeting advanced were:

First: To live over again the high lights and experiences of student days.

Second: To review some of the class contributions that marked the regime of their class days at Rose.

The members recalled that the class of '92 played a prime part in creating the TECHNIC and MODULUS as soundly established and creditable publications and in directing the State Inter-collegiate Athletic and the State College Editorial Associations and making them vital agencies in promoting cordial and productive relations between the member colleges.

As a conclusion, the group advanced and endorsed the following as a worthy addition to the Professional Code:

First: to accept as a course of Professional Duty the support in every way within our power, and give a definite part of our time to advancing the plane of citizenship in our communities.

Second: To use our influence and personal study to advance the public comprehension and political practice of the principles of economic action to the end that we might help to advance in practical ways the plane of our political and governmental efficiency, as our great Engineer-exPresident of the nation, the honorable Herbert Hoover has so aptly and ably championed.

The four members present were: Will J. Fogarty, George R. Wood, Edson F. Folsom, and W. Arnold Layman.

Editor's Note: Shortly after the reunion of the class of '92, Mr. Edson Folsom passed away.

Class of '92

New Books By Rose Men

A graduate of Rose Polytechnic Institute is the author of a technical book published in January, a copy of which has been recently received at the college.

The title of the book is "Foundry Science" and the author is Harry A. Schwartz, a Rose graduate in electrical engineering in the class of 1901. He is presently in charge of research for the National Malleable and Steel Casting Company in Cleveland.

Subtitled "Fundamentals Underlying Foundry Practice", the 286-page volume is one of a series of metallurgical texts published by the Pitman Publishing Corporation and is designed to interpret theoretical science, including recent advances, in its special applications to foundry practice. Particularly lucid in its writing and plentifully illustrated, the work is specifically directed to the student or foundry engineer.

A native of Oldham County, Kentucky, Schwartz instructed at Rose following graduation and took the advanced degrees of master of science and mechanical engineer. In 1907 he joined the National Malleable Company in Indianapolis and served there in various capacities until he was made manager of research in 1921.

He is the author of a number of other technical volumes and a holder of ten patents dealing with malleable processes. In 1939 he became the only non-British recipient of an award from the Institute of British Foundrymen. For a number of years he was a professorial lecturer on metallurgical subjects at the Case School of Applied Science.

The Schwartz book is the second book authored by a Rose graduate to appear in recent months. In December a survey of the beginnings of the western railroads appeared under the title "The First Transcontinental Railroad — Central Pacific, Union Pacific", the posthumously published work of John D. Galloway, a Rose graduate in 1889 and during his lifetime one of the most prominent civil engineers in the Pacific Coast region. The book has been received by the Rose Polytechnic Institute Library.

Published by the Simmons-Boardman Publishing Corporation of New York, the volume records the technical, financial and human problems that confronted the founders of the two railroads and the author's character portraits of the pioneer builders. A successful engineer himself, the author gathered material for the volume as an avocation, that of historical research into the development of the West. Much of the material was obtained through fieldwork and many of the protographs that illustrate the story are published for the first time.

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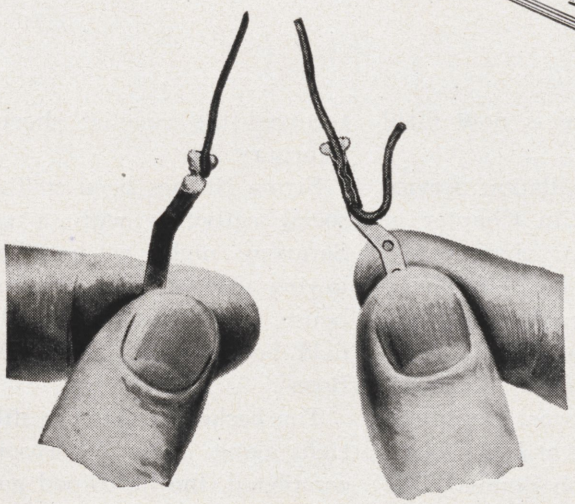
Newsworthy Notes for Engineers



What's the difference?

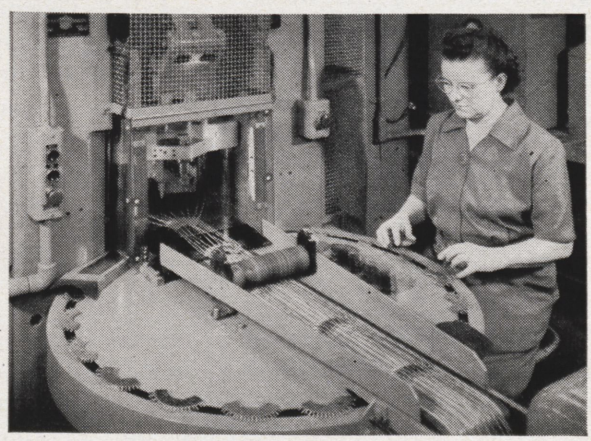
$2,500,000 a year!

Both hands hold terminations used in telephone dial switching equipment. They look pretty much alike – but let's see about that!

The termination at left is made by the old method. Insulation is stripped off the wire. The wire is twisted around the brass terminal, then fastened to it with a soldering iron. That had to be done on millions and millions of connections each year.

The termination at right is made by a new machine process developed by engineers at Western Electric—manufacturing unit of the Bell System. One type of machine separates the brass connectors from a "strip" and accurately positions each on an insulator to which groups of 10 are fastened by eyeleting. Another machine places 20 wires in the proper position on two sets of 10 connectors, drives two small pyramidal shaped points through the insulation into the wire and crimps the brass around the wire, making a good, solid electrical connection. The whole job now is done in one-tenth the time.

This improvement will add $2,500,000 a year to the vast amount Western Electric engineers are saving the Bell Telephone System through manufacturing economies. Year after year they look for – and *find* – ways to make telephone equipment better and at lower cost. Their savings help Bell Telephone companies to keep rates as low as they are.



This machine, developed by Western Electric engineers, assembles dial switching terminations automatically at the rate of 400 per minute.

Western Electric

A UNIT OF THE BELL SYSTEM SINCE 1882

Engineering problems *are many and varied at Western Electric, where manufacturing telephone equipment for the Bell System is the primary job. Engineers of many kinds—electrical, mechanical, industrial, chemical, metallurgical—are constantly working to devise and improve machines and processes for production of highest quality communications equipment.*

Fraternity Notes

Alpha Tau Omega

Election of new officers was held at the last meeting in February. The new officers have a difficult task in maintaining the same high standards of leadership displayed by past Worthy Master Jim Morris and his officers. The new officers assumed office with the beginning of this semester. Brother Bob Ricketts was elected Worthy Master with the following Brothers aiding him: Wayne Loving, Chaplain; George Eddy, Worthy Keeper of Exchequer; Jim Myers, Worthy Keeper of Annals; Glen Bickel, Worthy Scribe; Riley McKeen, Worthy Usher; Bill Kestermeier, Worthy Sentinel; Ed Burget, Palm Reporter.

For the past several years State Day has been held in Terre Haute. This year the Indianapolis Alumni are sponsoring the State Day activities at the Claypool Hotel in Indianapolis. Each of the seven chapters of Alpha Tau Omega in Indiana and Illinois will attend this annual conclave. Registration and a banquet will occupy the early part of the evening with a dance and a competitive singing contest concluding the activities.

Alumni Brothers Gene Glass and Dave Mullen made an appearance at the fraternity house recently. Brother Mullen is working in St. Louis at the present time.

Lambda Chi Alpha

New executive machinery has been added to the Theta Kappa chapter during the last month, those new cogs being: Fred Garry, president; Dave Smith, vice president; Tom Norman, secretary; Carl Bals, treasurer; Ralp Bennett, rush chairman; Mort Hief, ritualist; and Bill Chambers, social chairman. The position of house manager was left vacant by the resignation of Sam Lynch, and the office is now filled by Dick Kuehl.

At the recent installation service of a new Lambda Chi Chapter at Miami University, our chapter was represented by brother Mort Hief.

Two conclaves were attended this month, one at Indiana University, the other at the University of Michigan. Bill Chambers was present at the Midwest conclave at I. U. March 11, and brothers Ralph Bennett, Jim Dunlap, John Barco and Mac Fehsenfeld attended a three day meeting at Ann Arbor, Michigan, earlier this month.

Congratulations are extended to brother Aaron Hogg, who graduated last November and was married this month to Miss Elaine Hungerford of Terre Haute. Dave Smith acted as best man. Brothers Bill Bennett and Bill Chambers gave pin talks at the last meeting, having given their pins out last term.

In a recent game in the intramural basketball league Mort Hief, the Jasper flash, ripped the nets for eleven markers, which is news indeed!

Sigma Nu

Beta Upsilon started the new quarter off right when it held its "pre-term blowout" at the house Monday, February 27. Many actives, pledges, alumni and guests enjoyed a fine evening of entertainment in preparation for the new term. The traditional stag is held during the first meeting of each semester.

Beta Upsilon welcomes seven new initiates into the chapter. Those recently activated include: Hank Bosch, Phil Bracht, Gene Hicklin, Bill Luce, Lloyd McGrew, Walt Meyer and Dick Williams.

Congratulations are in order for Pierce Walinsky who last term completed his stay at Rose. Pierce, who was very active in fraternity affairs, received the coveted sheepskin on February 23.

Sigma Nu has been continuing its social activities with a series of Saturday night get-togethers. Following the informal dinners at the house, everyone proceeded to the field house to root for "Dear Old Rose".

The basketball team is still rolling right along. With the season almost completed, the hardwood gang from 525 North Eighth still remains undefeated.

After losing a comfortable lead and dropping to second place, the bowling team has finally pushed up to first place again.

Theta Xi

At the close of last term three new men were initiated into the fold of Theta Xi. They were Criss Scharpenborg, Bob McMasters and Dan Swartz. Kappa chapter welcomes these new brothers and also Dick Lewis, a new pledge.

Kappa's basketball team and supporters will travel to Indiana University to enter into an invitational tournament to be held there March 11. Other participants will be Purdue, Ohio State and I. U. Although Kappa has won only three out of seven games this season, hopes are high for victory since these teams were all strong independents from Terre Haute, Blackhawk and Sullivan. A big stag party will be held Saturday night at I. U. to celebrate everyone's victories and defeats plus anything else that needs celebrating.

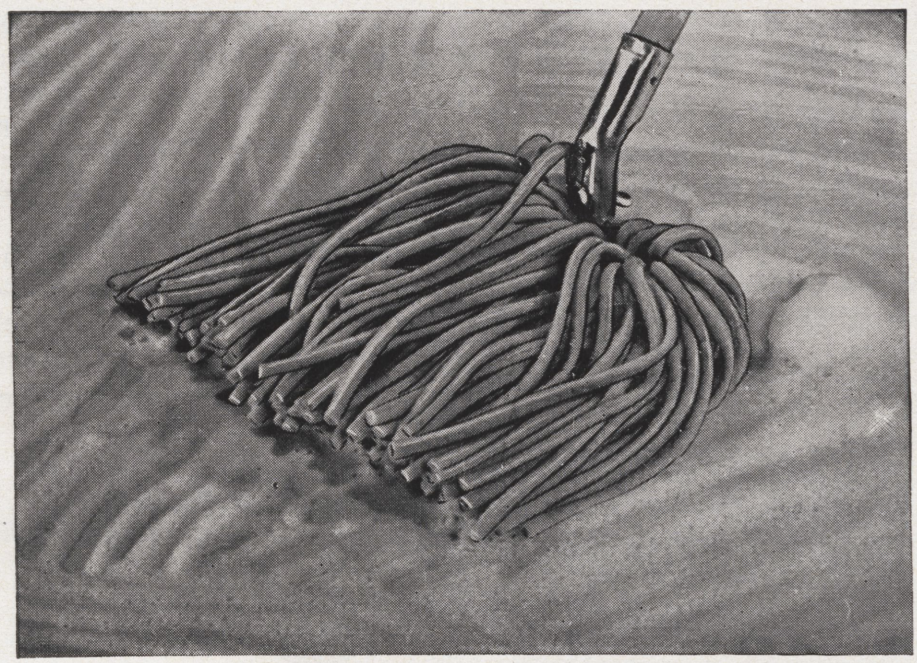
Rumors have it that "Mom" Appler is getting a big present; a new stove no doubt—the better to cook with. The brothers also have been on the lookout for a loose deep freeze but have been unable to uncover much since things haven't cooled off from the Brink's job yet.

THE DU PONT DIGEST

CROSS-SECTION *of the new mop yarn. Each cotton fiber strand is jacketed with cellulose sponge material.*

Science Makes a Better Mop

Cleaning tasks lightened by new Du Pont cellulose sponge yarn



An ordinary mop has a bad habit of unraveling. It often leaves a trail of lint. And it wears out fast. A man who sold yarn to mop manufacturers decided to do something about these nuisances. Perhaps some reinforcing material might be combined with the yarn. He did some experimental work of his own but more and more he wondered if it might be possible to use a cellulose sponge coating.

THREE YEARS OF RESEARCH

So the man called on Du Pont, the company that had introduced the cellulose sponge to America in 1936. The suggestion of a sponge yarn presented a challenging problem.

Some way would have to be found to extrude a tightly fitting cellulose sponge jacket around each strand of the yarn. The whole sponge process would have to be adjusted for use in an especially designed machine. Du Pont chemists and engineers tackled these problems.

Even the very first cellulose sponge yarn produced experimentally made mops that were strong, absorbent and durable. But the process had to be changed and improved time and time again. Then the mops were tested in places where they would get the hardest usage—railroad stations, for example.

The mops performed so well that Du Pont built a pilot plant near Buffalo and, under a license from the man who had the original idea, manufactured the yarn on a small scale. Only after three years of study and testing was Du Pont able to offer mop manufacturers the yarn in commercial quantities.

FASTER AND CLEANER

Mops made with cellulose sponge yarn pick up and retain so much water they need wringing less often. You can mop a floor with them in far less time than it formerly took. They dry quickly, leave no lint. They outwear other mops three to five times. Best of all, perhaps, they stay dirt-free longer than ordinary mops. Here is something women will appreciate—a *clean* mop!

The introduction of these new cleaning tools is another example of how business firms of all sizes depend on each other. The Du Pont Company had facilities for specialized research on cellulose sponge. Because Du Pont could supply sponge yarn economically, some twenty mop manufacturers today have a better product that saves maintenance people and the American housewife time, labor and money.

★ ★ ★

SEND FOR "The Story of Cellulose," a 43-page booklet that tells how wood and cotton are transformed into sponges, textile fibers, lacquers, plastics, coated fabrics, Cellophane and many other useful products. Illustrated with photographs, charts and chemical equations. For free copy, write to the Du Pont Company, 2503 Nemours Bldg., Wilmington 98, Delaware.

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Great Dramatic Entertainment—Tune in "Cavalcade of America" Tuesday Nights, NBC Coast to Coast

Deep Water Oil

Concluded From Page 9

other equipment that a driller needs could not be ferried in small boats; so Humble started by building, from scratch, an oilmen's navy and a complete port to serve it.

On the desolate beaches of Grand Isle, Louisiana, the engineers laid out a small city. It contains homes for families, offices, bachelor quarters, piers, storage tanks, loading facilities and fuel depots for the boats. At these depots a recent count disclosed thirty-six types of boats.

Meanwhile another problem was tackled—an "island" on which their drilling crews could work and live. The first Humble deep-water wildcat well was drilled about fifty miles from New Orleans and seven miles offshore from Grand Isle. On 100 steel piles—some as long as 280 feet—a two-deck steel island in fifty feet of salt water was built.

By March of 1948 the builders had installed the final equipment. The accountants tallied up the books, and reported that the platform (before the drilling rig was set atop it) cost $1,200,000. The first hole would cost another three-quarters of a million. Would there be oil?

The first wildcat was disappointing. It hit a salt dome, as the geologists had predicted. But the hole was in the salt, not in an oil formation—in other words, it was dry. Another try was made, this time by sidetracking from the same hole toward what they hoped would be the side of the dome.

The engineers got a well—a good well. It was Humble No. 1A Grand Isle State—8,904 feet deep—and was soon followed by another good well in a different pay zone.

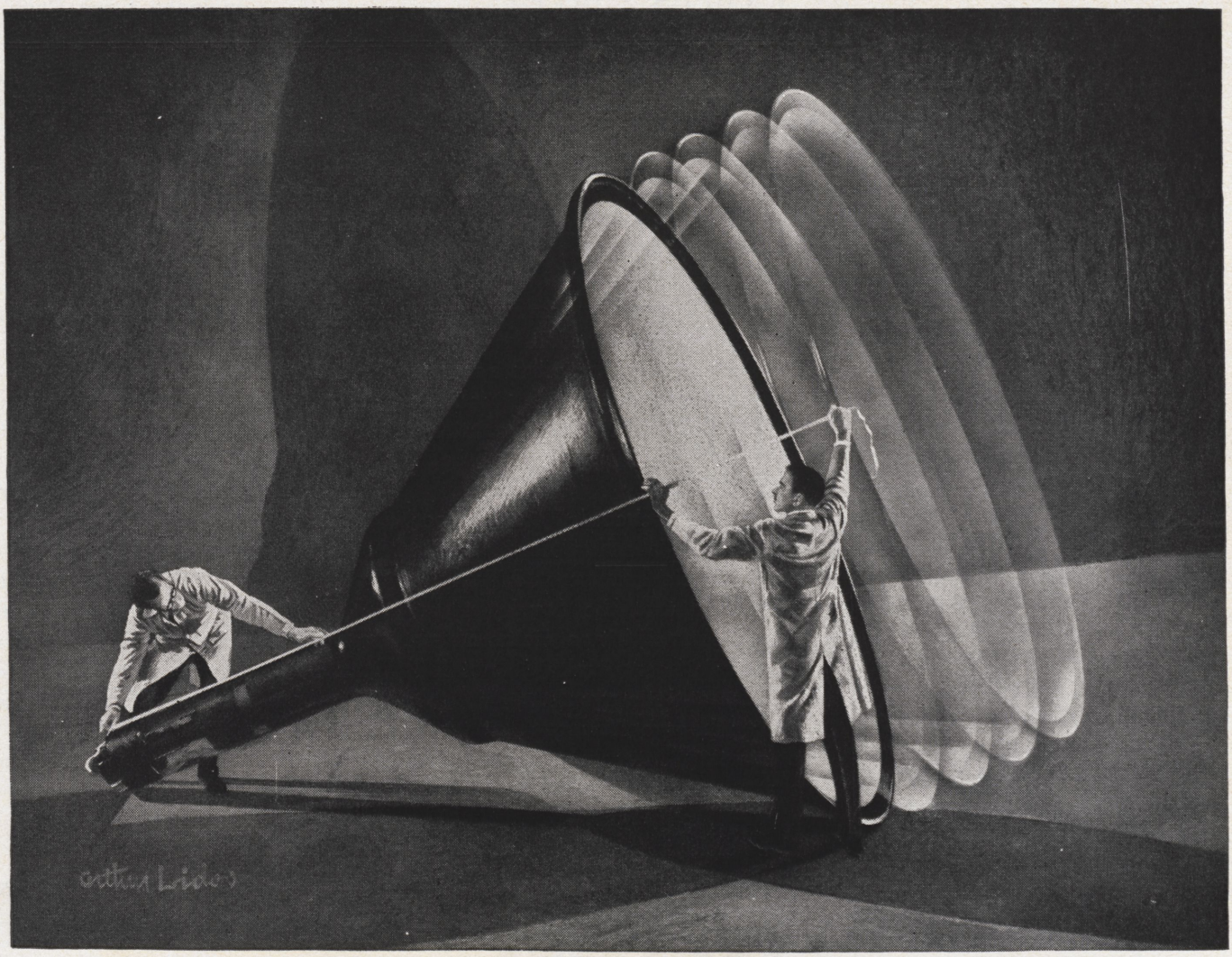
The engineers had learned that they didn't need so massive and so expensive a platform for drilling under water. That first platform was designed so that ultimately it might have as many as fourteen directional wells drilled from it. It appeared that smaller platforms, which would be less costly to move, would be practical for shallow exploration holes scattered over a wide area.

Since then Humble has built thirteen more drilling platforms, half the size of the original, besides two even smaller ones for shallow holes. Converted Navy landing ships, moored close to these platforms, provide living quarters for the crew and storage space for the drilling gear.

The last and most difficult problem yet to be solved is that of transporting the oil from the platform to the mainland.

A small pipeline was completed recently; however, some engineers think the answer may lie in tankers, which could tie up next to the rigs and take the oil to any destination. Weather and cost are the obstacles to both tankers and pipelines.

But Weather and cost haven't stopped the oilmen from finding and producing offshore oil; they won't stop them from delivering it, either.



New and shorter big screen 16-inch kinescope developed by RCA scientists.

Problem: shrink the television tube, but keep the picture ***big!***

Some rooms accommodate grand pianos; a small spinet is right for others. Until *recently*, much the same rule held true for television receivers. Your choice of screen sizes was largely governed by room space.

Now the space problem has been whipped by RCA scientists, who have *shortened the length of 16-inch television "picture tubes" more than 20%!* All the complex inner works—such as the sensitive electron gun that "paints" pictures on the screen—have been redesigned to operate at shorter focus, wider angle. Even a new type of faceplate glass, Filterglass, has been developed for RCA's 16-inch picture tubes—on principles first investigated for television by RCA.

Filterglass, incorporating a light-absorbing material, improves picture quality by cutting down reflected room light . . . and by reducing reflections inside the glass faceplate of the kinescope tube itself. Result: richer, deeper black areas and greater contrast in the television picture!

* * *

See the newest advances in radio, television, and electronics in action at RCA Exhibition Hall, 36 West 49th St., New York. Admission is free. Radio Corporation of America, Radio City, N. Y.

Continue your education with pay—at RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.

Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RADIO CORPORATION of AMERICA

World Leader in Radio—First in Television

Concluded From Page 13

the speaker.

Professor Cory talked about the uniqueness of Tau Beta Pi, and then told stories about the "Good Ole Days." He also told some very humorous incidents of his college career.

President Wilkinson closed the meeting by quelling some rumors concerning the remodeling of the school. He stated that all the money that has been and will be used for remodeling is from alumni donations, not student fees.

Track

Rose has scheduled an indoor meet with Wabash College, to be held in the field house on March 16. It is hoped that the novelty of an indoor meet will attract Terre Haute spectators who normally do not follow Rose athletic events.

Men who are now out for track are starting intensive training for the approaching season. The events not held in outdoor meets but which will be held in the indoor meet include: 50 yd. dash, 50 yd. high hurdles, 50 yd. low hurdles and 5 lap relay.

Tau Beta Pi

The Rose chapter of Tau Beta Pi was privileged to be the host of the Tau Beta Pi national president, M. M. Cory, and the national secretary, R. H. Nagle. These distinguished guests were honored at a banquet held February 28.

Mr. Cory described the national fraternity in a brief address to the local chapter.

In the last Tau Beta Pi initiation, the Rose chapter was privileged to initiate Harry R. Canfield, Rose Polytechnic Institute '06, and William E. Wynn, Texas A & M '22. These men were unable to become members while in school due to the fact that there was no charter in their respective schools at the time of their graduation. However the members of Tau Beta Pi felt they earned membership by their outstanding work in engineering.

Electronics

GLAMOUR GIRL—OR PRODUCTION WORKER?

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

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.

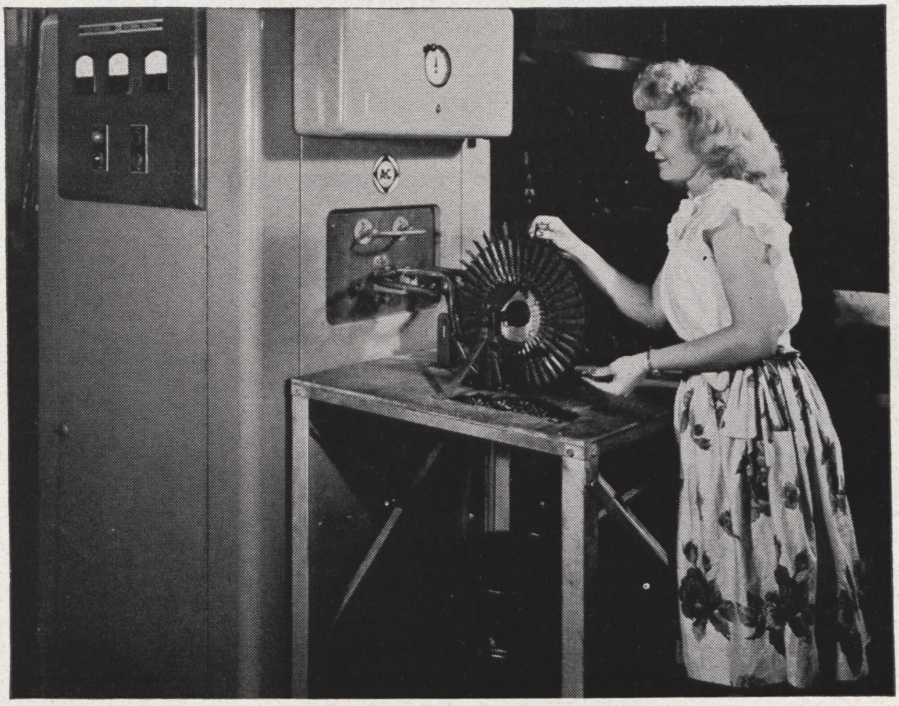
H. A. BARTLING

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.



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

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!

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

ALUMNI NEWS

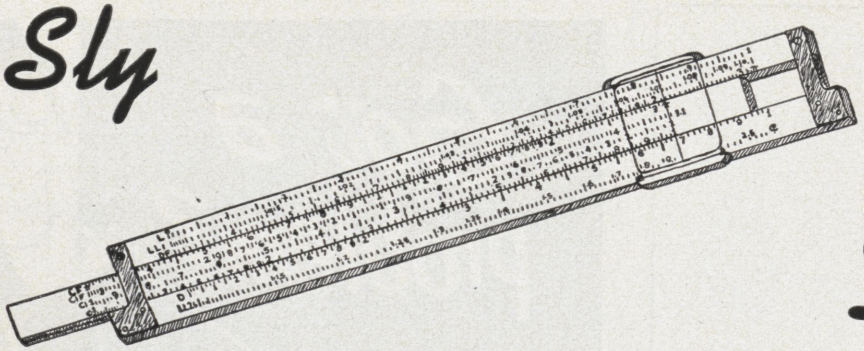
Concluded From Page 14

Mr. Galloway, who was born in 1869, died in California in 1943. He was well known throughout the country as a consulting civil engineer and a leading civil engineer of the Pacific Coast region. In 1940 the American Society of Civil Engineers made him an honorary member, the highest honor it can confer. He had been a member since 1905.

A member of the first commission on the location of the San Francisco-Oakland bridge, he took a leading part in the reconstruction of San Francisco following the great fire and earthquake of 1906. It is stated that few engineering projects on the Pacific Coast for more than 40 years were built without his consultation.

He was an advocate of earthquake resistant design and his buildings withstood the earthquake of 1906. He was an authority on the design of dams, hydroelectric works and structures generally.

Sly Droolings



By Denzil Hammond, sr., m.e.

Junior: "Daddy, what's a sweater girl?"

Dad: "Why, er-uh, a girl that works in a sweater factory." And after a minute's pause. "Say where did you get that question?"

Junior: "Never mind that, Daddy—where did you get that answer?"

* * * *

Real Estate Salesman: Would you like to see a model home?

Prospect: Glad to, what time does she quit work?

* * * *

A big buck Indian had just ordered a ham sandwich at a drug counter and was peering between the slices of bread when he turned to the waiter—"Ugh, you slice 'em ham?"

The waiter replied, "Yes, I sliced the ham."

"Ugh," grunted the Indian. "You damn near miss 'em."

* * * *

Prof. Hooper: "That's five times this week that you have failed to turn in your assignments. Do you have any comment?"

Bill Weaks: "Yes, sir. I'm sure glad it's Friday."

* * * *

The Scotchman had blown his girl to a movie, and hailed a cab to take her home. When he assisted her in, she, knowing his natural bent where money was concerned, remarked, "Oh, Jock, it makes me feel awfully wicked, riding around with you like this."

At that Jock was cheered up tremendously. "Then, mebbe." quoth he, "it'll be worth the money after all."

Funeral director (to aged mourner)—"how old are you?"

Aged Mourner—"I'll be 98 next month."

Funeral director — "Hardly worth going home is it?"

* * * *

1st Coed: "That boy friend you were riding with has trouble with his vision?"

2nd Coed: "Yes, he keeps seeing parking spots before his eyes."

* * * *

She: Take back your diamond ring. It's paste.

He: Better keep it girlie, a paste on the hand is worth two in the eye.

* * * *

He dashed up to the bar and hollered: "Gimme a double shot quick, before the trouble starts." The bartender did and he drank it.

"Gimme another double shot before the trouble starts."

The bartender puzzled, did, and asked: "Before what trouble starts?"

He replied sadly, "It's started now. I ain't got any money."

* * * *

Overheard: You never kiss me anymore. Why can't you be like the man next door.

* * * *

Professor: "Didn't you have a brother in this course last year?"

Student: "No, sir; it was I. I'm taking it over again."

Professor: "Extraordinary resemblance, though — extra-ordinary."

A fellow staggered up to the desk clerk in a local hotel the other night and demanded another room.

"But you have the best room in the house, sir," answered the clerk.

"I don't care," was the stubborn answer, "and I want it quick."

Realizing that it would do no good to argue or reason with the gentleman any longer, the clerk turned to the bell boy and said, "Move this gentleman out of 300 and put him into 309 right away."

Completely satisfied, the inebriate guest weaved toward the elevator offering no word of explanation or thanks.

"Would you mind telling me, sir, why you don't like 300?" asked the clerk, hardly expecting a sensible answer.

He got one however, "the damn thing's on fire!"

* * * *

A farmer's wife became mentally deranged. As they carried her out of the house in a strait jacket he remarked, "Shore don't know what could have got into her—she ain't been out of the kitchen in 25 years."

* * * *

Joe: "What kind of a dress did Eleanor wear last night?"

Blow: "I don't recall all the details, but I do know that the dress was checked."

Joe: "Boy! That must have been some party."

* * * *

ME.: Looks like a smart dog you got there.

CE.: Smart? All I gotta say is "Are you coming or aren't you?" and he either comes or he doesnt."

This is a picture of "PING"

It's a picture that gives automotive engineers clear-cut facts on performance—a picture that suggests how photography with its ability to record, its accuracy and its speed, can play important roles in all modern business and industry.

No, this is not the "doodling" of a man on the telephone. Far from it. It's the photographic record of an oscilloscope trace that shows, and times, detonation in a "knocking" engine. It all happens in a few hundred-thousandths of a second—yet photography gets it clearly and accurately as nothing else can.

Oscillograph recording is but one of countless functional uses of photography in bettering products and improving manufacturing methods. High speed "stills" can freeze fast action at just the crucial moment—and the design or operation of a part can be adjusted to best advantage.

And high speed movies can expand a second of action into several minutes so that fast motion can be slowed down for observation—and products be made more dependable, more durable.

Such uses of photography—and many more—can help you improve your product, your tools, your production methods. For every day, functional photography is proving a valuable and important adjunct in more and more modern enterprises.

Eastman Kodak Company, Rochester 4, N. Y.

Functional Photography

. . . is advancing business and industrial technics

Kodak